

R&S®FSW

Signal and Spectrum Analyzer

Service Manual



1173.9428.02 – 16

The Service Manual describes the following R&S® FSW models with firmware version 2.60 and higher and serial number 103000 and higher:

- R&S®FSW8 (1312.8000K08)
- R&S®FSW13 (1312.8000K13)
- R&S®FSW26 (1312.8000K26)
- R&S®FSW43 (1312.8000K43)
- R&S®FSW50 (1312.8000K50)
- R&S®FSW67 (1312.8000K67)
- R&S®FSW85 (1312.8000K85)

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The following abbreviations are used throughout this manual:

R&S®FSW is abbreviated as R&S FSW

Basic Safety Instructions

Always read through and comply with the following safety instructions!

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

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

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

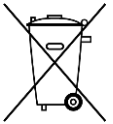
Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before and when using the product. It is also absolutely essential to observe the additional safety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

Safety labels on products

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

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

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

Signal words and their meaning

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



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



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



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



Indicates information considered important, but not hazard-related, e.g. messages relating to property damage.

In the product documentation, the word ATTENTION is used synonymously.

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

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Operating states and operating positions

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

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

Electrical safety

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

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

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

Operation

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

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

Repair and service

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

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

Batteries and rechargeable batteries/cells

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

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

Transport

1. The product may be very heavy. Therefore, the product must be handled with care. In some cases, the user may require a suitable means of lifting or moving the product (e.g. with a lift-truck) to avoid back or other physical injuries.
2. Handles on the products are designed exclusively to enable personnel to transport the product. It is therefore not permissible to use handles to fasten the product to or on transport equipment such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport or lifting. Observe the safety regulations of the manufacturer of the means of transport or lifting. Noncompliance can result in personal injury or material damage.

Instrucciones de seguridad elementales

3. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely and properly. The manufacturer assumes no responsibility for accidents or collisions. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident.

Waste disposal/Environmental protection

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

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

Instrucciones de seguridad elementales

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

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

Instrucciones de seguridad elementales

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

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

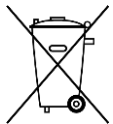
Tener en cuenta las informaciones de seguridad sirve para evitar en lo posible lesiones o daños por peligros de toda clase. Por eso es imprescindible leer detalladamente y comprender por completo las siguientes informaciones de seguridad antes de usar el producto, y respetarlas durante el uso del producto.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

Señalización de seguridad de los productos

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

Símbolo	Significado	Símbolo	Significado
	Aviso: punto de peligro general Observar la documentación del producto		Tensión de alimentación de PUESTA EN MARCHA / PARADA
	Atención en el manejo de dispositivos de peso elevado		Indicación de estado de espera (standby)
	Peligro de choque eléctrico		Corriente continua (DC)
	Advertencia: superficie caliente		Corriente alterna (AC)
	Conexión a conductor de protección		Corriente continua / Corriente alterna (DC/AC)

Instrucciones de seguridad elementales

Símbolo	Significado	Símbolo	Significado
	Conexión a tierra		El aparato está protegido en su totalidad por un aislamiento doble (reforzado)
	Conexión a masa		Distintivo de la UE para baterías y acumuladores Más información en la sección "Eliminación/protección del medio ambiente", punto 1.
	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)		Distintivo de la UE para la eliminación por separado de dispositivos eléctricos y electrónicos Más información en la sección "Eliminación/protección del medio ambiente", punto 2.
	Advertencia: rayo láser Más información en la sección "Funcionamiento", punto 7.		

Palabras de señal y su significado

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



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



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



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



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

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

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

Instrucciones de seguridad elementales

Estados operativos y posiciones de funcionamiento

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

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

Seguridad eléctrica

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

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

Instrucciones de seguridad elementales

integran productos sin interruptor en bastidores o instalaciones, se deberá colocar el interruptor en el nivel de la instalación.

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

Instrucciones de seguridad elementales

17. No utilice el producto en condiciones en las que pueda producirse o ya se hayan producido condensaciones sobre el producto o en el interior de éste, como p. ej. al desplazarlo de un lugar frío a otro caliente. La entrada de agua aumenta el riesgo de choque eléctrico.
18. Antes de la limpieza, desconecte por completo el producto de la alimentación de tensión (p. ej. red de alimentación o batería). Realice la limpieza de los aparatos con un paño suave, que no se deshilache. No utilice bajo ningún concepto productos de limpieza químicos como alcohol, acetona o diluyentes para lacas nitrocelulósicas.

Funcionamiento

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

Instrucciones de seguridad elementales

pueden causar perturbaciones radioeléctricas en entornos residenciales debido a posibles perturbaciones guiadas o radiadas. En este caso, se le podrá solicitar al operador que tome las medidas adecuadas para eliminar estas perturbaciones.

- Aparato de clase B:

Aparato adecuado para su uso en entornos residenciales, así como en aquellos conectados directamente a una red de distribución de baja tensión que suministra corriente a edificios residenciales.

Reparación y mantenimiento

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

Baterías y acumuladores o celdas

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

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

Instrucciones de seguridad elementales

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

Transporte

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

Eliminación/protección del medio ambiente

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

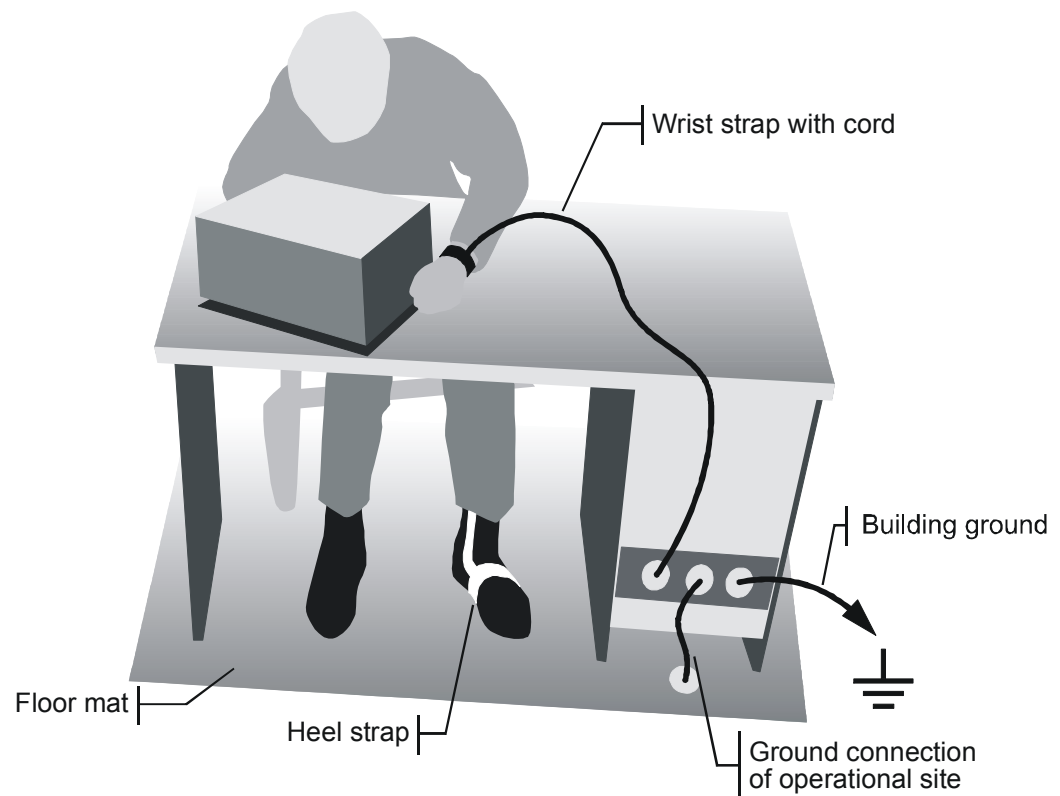
Se puede encontrar más información sobre la protección del medio ambiente en la página web de Rohde & Schwarz.

Instructions for Electrostatic Discharge Protection

NOTICE

Risk of damaging electronic components

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



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

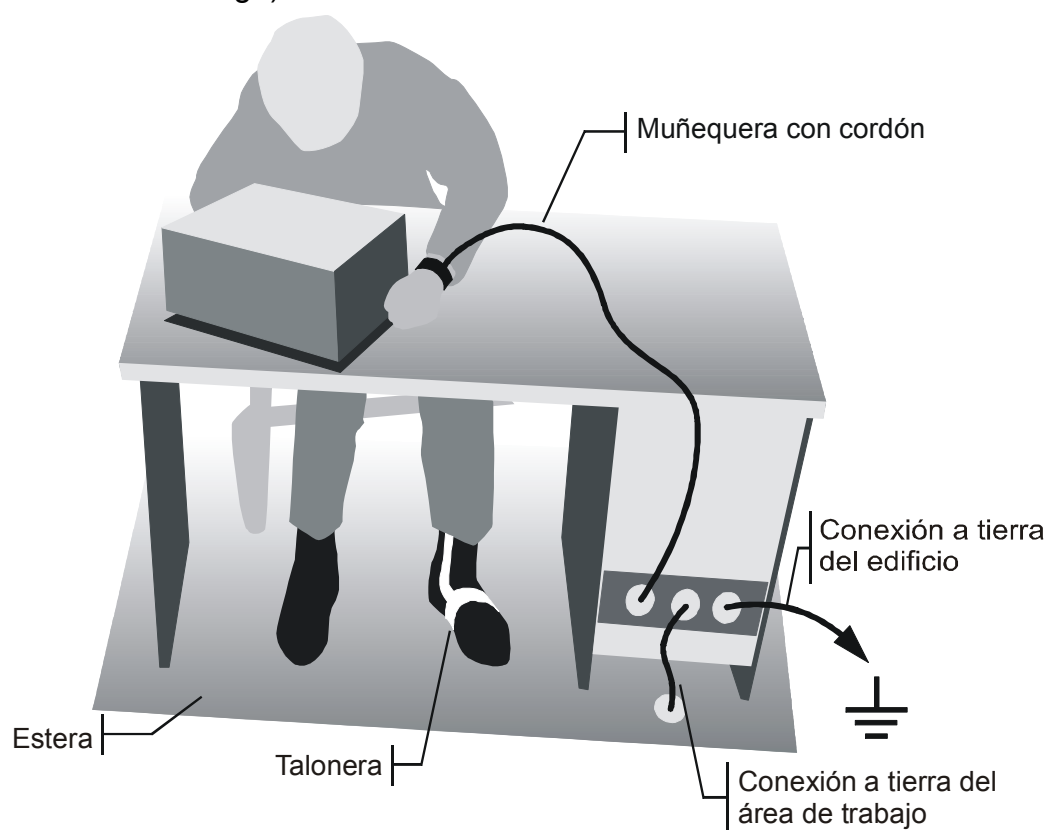
- Wrist strap with cord to ground connection
 - Conductive floor mat and heel strap combination
-

Instrucciones para la protección contra descargas electroestáticas

AVISO

Riesgo de avería de los componentes electrónicos

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



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

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

Procedure in Case of Service and Ordering of Spare Parts

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

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

Shipping the Instrument

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

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

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

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

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

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

Shipping Defective Modules

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

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

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

Exception:

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

Ordering Spare Parts

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

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

Refurbished Modules

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

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

Taking Back Defective Replaced Modules

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

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

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

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

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1 Documentation Overview

This section provides an overview of the R&S FSW user documentation. Unless specified otherwise, you find the documents on the R&S FSW product page at: www.rohde-schwarz.com/manual/FSW

1.1 Getting Started Manual

Introduces the R&S®FSW and describes how to set up and start working with the product. Includes basic operations, typical measurement examples, and general information, e.g. safety instructions, etc. A printed version is delivered with the instrument.

1.2 User Manuals and Help

Separate manuals for the base software and the additional options are provided for download:

- Base software manual
Contains the description of the graphical user interface, an introduction to remote control, the description of all SCPI remote control commands, programming examples, and information on maintenance, software interfaces and error messages. Includes the contents of the getting started manual.
- Optional application manuals
Contain the description of the specific functions of an option. Basic information on operating the R&S®FSW is not included.

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

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

1.3 Service Manual

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

The service manual is available for registered users on the global Rohde & Schwarz information system (GLORIS, <https://gloris.rohde-schwarz.com>).

1.4 Instrument Security Procedures

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

1.5 Basic Safety Instructions

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

1.6 Data Sheets and Brochures

The data sheet contains the technical specifications of the R&S®FSW. It also lists the options and their order numbers as well as optional accessories.

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

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

1.7 Release Notes and Open Source Acknowledgment (OSA)

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

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

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

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

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

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

2 Performance Test

2.1 Test Equipment

Item	Type of equipment	Recommended characteristics or features	Recommended model	R&S Order No.	Application
1	Signal generator	R&S FSW 8/13: 2 Hz to 15 GHz R&S FSW 26: 2 Hz to 26.5 GHz R&S FSW 43/50/67/85: 2 Hz to 40 GHz	R&S SMF R&S SMR40 with options depending on frequency range and LF output	1167.0000K02 1104.0002K40	Reference frequency uncertainty Display linearity
2	Signal generator	R&S FSW 8/13: 10 MHz to 15 GHz R&S FSW 26: 10 MHz to 26 GHz R&S FSW 43: 10 MHz to 43 GHz R&S FSW 50/67: 10 MHz to 50 GHz	R&S SMF R&S SMF R&S SMF R&S SMR50	1167.0000K02 1167.0000K02 1167.0000K02 1134.9008K50	Immunity to interference Nonlinearities Frequency response
3	Power splitter 2-resistor design	DC to 3.6 GHz equivalent output SWR 10 MHz to 3.6 GHz < 1.1 level imbalance ≤ 0.1 dB	Weinschel Model 1870A		Frequency response
4	Power splitter 2-resistor design	R&S FSW 8: 10 MHz to 8 GHz R&S FSW 13: 10 MHz to 14 GHz R&S FSW 26: 10 MHz to 26 GHz R&S FSW 43/50 10 MHz to 50 GHz R&S FSW 67 10 MHz to 67 GHz level imbalance 10 MHz to 26.5 GHz: ≤ 0.3 dB 26.5 GHz to 50 GHz: ≤ 0.5 dB 50 GHz to 67 GHz: ≤ 1.8 dB equivalent output SWR DC to 26.5 GHz: ≤ 1.3 26.5 GHz to 50 GHz: ≤ 1.7 50 GHz to 67 GHz: ≤ 3.11	Weinschel Model 1534 Agilent 11667B Agilent 11667C Anritsu V240C		Frequency response Third order intercept
5	50-Ohm termination	Frequency Range from DC to the maximum Frequency of the FSW	Anritsu 28S50		Noise display
6	Power meter	-30 dBm to +10 dBm	R&S NRP	1143.8500.02	Frequency response

Item	Type of equipment	Recommended characteristics or features	Recommended model	R&S Order No.	Application
		Instrumentation uncertainty<0.5%			B21, LO output power
7	Power sensor	9 kHz to 7 GHz -30 dBm to 0 dBm	R&S NRP-Z91	1168.8004.02	Frequency response
8	Power sensor	R&S FSW 8/13/26 DC to 40 GHz -30 dBm to 0 dBm R&S FSW 43/50 DC to 50 GHz R&S FSW 67 DC to 67 GHz R&S FSW 85 DC to 85 GHz	R&S NRP-Z55 R&S NRP-Z56 R&S NRP-Z57 R&S NRP-Z58	1138.2008.02 1171.8201.02 1171.8401.02 1171.7031.02	Frequency response B21, LO output power
9	Step attenuator	variable attenuation 0 dB to 100 dB, 1-dB steps attenuation uncertainty < 0.1 dB (f = 128 MHz)	R&S RSG with special calibration	1009.4505.02 0859.4822.00	Display linearity RF attenuator Reference level switching
10	Fixed Attenuator (2 units)	fixed attenuation 10 dB	Anritsu 43KC-10		Nonlinearities B21, LO output power
11	Network analyzer	R&S FSW 8: 20 MHz to 8 GHz R&S FSW 13: 20 MHz to 14 GHz R&S FSW26: 20 MHz to 26.5 GHz R&S FSW43/50/85: 20 MHz to 40 GHz	R&S ZVA	1145.1110.10 1145.1110.24 1145.1110.24 1145.1110.40	VSWR
12	Voltmeter	2 Hz to 9 kHz	R&S URE2	0350.5315.02	frequency response
13	50 Ω termination	BNC, 50 $\Omega \pm 0.1$ %	RAD 50	0844.9352.02	frequency response
15	Multimeter	Current 50 mA uncertainty +/- 0.01 mA			B21, bias current
16	Phasenoise Standard 1GHz or 640 MHz	< -105 dBc/Hz @ 100 Hz < -130 dBc/Hz @ 1 kHz < -140 dBc/Hz @ 10 kHz < -150 dBc/Hz @ 100 kHz < -150 dBc/Hz @ 1 MHz	SPREF FSU-B5		Phase Noise
17	Frequency doubler	f _{in} : 21.5 – 33.5 GHz f _{out} : 43 – 67 GHz fundamental wave suppression:< 10dBc	Marki Microwave D-0365		RF-source for measurements > 43.5 GHz
18	Driving amplifier for frequency	Frequency range: 21.5 – 33.5 GHz	Marki Microwave AG-2044V		Driving amplifier for frequency doubler for measurements> 43.5

Item	Type of equipment	Recommended characteristics or features	Recommended model	R&S Order No.	Application
	doubler	Output power: > 15dBm			GHz
19	Two V to WR15 waveguide transitions as highpass filter		RPG S/N: 050		Fundamental wave suppression of frequency doubler for measurements > 43,5 GHz
20	Signal generator	65 GHz to 85 GHz -25dBm to +1dBm	R&S SMF with R&S SMZ90 with Option R&S SMZ-B90E	1167.0000K02 1417.4504K02 1417.6607.02	RF-source for measurements > 43.5 GHz
21	1mm cable	Female to female short as possible			Connection SMZ90 to FSW85
22	WR12 Twist with bend			RPG	Connection SMZ90 to FSW85
23	WR12 to 1mm (male) Adapter			RPG	Connection SMZ90 to FSW85
24	Oscilloscope	4 GHz Bandwidth	R&S RTO1044	1316.1000.44	B2000
100	Low pass filter set	9 MHz, -30 dB@18 MHz 21 MHz, -30dB@42 MHz 106 MHz, -30dB@212 MHz 274 MHz, -30 dB@548 MHz 450 MHz, -30 dB@900 MHz 1 GHz, -30 dB@1,4 GHz 1.75 GHz, -30dB@3 GHz 3.5 GHz, -30dB@7 GHz			2nd order harmonic distortion

2.2 Checking the Reference Frequency Uncertainty

Test equipment: Signal generator (chapter "Measuring Equipment and Accessories", item. 1):

Frequency e.g. 1000 MHz

Level -20 dBm

Frequency uncertainty <1x10⁻⁹

If the frequency uncertainty 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®FSW.

Signal generator settings:

- Frequency 1000 MHz
- Level -20 dBm

R&S®FSW settings:

- [PRESET]
- [FREQ : CENTER : 1 GHz]
- [SPAN : 1 MHz]
- [BW : RES BW MANUAL : 300 kHz]
- [AMPT : REF Level : -8 dBm]
- [SETUP : REFERENCE INT / EXT]

Switch to the internal reference source (INT)

Note: Before the following measurement, the R&S®FSW must be on for at least ten minutes with the 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 1 GHz $\pm$ 100 Hz (corresponds to 1E-7)

Model with B4 1 GHz $\pm$ 30 Hz (corresponds to 3E-8)

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

2.3 Checking Immunity to Interference

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

Frequency range	R&S®FSW 8 :	10 MHz to 18 GHz
	R&S®FSW 13:	10 MHz to 18 GHz
	R&S®FSW 26:	10 MHz to 26.5 GHz
	R&S®FSW 43/ 50/ 67/85:	10 MHz to 40 GHz
Output level	-10 dBm minimum	

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

R&S®FSW settings:

- [PRESET]
- [AMPT : RF ATTEN MANUAL : 0 dB]
- [AMPT : REF LEVEL : -30 dBm]
- [SPAN : 15 MHz]
- [BW : RES BW MANUAL : 100 Hz] for FSW8/13/26/43/50
- [BW : RES BW MANUAL : 30 Hz] for FSW67/85

2.3.1 2nd IF Image Frequency Rejection

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

Frequency range	R&S®FSW 8 :	10 MHz to 18 GHz
	R&S®FSW 13:	10 MHz to 18 GHz
	R&S®FSW 26:	10 MHz to 26.5 GHz
	R&S®FSW 43/ 50/ 67/85:	10 MHz to 40 GHz
Output level	-10 dBm minimum	

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

R&S®FSW settings:

- [PRESET]
- [AMPT : RF ATTEN MANUAL : 0 dB]
- [AMPT : REF LEVEL : -30 dBm]
- [SPAN : 15 MHz]
- [BW : RES BW MANUAL : 100 Hz] for FSW8/13/26/43/50
- [BW : RES BW MANUAL : 30 Hz] for FSW67/85

2.3.2 3rd IF Image Frequency Rejection

Additional signal generator settings:

- Frequency $f_{in} + 2 \times 37 \text{ MHz}$
- Level: adjust the output level of signal generator for an RF-Input level of 0 dBm

Additional R&S®FSW settings:

- [FREQ : CENTER : { f_{in} }]

Test frequencies: R&S FSW 8 : $f_{in} = 63 \text{ MHz}, 100 \text{ MHz}, 900 \text{ MHz}, 1100 \text{ MHz}, 7990 \text{ MHz}$
 R&S FSW 13/ 26: $f_{in} = 63 \text{ MHz}, 100 \text{ MHz}, 900 \text{ MHz}, 1100 \text{ MHz}, 7990 \text{ MHz}$

Measurement: Set marker to peak of signal
 - [MKR $\Rightarrow$: PEAK]

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

2.3.3 2nd IF Rejection

Additional signal - Frequency 1317 MHz
 generator settings: - Level: adjust the output level of the signal generator for a RF-Input level of 0 dBm

Additional R&S®FSW settings: - [FREQ : CENTER : { f_{in} }]

Test frequencies 50 MHz, 200 MHz, 500 MHz, 900 MHz, 1100 MHz, 7990 MHz
 R&S®FSW 13: additional at 9 GHz, 12 GHz
 R&S®FSW 26: additional at 9 GHz, 12 GHz, 25 GHz
 R&S®FSW 43/50/67/85: additional at 9 GHz, 12 GHz, 25 GHz, 38 GHz

Measurement: Set marker to peak of signal
 - [MKR $\Rightarrow$: PEAK]

Evaluation: The IF rejection is the difference between the output level of the signal generator and the level reading of marker 1 (Ldis):
 IF rejection = $-10\text{dBm} - L_{dis}$

2.3.4 3rd IF Rejection

Additional signal - Frequency 37 MHz
 generator settings: - Level: adjust the output level of the signal generator for a RF-Input level of 0 dBm

Additional R&S®FSW settings:

Test frequencies 100 MHz, 200 MHz, 500 MHz, 900 MHz, 1100 MHz, 7990 MHz

R&S®FSW 13: additional at 9 GHz, 12 GHz

R&S®FSW 26: additional at 9 GHz, 12 GHz, 25 GHz

R&S®FSW 43/50/67/85: additional at 9 GHz, 12 GHz, 25 GHz, 38 GHz

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 (Ldis):

IF rejection = -10dBm – Ldis

2.4 Checking Nonlinearities

2.4.1 Third-Order Intercept Point

Test equipment: 2 signal generators (Section "Measurement Equipment", item 2)

Frequency range:

R&S®FSW 8: 10 MHz to 8 GHz

R&S®FSW 13: 10 MHz to 14 GHz

R&S®FSW 26: 10 MHz to 26.5 GHz

R&S®FSW 43/50/67/85: 10 MHz to 40 GHz

2 attenuators (Section "Measurement Equipment", item 10)

Attenuation aATT = 10 dB

Frequency range:

R&S®FSW 8: 10 MHz to 8 GHz

R&S®FSW 13: 10 MHz to 14 GHz

R&S®FSW 26: 10 MHz to 26.5 GHz

R&S®FSW 43/50/67/85: 10 MHz to 40 GHz

Power splitter/combiner (Section "Measurement Equipment", item 4)

Frequency range:

R&S®FSW 8: 10 MHz to 8 GHz

R&S®FSW 13: 10 MHz to 14 GHz

R&S®FSW 26: 10 MHz to 26.5 GHz

R&S®FSW 43/50/67/85: 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 FSW.

Note: If the interference between the generators is sufficient low without attenuators, the generators may be connected directly to the power combiner.

Signal generator - Frequency: generator 1 $fg1 = f_{in} - 500 \text{ kHz}$
 settings: generator 2 $fg2 = f_{in} + 500 \text{ kHz}$

(both generators):

Adjust the output level of the signal generators for an input level at the R&S®FSW of

-15 dBm $\pm$ 1 dB. for all models and all frequencies $\leq$ 8 GHz

-15 dBm $\pm$ 1 dB. for R&S FSW13/26 and frequencies > 8 GHz

-20 dBm $\pm$ 1 dB. for R&S FSW43/50/67/85 and frequencies > 8 GHz

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

R&S FSW
settings:

- [PRESET]
- [AMPT : RF ATTEN MANUAL : 0 dB]
- [AMPT : -10 dBm]
- [SPAN : 4 MHz]
- [BW : RES BW MANUAL : 2 kHz]
- [FREQ : CENTER : {fin}]

Test frequencies Fin = 11 MHz, 20 MHz, 50 MHz, 100 MHz, 190 MHz to 990 MHz in 200 MHz steps, 1010 MHz, 1190 MHz to 2990 MHz in 200 MHz steps, 3010 MHz, 3490 MHz to 7990 MHz in 500 MHz steps

R&S®FSW 13: additional 8.1 GHz to 13.1 GHz in 1 GHz steps

R&S®FSW 26: additional 8.1 GHz to 26.1 GHz in 1 GHz steps

R&S®FSW 43/50/67/85: additional 8.1 GHz to 39.1 GHz in 1 GHz steps, and 39.9 GHz

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].

Note: If the input signal is exactly known, the level of the spurious products can alternatively be measured in a span of 20 kHz, for example. The TOI is then calculated from the average of the two spurious signals and the average of the two useful signals.

2.4.2 Second-Order Harmonic Distortion

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

Frequency range: 9 MHz to 3.5 GHz

Recommended harmonic suppression:

10 MHz < f < 4 GHz: >80 dBc

f > 4 GHz : >90 dBc

In order to improve the harmonic suppression of the generator it is recommended to insert a lowpass filter with a suitable cut-off frequency (Section "Measurement Equipment", item 100) after the generator.

Test setup: Connect RF output of signal generator to the input of the lowpass filter
Connect the output of the lowpass filter to the RF input of the R&S®FSW

Note: The RF output of the generator can be connected directly to the RF input of the R&S FSW in this case.

Signal generator settings:
- Level: -5 dBm at the input of the R&S FSW
- Frequency: fin

R&S FSW settings:

- [PRESET]
- [AMPT : RF ATTEN MANUAL : 0 dB]
- [AMPT : -10 dBm]
- [SPAN : 500 kHz]
- [BW : RES BW MANUAL : 30 Hz]
- [BW : VIDEO BW MANUAL : 10 Hz]
- [FREQ : CENTER : { fin }]

Test frequencies fin = 9 MHz, 21 MHz, 106 MHz, 274 MHz, 449.9 MHz, 699.9 MHz, 999.9 MHz, 1499.9 MHz, 1749.9 MHz, 2699.9 MHz, 3449.9 MHz

Test limits according to datasheet

With option B13: switch on the high pass filter and repeat the measurement with 699.9 MHz and 1499 MHz, Test limits according to datasheet

Measurement: Set marker to peak of signal

- [MKR ⇒ : PEAK]

The level of the input signal Lin is displayed by the marker reading for marker 1.

Set center frequency of the R&S FSW to the frequency of the 2nd harmonic

- [FREQ : CENTER : { 2 x fin }]

Measurement: Set marker to peak of the 2nd harmonic

- [MKR ⇒ : PEAK]

The level of the harmonic signal LK2 is displayed by the marker reading for marker 1.

Evaluation: The second order harmonic distortion can be calculated as:

$$IPK2 / dBm = (LIN - L K2) + LIN$$

2.5 Checking IF Filters

Test equipment: Signal generator (Section "Measurement Equipment", item 1):

Frequency	64 MHz
Level	≥ 0 dBm

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

2.5.1 Checking the bandwidth switching level uncertainty

Reference
measurement
(RBW 10 kHz)

Signal generator settings:
- Frequency: 64 MHz
- Level: -20 dBm

R&S FSW settings:
- [PRESET]
- [AMPT : -10 dBm]
- [AMPT : RF ATTEN MANUAL : 10 dB]
- [FREQ : CENTER : 64 MHz]
- [SPAN : 100 kHz]
- [BW : RBW MANUAL : 10 kHz]
- [BW : VBW MANUAL : 100 kHz]
- [BW : SWEEP TIME MANUAL : 100 ms]
- [TRACE : DETECTOR : RMS]

Reference measurement:
Set marker to peak of signal
- [MKR ⇒ : PEAK]
Set reference to peak of signal
- [MKR : REFERENCE FIXED]

Checking the level
uncertainty:

R&S FSW settings:
- [SPAN : {10 x RBW}] for $RBW \leq 10$ MHz or
- [SPAN : ZERO] for $RBW > 10$ MHz
- [BW : RBW MANUAL : {RBW} : ENTER]
- [BW : VBW MANUAL : {10 x RBW} : ENTER]

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

Test points	Check the following resolution filters : RBW = 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz, 10 MHz
Evaluation:	The level difference is displayed in the marker field by the reading ‘Delta [T1 FXD] {xxx} dB’.

2.5.2 Checking the bandwidth switching level uncertainty with option R&S®FSW-B8

Reference
measurement
(RBW 10 kHz)

Signal generator
settings:

- Frequency: 64 MHz
- Level: -20 dBm

R&S FSW
settings:

- [PRESET]
- [AMPT : -10 dBm]
- [AMPT : RF ATTEN MANUAL : 10 dB]
- [FREQ : CENTER : 64 MHz]
- [SPAN : 100 kHz]
- [BW : RBW MANUAL : 10 kHz]
- [BW : VBW MANUAL : 100 Hz]

Reference
measurement:

Set marker to peak of signal

- [MKR ⇒ : PEAK]

Set reference to peak of signal

- [MKR : REFERENCE FIXED]

Checking the level
uncertainty:

R&S FSW
settings:

- [SPAN : ZERO]
 - [BW : RBW MANUAL : {RBW} : ENTER]
 - [BW : VBW MANUAL : {0.01 x RBW} : ENTER]
- If RBW < 100 Hz then use VBW = 1 Hz

Measurement: Set marker to peak of signal

- [MKR ⇒ : PEAK]

Test points Check the following resolution filters :

RBW = 20 MHz, 28 MHz, 50 MHz, 80 MHz

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

2.6 Checking Spurious Response

Test equipment: 50 Ω termination (Section "Measurement Equipment", item 5)

Frequency range:

R&S®FSW 8:	DC to 8 GHz
R&S®FSW 13:	DC to 13.6 GHz
R&S®FSW 26	DC to 26.5 GHz
R&S®FSW 43:	DC to 43.5 GHz
R&S®FSW 50:	DC to 50 GHz
R&S®FSW 67:	DC to 67 GHz
R&S®FSW 85:	DC to 85 GHz

Test setup: Terminate the RF input of the FSW with 50 Ω

R&S FSW
settings:

- [PRESET]
- [AMPT : RF ATTEN MANUAL : 0 dB]
- [AMPT : -50 dBm]
- [FREQ : START : 1 MHz]
- [FREQ : STOP : 8900 MHz] // 8000 MHz with FSW8
- [BW : RES BW MANUAL : 200 Hz]

Measurement: Start a Sweep and set the Marker to peak. The level should be below -110 dBm.

R&S FSW
settings:

R&S°FSW13

- [FREQ : START : 8900 MHz]
- [FREQ : STOP : Fmax of instrument]
- [BW : RES BW MANUAL : 1 kHz]

R&S°FSW26:

- [FREQ : START : 8900 MHz]
- [FREQ : STOP : 25000 MHz]
- [BW : RES BW MANUAL : 1 kHz]
- [FREQ : START : 25000 MHz]
- [FREQ : STOP : 26500 MHz]
- [BW : RES BW MANUAL : 500 Hz]

R&S°FSW43, R&S°FSW50

- [FREQ : START : 8900 MHz]
- [FREQ : STOP : 25000 MHz]
- [BW : RES BW MANUAL : 1 kHz]
- [FREQ : START : 25000 MHz]
- [FREQ : STOP : 43500 MHz]
- [BW : RES BW MANUAL : 300 Hz]

R&S°FSW67, R&S°FSW85

- [FREQ : START : 8900 MHz]
- [FREQ : STOP : 26500 MHz]
- [BW : RES BW MANUAL : 300 Hz]
- [BW : VBW MANUAL : 100 Hz]

Measurement: Start a Sweep and set the Marker to peak. The level should be below -100 dBm.

2.7 Checking Noise Display

Test equipment: 50 Ω termination (Section "Measurement Equipment", item 5)

Frequency range:

R&S®FSW 8:	DC to 8 GHz
R&S®FSW 13:	DC to 13.6 GHz
R&S®FSW 26:	DC to 26.5 GHz
R&S®FSW 43:	DC to 43.5 GHz
R&S®FSW 50:	DC to 50 GHz
R&S®FSW 67:	DC to 67 GHz
R&S®FSW 85:	DC to 85 GHz

Terminate the RF input of the FSW with 50 Ω

R&S FSW
settings:

- [PRESET]
- [AMPT : RF ATTEN MANUAL : 0 dB]
- [AMPT : -60 dBm]
- [INPUT:COUPLING:DC]
- [SPAN : 0 Hz]
- [TRACE 1 : AVERAGE]
- [TRACE 1 : SWEEP COUNT : {SWPCNT} ENTER]
- [MEAS : TIME DOMAIN POWER : MEAN]
- [FREQ : CENTER : {fn}]
- [BW : RBW MANUAL : {RBW}]
- [BW : VBW MANUAL : 1Hz]
- [BW : SWEEP TIME MANUAL : 100 ms]

Measurement: Read out the mean marker and correct the measurement value by
 $-10 \times \log(\text{RBW} / 1 \text{ Hz})$:

RBW = 1 Hz corresponds with 0 dB correction

RBW = 10 Hz corresponds with -10 dB correction

RBW = 100 Hz corresponds with -20 dB correction

RBW = 1 kHz corresponds with -30 dB correction

Test frequencies:	RBW = 1 Hz; SWPCNT = 20; f_n = 2 Hz, 10 Hz RBW = 10 Hz; SWPCNT = 5; f_n = 30 Hz, 90 Hz, RBW = 100 Hz; SWPCNT = 5; f_n = 300 Hz, 980 Hz RBW = 1 kHz; SWPCNT = 1; f_n = 9.8 kHz, 98 kHz, 998 kHz, 9.8 MHz, 30 MHz, 99 MHz to 7999 MHz in 100 MHz steps 8500 MHz to the maximum Frequency of the instrument in 500 MHz steps Test limits according to datasheet
Additional test frequencies with Option R&S®FSW-B24	Set the RF preamplifier to 30 dB gain and check with RBW = 1 kHz and SWPCNT = 1 the noise display with the following test frequencies: 50 MHz, 99 MHz to 7999 MHz in 100 MHz steps. For instruments with a maximum frequency above 8 GHz additional: 8500 MHz to the maximum Frequency of the instrument in 500 MHz steps Test limits according to datasheet
Additional test frequencies with Option R&S®FSW-B13	Activate the high pass (preamp off) and check the following test frequencies: 1051 MHz to 2850 MHz in 200 MHz steps and 2950 MHz Test limits according to datasheet.
YIG Filter Bypass	Activate the YIG Filter Bypass and check the following test frequencies:
For instruments with a maximum frequency > 8 GHz	For R&S FSW26/43/50/67 test frequencies are: 8001 MHz, 8500 MHz to maximum Frequency in 500 MHz steps. For R&S FSW85 test frequencies are: RBW = 1 Hz; SWPCNT = 20; f_n = 2 Hz, 10 Hz RBW = 10 Hz; SWPCNT = 5; f_n = 30 Hz, 90 Hz, RBW = 100 Hz; SWPCNT = 5; f_n = 300 Hz, 980 Hz RBW = 1 kHz; SWPCNT = 1; f_n = 9.8 kHz, 98 kHz, 998 kHz, 9.8 MHz, 30 MHz, 99 MHz to 7999 MHz in 100 MHz steps 8001 MHz, 8500 MHz to maximum Frequency in 500 MHz steps. Test limits according to datasheet.

2.8 Checking the Level Uncertainty and the Frequency Response

Test equipment:	Signal Generator (Section "Measurement Equipment", item 1)
	Frequency range 9 kHz to 1 GHz
	Maximum level ≥ 0 dBm

Signal Generator (Section "Measurement Equipment", item 2)

Frequency range: R&S®FSW 8:	10 MHz to 8 GHz
R&S®FSW 13:	10 MHz to 13.6 GHz
R&S®FSW 26:	10 MHz to 26.5 GHz
R&S®FSW 43:	10 MHz to 43.5 GHz
R&S®FSW 50:	10 MHz to 50.0 GHz
R&S®FSW 67:	10 MHz to 67.0 GHz
Maximum level:	≥ -10 dBm

Signal Generator with frequency doubler, driver amplifier and waveguide highpassfilter for frequency generation > 43.5 GHz (Section "Measurement Equipment", item 2 plus item 17 to 19)

Frequency range: R&S®FSW 50:	43.5 GHz to 50 GHz
R&S®FSW 67/85:	43.5 GHz to 67 GHz
Maximum level:	≥ -10 dBm

Signal Generator with frequency extension > 67 GHz (Section "Measurement Equipment", item 20)

Frequency range: R&S®FSW 85:	65 GHz to 85 GHz
Maximum level:	≥ -10 dBm

Power meter (Section "Measurement Equipment", item 6)

Power range	-30 to 0 dBm
Instrumentation uncertainty	$<0.5\%$
Uncertainty of power reference	$<1.2\%$
VSWR of power reference	<1.10

Power Sensor (Section "Measurement Equipment", item 7)

Frequency range	9 kHz to 7 GHz
Power range	-30 to 0 dBm
Cal factor uncertainty	1 MHz to 3.6 GHz $<1.6\%$
	3.6 GHz to 7 GHz $<2\%$
VSWR	1 MHz to 7 GHz <1.15
	50 MHz to 128 MHz <1.10

Power Sensor (Section "Measurement Equipment", item 8)

Frequency range:	
R&S®FSW 8:	DC to 8 GHz
R&S®FSW 13:	DC to 13.6 GHz
R&S®FSW 26:	DC to 26.5 GHz
R&S®FSW 43:	DC to 43 GHz
R&S®FSW 50:	DC to 50 GHz
R&S®FSW 67:	DC to 67 GHz
R&S®FSW 85:	DC to 85 GHz

Power range	-30 to 0 dBm	
Cal factor uncertainty	50 to 128 MHz	<1.6 %
	3.6 to 8 GHz	<2 %
	8 to 22 GHz	<2.5 %
	22 to 26.5 GHz	<3 %
	26.5 to 85 GHz	<3.5 %
VSWR	50 to 128 MHz	<1.15
	3.6 to 8 GHz	<1.15
	8 to 22 GHz	<1.25
	22 to 26.5 GHz	<1.35
	26.5 to 67 GHz	<1.30

6 dB Power Splitter (Section "Measurement Equipment", item 3)

Frequency range	DC to 3.6 GHz	
Level imbalance	10 MHz to 3.6 GHz	<0.1 dB
Equivalent output VSWR	10 MHz to 3.6 GHz	≤ 1.1

6 dB Power Splitter (Section "Measurement Equipment", item 4)

Frequency range:

R&S®FSW 8	DC to 8 GHz
R&S®FSW 13	DC to 13.6 GHz
R&S®FSW 26	DC to 26.5 GHz
R&S®FSW 43	DC to 43.5 GHz
R&S®FSW 50	DC to 50.0 GHz
R&S®FSW 67/85	DC to 67.0 GHz

Level imbalance	3.6 to 7 GHz	≤ 0.3 dB
	7 to 22 GHz	≤ 0.4 dB
	22 to 26.5 GHz	≤ 0.5 dB
	26,5 to 43 GHz	≤ 0.8 dB

Equivalent output VSWR	3.6 to 7 GHz	≤ 1.3
	7 to 22 GHz	≤ 1.4
	22 to 26.5 GHz	≤ 1.5
	26,5 to 43 GHz	≤ 2

2.8.1 Absolute level uncertainty at 64 MHz

- Test setup:
- Standardize the Power Meter and Power Sensor (item 6, 7).
 - Set the Power Meter Cal Factor to the appropriate value for the Power Sensor for 64 MHz.
 - Connect Power Sensor through a cable to RF output of Signal Generator.

Signal generator settings:

- Frequency 64 MHz
- Level -10 dBm

Measurement:

- Adjust level to $-10 \text{ dBm} \pm 0.1 \text{ dB}$ as viewed on the Power Meter.
- Record the Power Meter indication.
- Disconnect Power Sensor from the cable.

R&S FSW settings:

- [PRESET]
- [AMPT : RF ATTEN MANUAL : 10 dB]
- [AMPT : -10 dBm]
- [SWEEP : SWEEP TIME : 10 ms]
- [SPAN : 30 kHz]
- [BW : RES BW MANUAL : 10 kHz]
- [TRACE : DETECTOR : RMS]
- [FREQ : CENTER : 64 MHz]
- Set marker to peak of signal
- [MKR $\Rightarrow$: PEAK]

Evaluation:

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

$$\text{Level uncertainty}_{64\text{MHz}} = L_{\text{FSW}} - L_{\text{powermeter}}$$

Additional measurement for instruments with FSW-B25

Repeat Measurement with RF attenuation = 10 dB, electronic attenuation = 0n and electronic attenuation = 0, 10 and 20 dB

2.8.2 Frequency response

Checking the frequency response

Note:

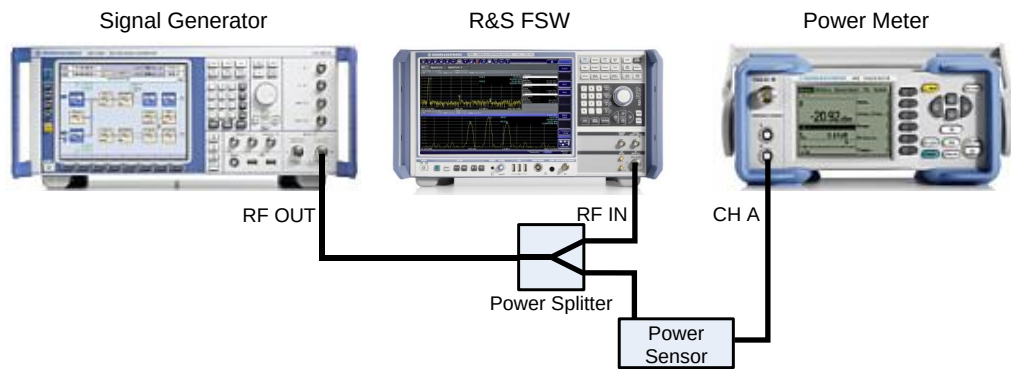
If a power splitter with higher level imbalance is used, correction of the measured frequency response is recommended.

Test setup for
measurement up
to 67 GHz:

Standardize the Power Meter and Power Sensor (item 6, 7, 8).

Use Power Splitter/Combiner (item 3) and connect equipment as shown below.

Connect the power splitter directly to the R&S FSW RF input.



Important Note

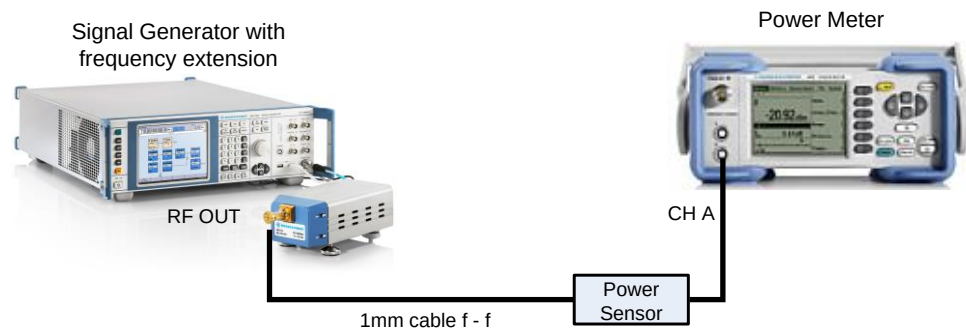
Throughout the remaining steps set the Power Meter Cal Factor as appropriate!

Test setup for measurement from 65 GHz to 85 GHz: Standardize the Power Meter and Power Sensor (item 6, 7, 8).
In a first step connect frequency extension for measurements above 65 GHz (item 20) via 1mm cable (item 21) to power sensor (item 8) – see picture below.

Set signal level to -10 dBm.

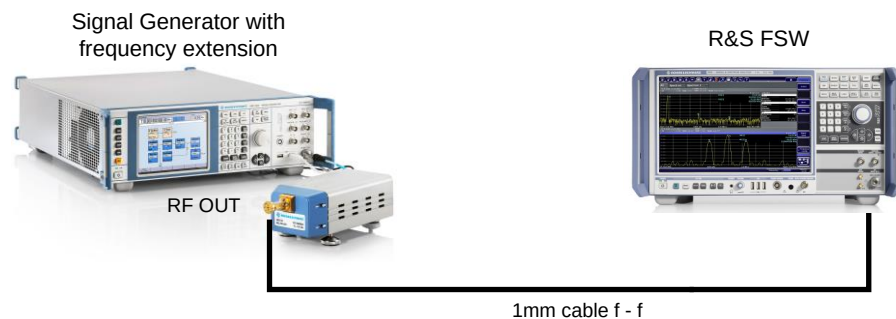
Set signal source frequency to f_{fresp} – use same frequency list as defined for executed frequency response test (see below).

Read level indication from power meter $L_{\text{ref}}(f_{\text{fresp}})$ and store value together with adjusted frequency f_{fresp} in a list



For the frequency response measurement connect frequency extension via same 1mm cable (item 21) as in the reference measurement above to instrument

Set signal level to -10 dBm.



Important Note

Throughout the remaining steps set the Power Meter Cal Factor as appropriate!

Signal generator settings:

- Level 0 dBm
- Frequency 64 MHz

R&S FSW settings:	- [PRESET] - [AMPT : RF INPUT {coupling}] - [AMPT : RF ATTEN MANUAL : {aFSW}] - [AMPT : 0 dBm] - [SPAN : 100 kHz] - [BW : RES BW MANUAL : 10 kHz] - [FREQ : CENTER : 64 MHz] - [MKR $\Rightarrow$: MORE : EXCLUDE LO]
Reference measurement:	Determine signal level $L_{\text{powermeter}}$. Set marker to peak of signal - [MKR $\Rightarrow$: PEAK] Read level indication from R&S FSW (reading of marker 1): LFSW
Power Meter:	Read level indication from power meter : $L_{\text{powermeter}}$
Evaluation:	Calculate $\Delta \text{Ref} / \text{dB} = \text{LFSW} / \text{dBm} - L_{\text{powermeter}} / \text{dBm}$ Record $\Delta \text{Ref} / \text{dB}$ Note: for frequency response measurements above 43.5 GHz the 64 MHz measurement is omitted
Signal generator settings:	Set the signal generator to the test frequency
R&S FSW settings:	- [SPAN : zero] - [FREQ : CENTER : {ffresp}] - [BW : RES BW MANUAL : {RBW}] For $f < 100 \text{ kHz}$ use a $\text{RBW} = f_{\text{in}} / 10$, use a RBW of 10 kHz for other frequencies. For the 85 GHz test setup signal level of signal source to -10dBm Set marker to peak of signal - [MKR $\Rightarrow$: PEAK] Read level indication from R&S FSW (reading of marker 1): LFSW

Power Meter:	For test frequencies below 67 GHz read level indication from Power Meter : Lpowermeter
Evaluation:	For frequencies below 67 GHz with power meter the frequency response can be calculated as: Freq. response / dB = LFSW – Lpowermeter - ΔRef / dB For frequencies above 65 GHz without power meter the frequency response can be calculated as: Freq. response / dB = LFSW – Lref(ffresp)
Attenuator Setting	Repeat the measurement for RF attenuation of 0 dB, 5 dB, 10 dB, 20 dB, 40 dB for R&S FSW8/13/26/43/50/67/85
Test frequencies	Fin = 10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, 3MHz, DC coupling (10dB only) Fin = 10 MHz, 50 MHz, 100 MHz 200 MHz, 500 MHz to 8 GHz in 500 MHz steps, AC coupling (steps as defined under “Attenuator Setting” above) 8500 MHz to the maximum Frequency of the instrument in 500 MHz steps, AC coupling (steps as defined under “Attenuator Setting” above) The following additional frequencies for FSWs with a stop frequency > 8 GHz at 10dB AC coupling: Fin = FStop[band i] ± 1 MHz, i = 1 to the last microwave converter band - 1 Fin = maximum Frequency of the instrument – 1 MHz for the last microwave converter band The stop frequencies and number of bands can be derived from the following files of the instrument hard disk: C:\R_S\Instr\leeprom\mwc_frontend\MwcBandConfig.dat for the frequency range 8 to 43,5/49,5/50 GHz (depends on instrument model) C:\R_S\Instr\leeprom\mwc67_frontend\Mwc67Lo1BandConfig.dat for the frequency range 49,5/50 to 67 GHz for FSW67 C:\R_S\Instr\leeprom \mwc85_frontend\Mwc85SweepBandConfig.dat for the frequency range 43,5 to 85 GHz for FSW85 Test limits according to datasheet. The test should be listed in the factory/service test report with band number and frequency entree. For the customer report the test should be only listed with passed or failed. The headline of the test is “Microwave band transition test”

- YIG Filter Bypass** Repeat the measurement for RF attenuation of 10 dB and YIG Filter Bypass, test frequencies: 8001 MHz, 8500 MHz to the maximum Frequency of the instrument in 500 MHz steps.
- The following additional frequencies for FSWs with a stop frequency > 8 GHz at 10dB AC coupling:
- $F_{in} = F_{Stop}[\text{band } i] \pm 1 \text{ MHz}$, $i = 1$ to the last microwave converter band - 1
- $F_{in} = \text{maximum Frequency of the instrument} - 1 \text{ MHz}$ for the last microwave converter band
- The stop frequencies and number of bands can be derived from the following files of the instrument hard disk:
- C:\R_S\Instr\eprom\mwc_frontend\MwcBandConfig.dat for the frequency range 8 to 43,5/49,5/50 GHz (depends on instrument model)
- C:\R_S\Instr\eprom\mwc67_frontend\Mwc67Lo1BandConfig.dat for the frequency range 49,5/50 to 67 GHz for FSW67
- C:\R_S\Instr\eprom\mwc85_frontend\Mwc85AnalyseBandConfig.dat for the frequency range 43,5 to 85 GHz for FSW85
- The test should be listed in the factory/service test report with band number and frequency entree. For the customer report the test should be only listed with passed or failed. The headline of the test is "Microwave band transition test"
- For FSW85 repeat the YIG-Filter Bypass measurement for AC coupling and test frequencies: $F_{in} = 10 \text{ kHz}$, 30 kHz, 100 kHz, 300 kHz, 1 MHz, 3MHz, DC coupling
- $F_{in} = 10 \text{ MHz}$, 50 MHz, 100 MHz 200 MHz, 500 MHz to 8 GHz in 500 MHz steps
- For FSW85 repeat the YIG-Filter Bypass measurement for AC coupling and test frequencies $F_{in} > 10 \text{ MHz}$ and RF attenuation of 0 dB, 10dB and 20 dB
- Instruments with option B24** With option B24 RF Preamplifier switch the RF preamplifier to 30 dB gain, RF-Attenuation 10 dB, DC coupling, reference level = -20 dBm and signal level -25dBm.
- Check the level uncertainty with the following test frequencies:
- 10 MHz, 50 MHz to 7999 MHz in 100 MHz steps
- 8500 MHz to the maximum frequency of the instrument in 500 MHz steps
- Test limits according to datasheet.

2.8.3 IF frequency response with Bandwidth Extension FSW-B1200

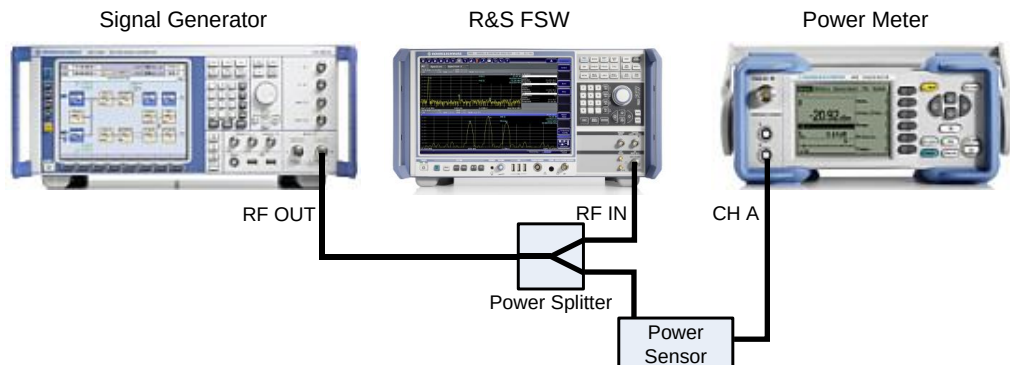
Instruments with bandwidth extension FSW-B1200 must be measured over 512 MHz and 1.2 GHz bandwidth!

Test setup

Standardize the Power Meter and Power Sensor (item 6, 7, 8).

Use Power Splitter/Combiner (item 3) and connect equipment as shown below.

Connect the power splitter directly to the R&S FSW RF input.



Important Note

Throughout the remaining steps set the Power Meter Cal Factor as appropriate!

Signal generator settings:

- Level -3 dBm at FSW input, when normal generator is used
- Level -10 dBm at FSW input, when doubler unit is used
- Frequency {center} (begin with *see table below)

R&S®FSW settings:

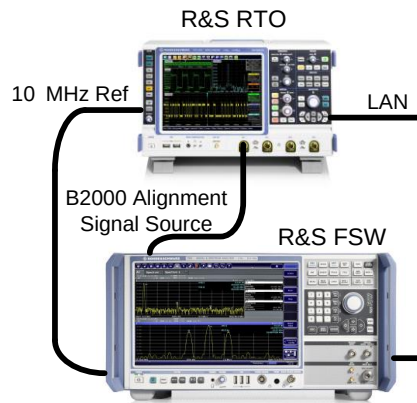
- [PRESET]
- [AMPT : RF ATTEN MANUAL : 10 dB]
- [AMPT : 0 dBm]
- [FREQ : CENTER : {center}]
- [MODE : I/Q ANALYZER]
- [DISPLAY CONFIG : SPECTRUM]
- [SWEEP : POINTS : 100001]
- [DATA ACQUISITION : SAMPLE RATE: 1500 MHz;
RECORD LENGTH: 40960]

Reference measurement:	Set marker to peak of signal - [MKR ⇒ : PEAK] Read level indication from R&S®FSW (reading of marker 1): LFSW
Power Meter:	Read level indication from Power Meter : Lpowermeter
Evaluation:	Calculate $\Delta\text{Ref} / \text{dB} = \text{LFSW} / \text{dBm} - \text{Lpowermeter} / \text{dBm}$ Record $\Delta\text{Ref} / \text{dB}$
Signal generator settings:	Set the signal generator to the lowest offset frequency: center – 600 MHz
R&S®FSW settings:	Set marker to peak of signal - [MKR ⇒ : PEAK] Read level indication from R&S®FSW (reading of marker 1): LFSW
Power Meter:	Read level indication from Power Meter : Lpowermeter
Evaluation:	The IF frequency response can be calculated as: $\text{IF freq. response} / \text{dB} = \text{LFSW} - \text{Lpowermeter} - \Delta\text{Ref} / \text{dB}$
Offset frequencies	Repeat the measurement with the following offset frequencies:
	center -550 MHz to center +600 MHz in 50 MHz steps excluding center frequency
Test center frequencies	Center = 1000 MHz to 4 GHz in 500 MHz steps, 5 GHz, 6 GHz, 7 GHz, 8 GHz, 10 GHz, 12 GHz, 13 GHz, 18 GHz, 22 GHz, 26 GHz, 38 GHz. For f>12GHz: The YIG Filter Bypass has to be switched on. Test limits: According to datasheet

2.8.4 IF Frequency Response with Bandwidth Extension R&S®FSW-B2000

At first the R&S®RTO (test equipment item 22) must be aligned using the 'Alignment Signal Source' of the DUT !

Test setup for
R&S®RTO
Alignment



R&S®FSW settings: - [PRESET]

- [MODE : I/Q Analyzer]

- [INPUT/OUTPUT : Input Source Config: B2000: <enter TCPIP address of R&S®RTO>: ON: Alignment: Start Alignment]

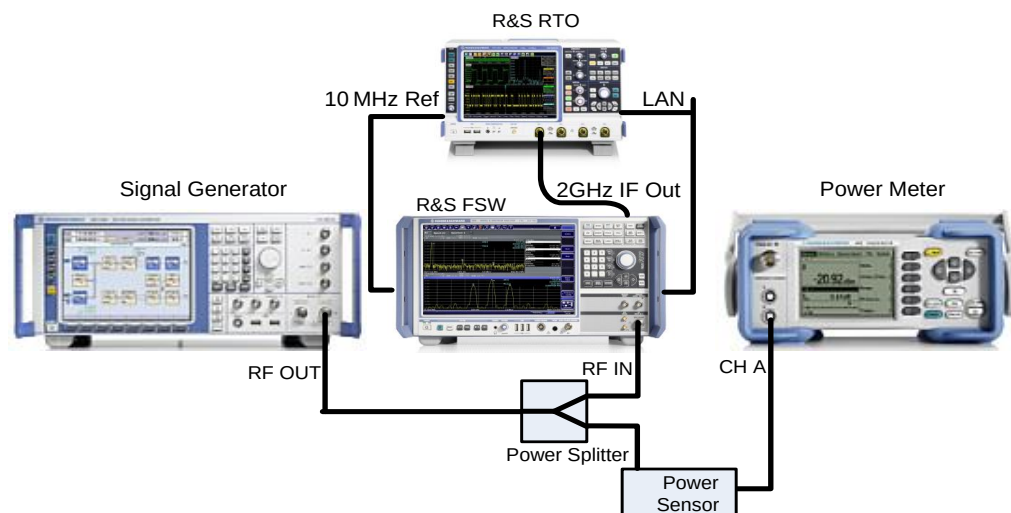
Check for successful alignment

Test setup for
measurement up to
67 GHz:

Standardize the Power Meter and Power Sensor (item 6, 7, 8).

Use Power Splitter/Combiner (item 3) and connect equipment as shown below.

Connect the power splitter directly to the R&S®FSW RF input.



Important Note: Throughout the remaining steps set the Power Meter Cal Factor as appropriate!

Test setup for measurement from 67 GHz to 85 GHz:

Standardize the Power Meter and Power Sensor (item 6, 7, 8).

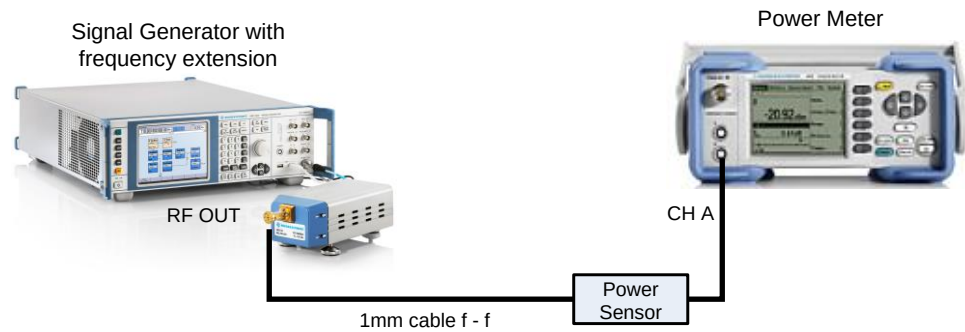
In a first step connect frequency extension for measurements above 67 GHz (item 20) via 1mm cable (item 21) to power sensor (item 8) – see picture below.

Set signal level to -10 dBm.

Set signal source frequency to f_{center} – use center frequency list as defined below

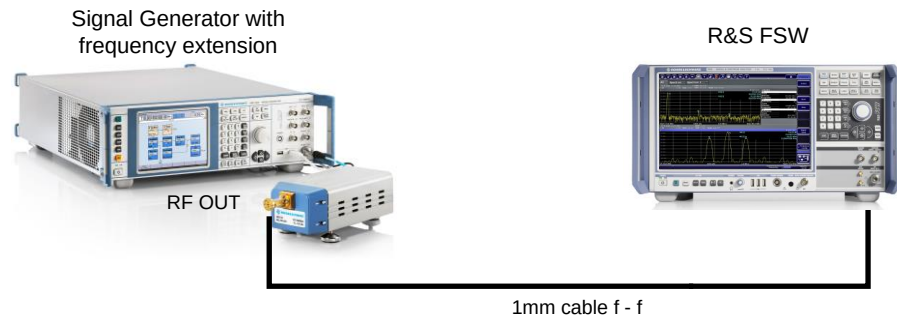
Read level indication from power meter $L_{ref}(f_{center})$ and store value together with adjusted frequency f_{center} in a list

Do same measurement for offset frequencies defined below f_{center} – f_{offset} and store displayed power meter values $L_{ref}(f_{center} - f_{offset})$ in a list



For the frequency response measurement connect frequency extension via same 1mm cable (item 21) as in the reference measurement above to instrument

Set signal level to -3 dBm.



Important Note:

Throughout the remaining steps set the Power Meter Cal Factor as appropriate!

Signal generator settings:

- Level -3 dBm at R&S®FSW input, when normal generator is used
- Level -7 dBm at R&S®FSW input, when doubler unit is used
- Frequency {center} (begin with 9 GHz)

R&S®FSW settings: - [PRESET]

- [MODE : I/Q Analyzer]
- [INPUT/OUTPUT : Input Source Config: B2000: <enter TCPIP address of R&S®RTO>: ON]
- [MEAS CONFIG: DISPLAY CONFIG : SPECTRUM]
- [MEAS CONFIG: DATA ACQUISITION : Analysis Bandwidth: 2000 MHz]
- [AMPT : RF ATTEN MANUAL : 10 dB]
- [AMPT : 0 dBm]
- [FREQ : CENTER : {center}] (begin with 9 GHz)

Reference measurement:

Set marker to peak of signal

- [MKR ⇒ : PEAK]

Read level indication from R&S®FSW (reading of marker 1): LR&S®FSW

Power Meter:

For test frequencies below 67 GHz read level indication from Power Meter : Lpowermeter

Evaluation:

For frequencies below 67 GHz with power meter calculate

$$\Delta \text{Ref} / \text{dB} = \text{LR\&S\&FSW} / \text{dBm} - \text{Lpowermeter} / \text{dBm}$$

Record $\Delta \text{Ref} / \text{dB}$

For frequencies above 67 GHz without power meter calculate

$$\Delta \text{Ref} / \text{dB} = \text{LR\&S\&FSW} / \text{dBm} - \text{Lref}(\text{fcenter}) / \text{dBm}$$

Record $\Delta \text{Ref} / \text{dB}$

Signal generator settings:

Set the signal generator to the lowest offset frequency: center -1000 MHz

R&S®FSW settings: Set marker to peak of signal

- [MKR ⇒ : PEAK]

Read level indication from R&S®FSW (reading of marker 1): LR&S®FSW

Power Meter:

For test frequencies below 67 GHz read level indication from Power Meter : Lpowermeter

Evaluation:	For frequencies below 67 GHz with power meter the IF frequency response can be calculated as: $\text{IF freq. response / dB} = \text{LR\&S}\text{\textcircled{R}}\text{FSW} - \text{Lpowermeter} - \Delta\text{Ref} / \text{dB}$ For frequencies above 67 GHz without power meter the IF frequency response can be calculated as: $\text{IF freq. response / dB} = \text{LR\&S}\text{\textcircled{R}}\text{FSW} - \text{Lref}(\text{fcenter} - \text{foffset}) - \Delta\text{Ref} / \text{dB}$
Offset frequencies	Repeat the measurement with the following offset frequencies: center -1000 MHz to center +1000 MHz in 100 MHz steps (excluding center frequency)
Test center frequencies	Center = 9 GHz to stop frequency of instrument in 2 GHz steps
Test limits	Test limits according to datasheet.

2.9 Checking the Display Nonlinearity

Test equipment:	Signal generator (Section "Measurement Equipment", item 1) Frequency 128 MHz Maximum level ≥ 10 dBm Step attenuator (Section "Measurement Equipment", item 9) Frequency 128 MHz Attenuation 0 to 100 dB in 1 dB steps Attenuation uncertainty < 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 FSW
Signal generator settings:	- Frequency 128.1 MHz - Level +10 dBm
Step attenuator settings:	- attenuation 20 dB

R&S FSW settings:

- [PRESET]
- [AMPT : RF ATTEN MANUAL : 10 dB]
- [AMPT : 0 dBm]
- [FREQ :CENTER : 128.1 MHz]
- [SPAN : 0 Hz]
- [TRACE : DETECTOR : AV]
- [BW : RES BW MANUAL : 1kHz]
- [SWEEP : SWEEP TIME MANUAL : {sweep time}]
- [MEAS : TIME DOMAIN POWER : MEAN]

Wait 30 seconds to ensure that there is no thermal drift.

See table below for values of sweep time.

Reference measurement: Read out the mean marker value (= LRef)

Measurement:

Step attenuator settings: - attenuation {aATT}
See table of performance test report for values of aATT.

Evaluation: Read out the mean marker value. The difference between the level of the input signal of the R&S FSW and the reference LRef (about 10 dB below the reference level) can be calculated as :

$$\Delta L = L_{FSW} - L_{Ref}$$

Test points: Check linearity from 0 to -70 dB in 2 dB steps
from -70 dB to -90 dB in 5 dB steps

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

aATT	10 dB to 50 dB	50 dB to 80 dB	80 dB to 100 dB
Sweep time	200 ms	600 ms	1000 ms

2.10 Checking the RF Attenuator uncertainty

Test equipment: Signal generator (Section "Measurement Equipment", item 1)

Frequency 128 MHz

Maximum level ≥ 10 dBm

Step attenuator (Section "Measurement Equipment", item 9)

Frequency 128 MHz

Attenuation 0 to 80 dB in 5 dB steps

Attenuation uncertainty < 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 FSW

Signal generator settings: - Frequency 128.1 MHz

- Level 10 dBm

R&S FSW settings:

- [PRESET]

- [FREQ : CENTER : 128.1 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 $\Rightarrow$: PEAK]

Set reference to peak of signal

- [MKR : REFERENCE FIXED]

Measurement

Step attenuator settings: - Attenuation { 80dB - a FSW }

R&S FSW settings:

- [AMPT : RF ATTEN MANUAL : { a FSW }]
- [AMPT : { -45dBm + aFSW } dBm]
- [MKR $\Rightarrow$: PEAK]

See table below for values of a FSW, a ATT and reference level.

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

aATT	70 dB	80 dB	75 dB	65 dB	60 dB	55 dB	50 dB	40dB	30 dB	20 dB	10 dB
aFSW	10 dB	0 dB	5 dB	15 dB	20 dB	25 dB	30 dB	40dB	50 dB	60 dB	70 dB
reference level	-35 dBm	-45 dBm	-40 dBm	-30 dBm	-25 dBm	-20 dBm	-15 dBm	-5 dBm	5 dBm	+15 dBm	+25 dBm

2.11 Checking the Phase Noise

Test equipment: Signal generator (refer to "Measurement Equipment", item 16)

Frequency 1000 MHz

Level $\geq$ 5 dBm

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

Signal generator settings:

- Frequency 1000 MHz
- Level $>$ 5 dBm

R&S FSW settings:

- [PRESET]
- [SETUP : REFERENCE INT]
- [FREQ : CENTER : 1000 MHz]
- [AMPT : ATTEN MANUAL: 20 dB]
- [AMPT : 20 dBm]
- [SPAN : 1 MHz]
- [SWEEP : SINGLE]
- [TRACE1 : Detector : RMS]
- [MKR FCTN : SIGNAL COUNT]

Set center frequency to counter frequency

- [MKR FCTN : PHASE NOISE]

- [SPAN : {span}]

- [MKR : {Offset}]

See table below for values of reference level, sweep time, sweep count and span.

Refer to "Performance Test Report" table for values of offset, reference level and RF attenuation.

Example: For an input power of +10 dBm the reference level shall be set to +10 dBm for offsets below or equal 1 kHz. The attenuation to 10 dB for a mixer level of 0 dBm.

With bigger offsets the broadband noise becomes critical therefore the reference level and the attenuation shall be decreased by 2 dB.

Evaluation: The phase noise is displayed in the marker field by the reading 'PHNOISE 2'.

Note: Please make sure not to measure on a spurious signal. The phase noise may be checked at 640 MHz instead of 1 GHz. In this case the test limits at frequency offsets less or equal 100 kHz are 1 dB better as with 1 GHz test frequency. At offsets above 100 kHz check for the same limit as with 1 GHz.

Settings for phase noise measurement				
Offset	Span	RBW / VBW	Reference level	R&S®FSW
1 kHz	2.2 kHz	100 Hz / 1 Hz	= signal level	= signal level
10 kHz	22 kHz	1 kHz / 1 Hz	signal level -2 dB	signal level -2 dB
100 kHz	220 kHz	10 kHz / 1 Hz	signal level -2 dB	signal level -2 dB
1 MHz	2.2 MHz	10 kHz / 1 Hz	signal level -6 dB	signal level -6 dB

2.12 Checking the Return Loss at the RF Input

Test equipment: Network analyzer (Section "Measurement Equipment", item 11)

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

R&S FSW settings:	- [PRESET] - [AMPT : RF INPUT {state}] - [AMPT : RF ATTEN MANUAL : {aFSW}]
Measurement:	See operating manual of the network analyzer for detailed information about S11 measurement. For RF attenuation below or equal 14 dB the FSW has to be set to the test frequency in zero span. For attenuation above 15 dB the influence of the frequency setting of the FSW can be neglected, the measurement may be done with any frequency setting of the FSW. Determine S11 of the R&S FSW input with the following setting of the RF attenuator and input set to DC coupling: FSW8/13/26/43/50/67 aFSW = 5 dB, 10 dB, 20 dB, 40 dB FSW85 aFSW = 10 dB, 20 dB, 40 dB Determine S11 of the R&S FSW input with the following setting of the RF attenuator and input set to AC coupling: aFSW = 10 dB
Test frequencies	Fin = fStart to 8 GHz 101 points, R&S®FSW13: additional from Fin = 8 GHz to 13.6 GHz 61 points R&S®FSW26: additional from Fin = 8 GHz to 26.5 GHz 201 points, R&S®FSW43/50/67/85: additional from Fin = 8 GHz to 40 GHz 201 points, test limits and fStart according to datasheet

2.12.1 Absolute Amplitude Uncertainty at 1 MHz R&S®FSW-B71

Only applicable with option R&S®FSW-B71 installed (analog baseband input).

Measurements for $\bar{T}$ and $\bar{Q}$ Inputs can be skipped for R&S®FSW85.

Test equipment:	Signal Generator (item 1) Power Sensor (item 7) Power Meter (item 6)
Test setup:	Standardize the Power Meter and Power Sensor (item 6, 7). Set the Power Meter Cal Factor to the appropriate value for the Power Sensor for 1 MHz. Connect Power Sensor through a cable to RF output of Signal Generator.

Signal generator settings:

- Frequency 1 MHz
- Level +10 dBm
- +4 dBm
- 2 dBm
- 8 dBm

Measurement: ➤ Record the Power Meter indication with all level settings as listed above.

Test setup: ➤ Disconnect Power Sensor from the cable.
➤ Connect the cable to the Baseband Input BNC connectors (I, I\, Q, Q\ one after the other according to the table below).

R&S FSW settings:

- [PRESET]
- [MODE : IQ Analyzer]
- [INPUT/OUTPUT: Input Source Config: Input Source: Analog Baseband ON: I/Q Mode = refer to table: Input Config = Differential]
- [MEAS CONFIG: Display Config : Spectrum]
- [MEAS CONFIG: Data Acquisition: Sample Rate: 200 MHz]
- [AMPT : Amplitude Config: Full Scale Level : refer to table]
- [MKR → : PEAK]

Measurement:	- Signal Generator Baseband		IQ Mode	Full Scale Level
	Level	Input		
	+10 dBm	I	I Only	2 V peak
	+4 dBm	I	I Only	1 V peak
	-2 dBm	I	I Only	0.5 V peak
	-8 dBm	I	I Only	0.25 V peak
	+10 dBm	I\	I Only	2 V peak
	+4 dBm	I\	I Only	1 V peak
	-2 dBm	I\	I Only	0.5 V peak
	-8 dBm	I\	I Only	0.25 V peak
	+10 dBm	Q	Q Only	2 V peak
	+4 dBm	Q	Q Only	1 V peak
	-2 dBm	Q	Q Only	0.5 V peak
	-8 dBm	Q	Q Only	0.25 V peak

+10 dBm	Q\	Q Only	2 V peak
+4 dBm	Q\	Q Only	1 V peak
-2 dBm	Q\	Q Only	0.5 V peak
-8 dBm	Q\	Q Only	0.25 V peak

Evaluation: The difference between the signal levels measured with the power meter and the R&S FSW (level reading of marker 1) reflects the absolute level uncertainty of the R&S FSW-B71. It can be calculated as:

$$\text{Level uncertainty 1MHz} = \text{LFSW} - \text{Lpowermeter}$$

test limits according to datasheet

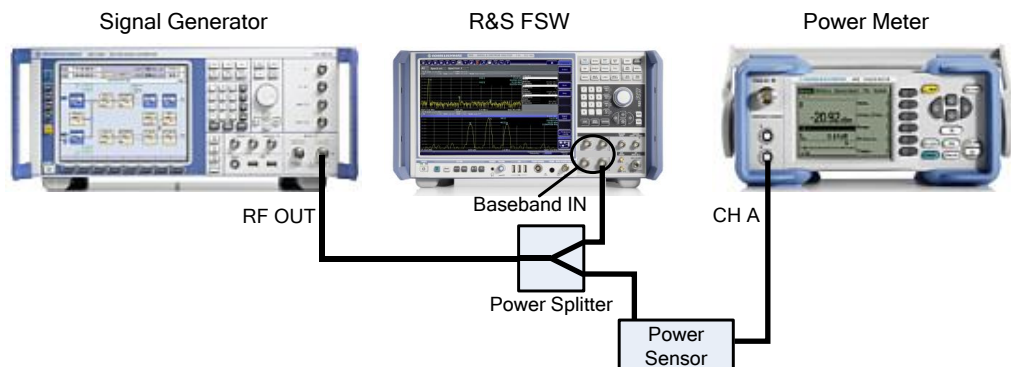
2.12.2 Frequency response R&S®FSW-B71

Only applicable with option R&S®FSW-B71 installed (analog baseband input).

Measurements for $\bar{T}$ and $\bar{Q}$ Inputs can be skipped for R&S®FSW85.

Test setup: Standardize the Power Meter and Power Sensor (item 6, 7).
Use Power Splitter (item 3), Signal Generator (item 1) and connect equipment as shown below.

Connect the Power Splitter directly to the R&S®FSW Baseband Input I.



Important Note

Throughout the remaining steps set the Power Meter Cal Factor as appropriate!

R&S®FSW settings:	- [PRESET] - [MODE : IQ Analyzer] - [INPUT/OUTPUT: Input Source Config: Input Source: Analog Baseband ON: I/Q Mode = I Only: Input Config = single ended] - [MEAS CONFIG: Display Config : Spectrum] - [MEAS CONFIG: Data Acquisition: Sample Rate: 200 MHz] - [AMPT : Amplitude Config: Full Scale Level : 0.25 V peak]
Signal generator settings:	- Level -2 dBm - Frequency 1 MHz
Reference measurement:	Set marker to peak of signal - [MKR ⇒ : PEAK] Read level indication from R&S®FSW (reading of marker 1): LFSW
Power Meter:	Read level indication from power meter : Lpowermeter
Evaluation:	Calculate $\Delta\text{Ref} / \text{dB} = \text{LFSW} / \text{dBm} - \text{Lpowermeter} / \text{dBm}$ Record $\Delta\text{Ref} / \text{dB}$
Signal generator settings:	Set the signal generator to the test frequencies
R&S®FSW settings:	Set marker to peak of signal - [MKR ⇒ : PEAK] Read level indication from R&S®FSW (reading of marker 1): LFSW
Power Meter:	Read level indication from Power Meter : Lpowermeter
Evaluation:	The frequency response can be calculated as: $\text{Freq. response} / \text{dB} = \text{LFSW} - \text{Lpowermeter} - \Delta\text{Ref} / \text{dB}$

Test frequencies: 2.5 MHz, 5 MHz, 10 MHz, 20 MHz, 30 MHz, 40 MHz

in addition, with bandwidth extension installed:

50 MHz, 60 MHz, 70 MHz, 75 MHz, 80 MHz

Test setup: Connect the Power Splitter directly to the R&S®FSW Baseband Input Q.

R&S®FSW settings: - [INPUT/OUTPUT: Input Source Config: Input Source: Analog Baseband:
I/Q Mode =Q Only]

Measurement: The test procedure is the same as with Input I.

Test limit: test limits according to datasheet

2.13 Performance Test Option LO/IF ports for external mixers R&S®FSW-B21

2.13.1 Checking LO-level

Test equipment: Power Meter (Section "Messmittelliste | Test Equipment", item 6)

Power sensor (section "Measurement Equipment", item 8)

Frequency range 7.0 MHz to 17.45 GHz

Max. input power $P_{max} = +23 \text{ dBm}$

$RSS \leq 2.5\%$ referred to measured power

Impedance $Z = 50 \text{ } \Omega$

Fixed attenuator with 10 dB (Section "Measurement Equipment" item 10)

Power meter settings: Connect power sensor to the power meter and execute function 'ZERO' when there is no signal applied to the power sensor

R&S FSW settings:	- [PRESET] - [SENS:MIX ON] -[MIX:HARM:BAND USER] - [MIX:HARM 2] - [FREQ:SPAN 0HZ] - [SETUP:MORE:SERVICE:PASSWORD: 30473035] Fix IF2-Frequency to 1,58GHz - [DIAG:SERV:SFUN '2.3.16.1.4'] Select LO-Power: - [SENS:MIX:LOP {PLO}] for PLO = 13,0dBm, 15,5dBm and 17,0dBm Bias current set to zero: - [SENS:MIX:BIAS 0.0] Select upper sideband with service-function: - [DIAG:SERV:SFUN '2.5.2.2.1'] - [FREQ CENTER : {fCenter1}] resulting LO-frequency $f_{LO} = (f_{Center1} - 1580,0 \text{ MHz}) / 2$ Select lower sideband with service-function: - [SETUP : SERVICE FUNCTIONS 2.5.2.2.0] - [FREQ CENTER : {fCenter2}] resulting LO-frequency $f_{LO} = (f_{Center2} + 1580,0 \text{ MHz}) / 2$
Test setup:	Connect power sensor via fixed attenuator to the output 'LOout / IFin'
Measurement:	Determine level of the LO-signal $L_{LO, meas}$ To achieve higher uncertainty the frequency response of the power sensor must be compensated. For compensation frequency use f_{LO}
Evaluation:	The level of the LO-signal can be determined as $L_{LO} = L_{LO, meas} + 10 \text{ dB}$
Test Frequencies	$f_{Center1} = 16880 \text{ MHz}$ to 26880 MHz in 500 MHz Steps $f_{Center2} = 23820 \text{ MHz}$ to 33320 MHz in 500 MHz Steps

2.13.2 Checking the Input LOout / IFin (2-Port-Mixers)

Test equipment:	Signal Generator (section " Messmittelliste Test Equipment ", item 1)
	Frequency 1330,0 MHz
	Output power -20 dBm

- R&S FSW settings:
- [PRESET]
 - [SENS : MIX ON]
 - [SENS : MIX:HARM:BAND USER]
 - [SENS : MIX:HARM 2]
 - [SPAN : ZERO SPAN]
 - [FREQ : CENT 18.00 GHz]
 - [SENS : BAND 2KHz]
 - [DET : FUNC RMS]
 - [SETUP:MORE:SERVICE:PASSWORD: 30473035]
- Fix IF2-Frequency to 1,33GHz:
- [DIAG:SERV:SFUN '2.3.16.1.2']
- Activate syncon mode of synthesizer
- [DIAG:SERV:SFUN '2.3.16.20.0']
- Force NCO sweep
- [DIAG:SERV:SFUN '2.3.16.49.1']
- Switch off LO with service function:
- [DIAG:SERV:SFUN '2.5.2.8.0']
 - [DIAG:SERV:SFUN '2.0.22.1.SIRIUS_MWC_EB.LO_CAL_SIGNALS.LO_HIGH_LOW.DOUBLE']
 - [DIAG:SERV:SFUN '2.0.22.1.SIRIUS_MWC_EB.LO_CAL_SIGNALS.LO_ON_OFF.OFF']
- Bias current set to zero:
- [SENS:MIX:BIAS 0.0]
- Select 2-port case:
- [SENS:MIX:PORT 2]
- Conversion Loss set to 0dB
- [SENS : MIX:LOSS 0.0]
- Signal generator settings:
- Frequency 1330,0 MHz
 - Input Level DUT -30 dBm +/- 0,1 dB
- Test setup: Connect the generator to the connector LOout / IFin;
- Measurement:
- [MKR-> : PEAK]
- Read out the marker
- Test limit according to datasheet

2.13.3 Checking the Input IFin (3-Port-Mixers)

- Test equipment: Signal Generator (section " Messmittelliste | Test Equipment ", item 1)
- Frequency 1330,0 MHz
 - Output power -20 dBm

R&S FSW settings:	- [PRESET] - [SENS : MIX ON] - [SENS : MIX:HARM:BAND USER] - [SENS : MIX:HARM 2] - [SPAN : ZERO SPAN] - [FREQ : CENT 18.00 GHz] - [SENS : BAND 2KHz] - [DET : FUNC RMS] - [SETUP:MORE:SERVICE:PASSWORD: 30473035] Fix IF2-Frequency to 1,33GHz: - [DIAG:SERV:SFUN '2.3.16.1.2'] Activate syncon mode of synthesizer - [DIAG:SERV:SFUN '2.3.16.20.0'] Force NCO sweep - [DIAG:SERV:SFUN '2.3.16.49.1'] Switch off LO with service function: - [DIAG:SERV:SFUN '2.5.2.8.0'] - [DIAG:SERV:SFUN '2.0.22.1.SIRIUS_MWC_EB.LO_CAL_SIGNALS.LO_HIGH_LOW.DOUBLE'] - [DIAG:SERV:SFUN '2.0.22.1.SIRIUS_MWC_EB.LO_CAL_SIGNALS.LO_ON_OFF.OFF] Bias current set to zero: - [SENS:MIX:BIAS 0.0] Select 2-port case: - [SENS:MIX:PORT 3] Conversion Loss set to 0dB - [SENS : MIX:LOSS 0.0]
Signal generator settings:	- Frequency 1330,0 MHz - Input Level DUT –30 dBm +/- 0,1 dB
Test setup:	Connect the generator to the connector LOout / IFin;
Measurement:	- [MKR-> : PEAK] Read out the marker Test limit according to datasheet

2.14 Performance Test Avionics Option R&S®FSW-K15

2.14.1 Test Instructions

The rated specifications of the analyzer are tested after a warm-up time of at least 30 minutes and complete internal calibration.

To start an internal calibration:

- ▶ Press SETUP > Alignment > Start Self alignment.

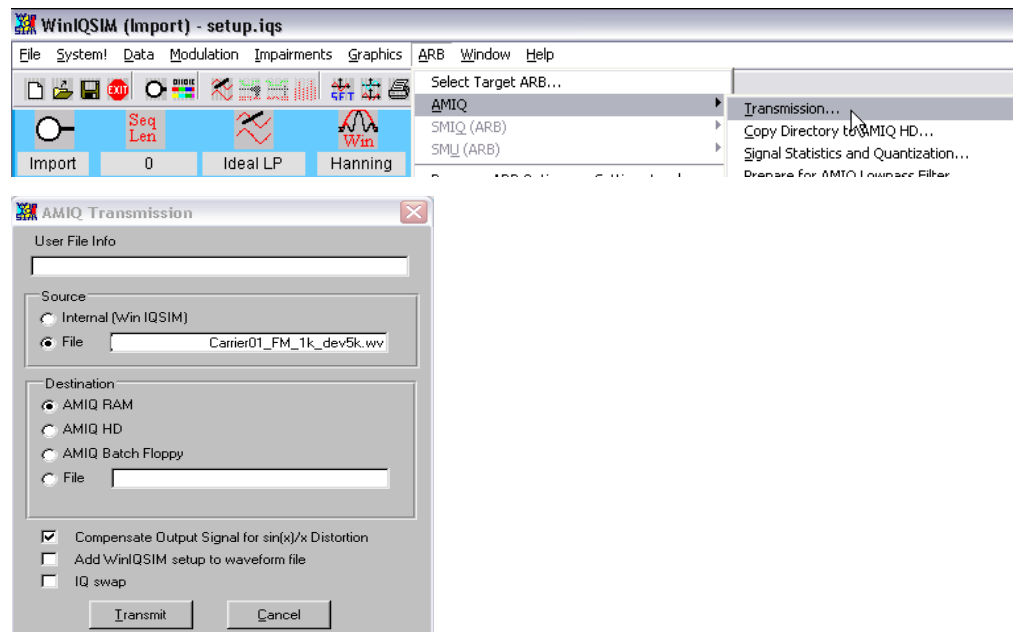
If nothing else is specified, all measurements are performed with an external reference frequency.

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>). Search for "AMIQ Testfiles".

A convenient method to transfer the files into the AMIQ is to use WinIQSIM, also available from GLORIS. Search for "WinIQSIM".



2.14.2 Measuring Equipment and Accessories

Item	Type of equipment	Specifications recommended	Equipment recommended	R&S Order No.	Use
1	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	AMIQ	1110.2003.04	Audio Input Frequency Counter Uncertainty AM: Modulation Depth Uncertainty FM Deviation Uncertainty
2	WinIQSIM	PC test program for AMIQ			.

Measuring tips

The phase readings on the screen of the VOR/ILS demodulator are limited to a unique range. In VOR mode the default measurement range is 0 to 360 degree, in ILS mode the range is -60 to +60 degree.

Due to this discontinuous phase range a reading of 359.98 degree is equal to -0.02 degree.



In the performance test of this demodulator unique phase ranges are used as limits.

Example: In the VOR test a measurement at 0 degree VOR phase is performed. The test limit in this case is defined from -0.03 degree to + 0.03 degree.

Due to the discontinuous phase range a negative reading of -0.03 degree will not be displayed. The displayed reading of 359.97 degree is equal to -0.03 degree.

The phase readings outside of the continuous range have to be adjusted before the value is checked against the limit

2.14.3 Checking the ILS Demodulation (AM)

The test of the ILS demodulator is performed on several test signals with variation of the following parameters: Modulation depth = 18% to 48 % (covering Localizer and Glideslope ranges), Freq(ID) = 300 Hz to 3990 Hz (to test the full bandwidth of the identifier channel), DDM = 0 to $\pm 0,4$ (center to maximum deviation from center), Phase 0 to 59° (to test nonlinearities of the demodulator), Modulation frequency +1% (to test the selectivity).

2.14.3.1 Test 1 Standard ILS Glideslope Signal, DDM = 0, no distortion

Signal 1 ILS Glideslope, m = 48%

File ILS_AM_ph0_m48_DDM0.WV

	AM	Frequency	
90 Hz	48 %	90 Hz	
150 Hz	48 %	150 Hz	
Identifier	10 %	1020 Hz	
	DDM	Phase	THD
90/150 Hz	0	0°	0 %

Test Equipment: Arbitrary Waveform Generator (Section Measuring Equipment and Accessories, item 1)

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

Instrument Settings:	[PRESET] [MODE :: AVIONICS] [AMPT : REF LEVEL : 5 dBm] [FREQ : CENTER FREQUENCY : 12 MHz] [MEAS : ILS] [INPUT/OUTPUT: INPUT SOURCE CONFIG , DIRECT PATH OFF]
Signal Generator Settings:	Generate a ILS amplitude modulated carrier. Set carrier frequency, modulation frequency and depth as listed in the table. 4x oversampling (4x carrier frequency) is recommended. When using the R&S AMIQ download the listed files into the AMIQ: File ILS_AM_ph0_m48_DDM0.WV
Measurement:	Read the indications: 90 Hz AM: depth and frequency, 150 Hz AM: depth and frequency Voice/Ident: depth and frequency, DDM SDM(90+150 Hz):phase and THD

2.14.3.2 Test 2 ILS Localizer Signal, DDM = 0, distortion meter and ID low frequency test

Signal 2 Localizer m = 18%, fid = 300 Hz

File ILS_AM_ph0_m18_DDM0_fid03.WV

	AM	Frequency	
90 Hz	18 %	90 Hz	
150 Hz	18 %	150 Hz	
Identifier	10 %	300 Hz	
	DDM	Phase	THD
90/150 Hz	0	0°	55.56 %

Test Equipment:	Arbitrary Waveform Generator (Section Measuring Equipment and Accessories, item 1)
Test Setup:	Connect the Signal Generator to the RF Input of the instrument. When using the R&S AMIQ the "I" output must be used.

- Instrument Settings: [PRESET]
 [**MODE** :: AVIONICS]
 [**AMPT** : REF LEVEL : **5 dBm**]
 [**FREQ** : CENTER FREQUENCY : **12 MHz**]
 [**MEAS** : ILS]
 [**INPUT/OUTPUT**: INPUT SOURCE CONFIG , DIRECT PATH **OFF**]
- Signal Generator Settings: Generate a ILS amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the table. 4x oversampling (4x carrier frequency) is recommended.
- When using the R&S AMIQ download the listed files into the AMIQ:
 File ILS_AM_ph0_m18_DDM0_fid03.WV
- Measurement: Read the indications:
- | | |
|---------------------|---------------------|
| 90 Hz AM: | depth and frequency |
| 150 Hz AM: | depth and frequency |
| Voice/Ident: | depth and frequency |
| DDM SDM(90+150 Hz): | phase and THD |

2.14.3.3 Test 3 ILS Localizer Signal, DDM = 0, Phase =45°, ID high frequency test

Signal 3 Localizer, phase 45°, fid = 3990 Hz

File ILS_AM_ph45_m20_DDM0_fid40.WV

	AM	Frequency	
90 Hz	20 %	90 Hz	
150 Hz	20 %	150 Hz	
Identifier	10 %	3990 Hz	
	DDM	Phase	THD
90/150 Hz	0	45°	0 %

- Test Equipment: Arbitrary Waveform Generator (Section Measuring Equipment and Accessories, item 1)
- Test Setup: Connect the Signal Generator to the RF Input of the instrument.
- When using the R&S AMIQ the "I" output must be used.

- Instrument Settings: [PRESET]
 [**MODE** :: AVIONICS]
 [**AMPT** : REF LEVEL : **5 dBm**]
 [**FREQ** : CENTER FREQUENCY : **12 MHz**]
 [**MEAS** : ILS]
 [**INPUT/OUTPUT**: INPUT SOURCE CONFIG , DIRECT PATH **OFF**]
- Signal Generator Settings: Generate a ILS amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the table. 4x oversampling (4x carrier frequency) is recommended.
- When using the R&S AMIQ download the listed files into the AMIQ:
 File ILS_AM_ph45_m20_DDM0_fid40.WV
- Measurement: Read the indications:
 90 Hz AM: depth and frequency
 150 Hz AM: depth and frequency
 Voice/Ident: depth and frequency
 DDM SDM(90+150 Hz):phase and THD

2.14.3.4 Test 4 Standard ILS Localizer Signal, DDM = 0.2 , (DDM test)

Signal 4 Localizer, DDM = 0.2

File ILS_AM_ph0_m20_DDM02.WV

	AM	Frequency	
90 Hz	30 %	90 Hz	
150 Hz	10 %	150 Hz	
Identifier	10 %	1020 Hz	
	DDM	Phase	THD
90/150 Hz	0.2	0°	0 %

- Test Equipment: Arbitrary Waveform Generator (Section Measuring Equipment and Accessories, item 1)
- Test Setup: Connect the Signal Generator to the RF Input of the instrument.
 When using the R&S AMIQ the "I" output must be used.

- Instrument Settings: [PRESET]
 [**MODE** :: AVIONICS]
 [**AMPT** : REF LEVEL : **5 dBm**]
 [**FREQ** : CENTER FREQUENCY : **12 MHz**]
 [**MEAS** : ILS]
 [**INPUT/OUTPUT**: INPUT SOURCE CONFIG , DIRECT PATH **OFF**]
- Signal Generator Settings: Generate a ILS amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the table. 4x oversampling (4x carrier frequency) is recommended.
- When using the R&S AMIQ download the listed files into the AMIQ:
 File ILS_AM_ph0_m20_DDM02.WV
- Measurement: Read the indications:
 90 Hz AM: depth and frequency
 150 Hz AM: depth and frequency
 Voice/Ident: depth and frequency
 DDM SDM(90+150 Hz):phase and THD

2.14.3.5 Test 5 ILS Localizer Signal, DDM = -0.2 , Phase = -30° (DDM test at different phase)

Signal 5 Localizer, DDM = -0.2, phase = -30°

File ILS_AM_ph-30_m20_DDM-02.WV

	AM	Frequency	
90 Hz	10 %	90 Hz	
150 Hz	30 %	150 Hz	
Identifier	10 %	1020 Hz	
	DDM	Phase	THD
90/150 Hz	-0.2	-30°	0 %

Test Equipment: Arbitrary Waveform Generator (Section Measuring Equipment and Accessories, item 1)

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

- Instrument Settings: [PRESET]
 [**MODE** :: AVIONICS]
 [**AMPT** : REF LEVEL : **5 dBm**]
 [**FREQ** : CENTER FREQUENCY : **12 MHz**]
 [**MEAS**: ILS]
 [**INPUT/OUTPUT**: INPUT SOURCE CONFIG , DIRECT PATH **OFF**]
- Signal Generator Settings: Generate a ILS amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the table. 4x oversampling (4x carrier frequency) is recommended.
- When using the R&S AMIQ download the listed files into the AMIQ:
 File ILS_AM_ph-30_m20_DDM-02.WV
- Measurement: Read the indications:
 90 Hz AM: depth and frequency
 150 Hz AM: depth and frequency
 Voice/Ident: depth and frequency
 DDM SDM(90+150 Hz):phase and THD

2.14.3.6 Test 6 Standard ILS Glideslope Signal, DDM = 0.4 (Glideslope DDM test)

Signal 6 Glideslope, DDM = 0.4

File ILS_AM_ph0_m40_DDM04.WV

	AM	Frequency	
90 Hz	60 %	90 Hz	
150 Hz	20 %	150 Hz	
Identifier	10 %	1020 Hz	
	DDM	Phase	THD
90/150 Hz	0.4	0°	0 %

Test Equipment: Arbitrary Waveform Generator (Section Measuring Equipment and Accessories, item 1)

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

Instrument Settings:

- [PRESET]
- [**MODE** :: AVIONICS]
- [**AMPT** : REF LEVEL : **5 dBm**]
- [**FREQ** : CENTER FREQUENCY : **12 MHz**]
- [**MEAS**: ILS]
- [**INPUT/OUTPUT**: INPUT SOURCE CONFIG , DIRECT PATH **OFF**]

Signal Generator Settings: Generate a ILS amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the table. 4x oversampling (4x carrier frequency) is recommended.

When using the R&S AMIQ download the listed files into the AMIQ:

File ILS_AM_ph0_m40_DDM04.WV

Measurement: Read the indications:

- 90 Hz AM: depth and frequency
- 150 Hz AM: depth and frequency
- Voice/Ident: depth and frequency
- DDM SDM(90+150 Hz): phase and THD

2.14.3.7 Test 7 ILS Glideslope Signal, DDM = -0.4 , Phase = 59° , Frequency offset 1%

Signal 7 Glideslope, DDM = -0.4, Frequency offset +1%, Phase 59°, Receiver Frequency = 12.12 MHz

File ILS_AM_ph59_m40_DDM-04_offset01.WV

	AM	Frequency	
90 Hz	20 %	90.9 Hz	
150 Hz	60 %	151.5 Hz	
Identifier	10 %	1030.2 Hz	
	DDM	Phase	THD
90/150 Hz	-0.4	59°	0 %

Test Equipment: Arbitrary Waveform Generator (Section Measuring Equipment and Accessories, item 1)

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

Instrument Settings:	[PRESET]
	[MODE :: AVIONICS]
	[AMPT : REF LEVEL : 5 dBm]
	[FREQ : CENTER FREQUENCY : 12.12 MHz]
	[MEAS : ILS]
	[INPUT/OUTPUT : INPUT SOURCE CONFIG , DIRECT PATH OFF]
Signal Generator Settings:	Generate a ILS amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the table. 4x oversampling (4x carrier frequency) is recommended.
	When using the R&S AMIQ download the listed files into the AMIQ:
	File ILS_AM_ph59_m40_DDM-04_offset01.WV
Measurement:	Read the indications:
	90 Hz AM: depth and frequency,
	150 Hz AM: depth and frequency
	Voice/Ident: depth and frequency,
	DDM SDM(90+150 Hz): phase and THD

2.14.4 Checking the VOR Demodulation (AM, FM)

The test of the VOR demodulator is performed on several test signals with variation of the following parameters:

Modulation depth = 10% to 40 % (30 Hz, 9.96 kHz), Freq(ID) = 300 Hz to 3990 Hz (to test the full bandwidth of the identifier channel), 9.96 kHz carrier with frequency deviation = 200 to 700 Hz, VOR phase 0 to 360°, modulation frequency +1% (to test the selectivity).

Note: The "VOR Phase" is always used in the FROM notation in this test.

2.14.4.1 Test 1 Standard VOR Signal, VOR phase = 0°, no distortion

Signal 1 Standard VOR
File VOR_AM_ph0_m30_dev480.WV

	AM (depth)	Frequency
30 Hz	30 %	30 Hz
9960 Hz	30 %	9960 Hz
Identifier	10 %	1020 Hz
9960 Hz	FM (deviation)	480 Hz
30/30 Hz	Azimuth	0°

Test Equipment:	Arbitrary Waveform Generator (Section Measuring Equipment and Accessories, item 1)
Test Setup:	Connect the Signal Generator to the RF Input of the instrument. When using the R&S AMIQ the "I" output must be used.
Instrument Settings:	[PRESET] [MODE :: AVIONICS] [AMPT : REF LEVEL : 5 dBm] [FREQ : CENTER FREQUENCY : 12 MHz] [MEAS: VOR] [INPUT/OUTPUT: INPUT SOURCE CONFIG , DIRECT PATH OFF]
Signal Generator Settings:	Generate a VOR amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the table. 4x oversampling (4x carrier frequency) is recommended. When using the R&S AMIQ download the listed files into the AMIQ: File VOR_AM_ph0_m30_dev480.WV
Measurement:	Read the indications: 30 Hz AM: depth and frequency, 9.96 kHz AM: depth and frequency 30 Hz FM: deviation and frequency, Voice/Ident: depth and frequency VOR Phase

2.14.4.2 Test 2 VOR Signal, low AM depth, Freq(ID) 300 Hz, ID low frequency test

Signal 2 m = 10%, frequency(Id) = 300 Hz

File VOR_AM_ph0_m10_dev480_fid03.WV

	AM (depth)	Frequency
30 Hz	10 %	30 Hz
9960 Hz	10 %	9960 Hz
Identifier	10 %	300 Hz
9960 Hz	FM (deviation)	480 Hz
30/30 Hz	Azimuth	0°

- Test Equipment: Arbitrary Waveform Generator (Section Measuring Equipment and Accessories, item 1)
- Test Setup: Connect the Signal Generator to the RF Input of the instrument.
When using the R&S AMIQ the "I" output must be used.
- Instrument Settings: [PRESET]
[**MODE :: AVIONICS**]
[**AMPT : REF LEVEL : 5 dBm**]
[**FREQ : CENTER FREQUENCY : 12 MHz**]
[MEAS VOR]
[**INPUT/OUTPUT: INPUT SOURCE CONFIG , DIRECT PATH OFF**]
- Signal Generator Settings: Generate a VOR amplitude modulated carrier with a peak level of 0 dBm.
Set carrier frequency, modulation frequency and depth as listed in the table.
4x oversampling (4x carrier frequency) is recommended.
When using the R&S AMIQ download the listed files into the AMIQ:
File VOR_AM_ph0_m10_dev480_fid03.WV
- Measurement: Read the indications:
30 Hz AM: depth and frequency and THD
9.96 kHz AM: depth and frequency
30 Hz FM: deviation and frequency
Voice/Ident: depth and frequency
VOR Phase

2.14.4.3 Test 3 VOR, high AM depth, high deviation, ID high freq. test, Phase 350°

Signal 3 m = 40%, fid = 3990 Hz, dev = 700 Hz, Azimuth = 350°

File VOR_AM_ph350_m40_dev700_fid40.WV

	AM (depth)	Frequency
30 Hz	40 %	30 Hz
9960 Hz	40 %	9960 Hz
Identifier	10 %	3990 Hz
9960 Hz	FM (deviation)	700 Hz
30/30 Hz	Azimuth	350°

Test Equipment:	Arbitrary Waveform Generator (Section Measuring Equipment and Accessories, item 1)
Test Setup:	Connect the Signal Generator to the RF Input of the instrument. When using the R&S AMIQ the "I" output must be used.
Instrument Settings:	[PRESET] [MODE :: AVIONICS] [AMPT : REF LEVEL : 5 dBm] [FREQ : CENTER FREQUENCY : 12 MHz] [MEAS : VOR] [INPUT/OUTPUT: INPUT SOURCE CONFIG , DIRECT PATH OFF]
Signal Generator Settings:	Generate a VOR amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the table. 4x oversampling (4x carrier frequency) is recommended. When using the R&S AMIQ download the listed files into the AMIQ: File VOR_AM_ph350_m40_dev700_fid40.WV
Measurement:	Read the indications: 30 Hz AM: depth and frequency 9.96 kHz AM: depth and frequency 30 Hz FM: deviation and frequency Voice/Ident: depth and frequency VOR Phase

2.14.4.4 Test 4 Standard VOR Signal, VOR phase = 45°, no distortion

Signal 4 Azimuth = 45°

File VOR_AM_ph45_m30_dev480.WV

	AM (depth)	Frequency
30 Hz	30 %	30 Hz
9960 Hz	30 %	9960 Hz
Identifier	10 %	1020 Hz
9960 Hz	FM (deviation)	480 Hz
30/30 Hz	Azimuth	45°

Test Equipment:	Arbitrary Waveform Generator (Section Measuring Equipment and Accessories, item 1)
Test Setup:	Connect the Signal Generator to the RF Input of the instrument. When using the R&S AMIQ the "I" output must be used.
Instrument Settings:	[PRESET] [MODE :: AVIONICS] [AMPT : REF LEVEL : 5 dBm] [FREQ : CENTER FREQUENCY : 12 MHz] [MEAS : VOR] [INPUT/OUTPUT: INPUT SOURCE CONFIG , DIRECT PATH OFF]
Signal Generator Settings:	Generate a VOR amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the table. 4x oversampling (4x carrier frequency) is recommended. When using the R&S AMIQ download the listed files into the AMIQ: File VOR_AM_ph45_m30_dev480.WV
Measurement:	Read the indications: 30 Hz AM: depth and frequency 9.96 kHz AM: depth and frequency 30 Hz FM: deviation and frequency Voice/Ident: depth and frequency VOR Phase

2.14.4.5 Test 5 VOR Signal, VOR phase = 271°, low deviation (200 Hz)

Signal 5 Azimuth = 271°, Deviation 200 Hz

File VOR_AM_ph271_m30_dev200.WV

	AM (depth)	Frequency
30 Hz	30 %	30 Hz
9960 Hz	30 %	9960 Hz
Identifier	10 %	1020 Hz
9960 Hz	FM (deviation)	200 Hz
30/30 Hz	Azimuth	271°

Test Equipment:	Arbitrary Waveform Generator (Section Measuring Equipment and Accessories, item 1)
Test Setup:	Connect the Signal Generator to the RF Input of the instrument. When using the R&S AMIQ the "I" output must be used.
Instrument Settings:	[PRESET] [MODE :: AVIONICS] [AMPT : REF LEVEL : 5 dBm] [FREQ : CENTER FREQUENCY : 12 MHz] [MEAS : VOR] [INPUT/OUTPUT: INPUT SOURCE CONFIG , DIRECT PATH OFF]
Signal Generator Settings:	Generate a VOR amplitude modulated carrier with a peak level of 0 dBm. Set carrier frequency, modulation frequency and depth as listed in the table. 4x oversampling (4x carrier frequency) is recommended. When using the R&S AMIQ download the listed files into the AMIQ: File VOR_AM_ph271_m30_dev200.WV
Measurement:	Read the indications: 30 Hz AM: depth and frequency 9.96 kHz AM: depth and frequency 30 Hz FM: deviation and frequency Voice/Ident: depth and frequency VOR Phase

2.14.4.6 Test 6 VOR Signal, VOR phase = 180.1°, frequency offset 1%

Signal 6 Azimuth = 180.1°, Frequency offset +1%,
Receiver Frequency = 12.12 MHz

File VOR_AM_ph180_m30_dev480_offset01.WV

	AM (depth)	Frequency
30 Hz	30 %	30.3 Hz
9960 Hz	30 %	10059.6 Hz
Identifier	10 %	1030.2 Hz
9960 Hz	FM (deviation)	480 Hz
30/30 Hz	Azimuth	180.1°

- Test Equipment: Arbitrary Waveform Generator (Section Measuring Equipment and Accessories, item 1)
- Test Setup: Connect the Signal Generator to the RF Input of the instrument.
When using the R&S AMIQ the "I" output must be used.
- Instrument Settings: [PRESET]
[**MODE :: AVIONICS**]
[**AMPT : REF LEVEL : 5 dBm**]
[**FREQ : CENTER FREQUENCY : 12 MHz**]
[**MEAS: VOR**]
[**INPUT/OUTPUT: INPUT SOURCE CONFIG , DIRECT PATH OFF**]
- Signal Generator Settings: Generate a VOR amplitude modulated carrier with a peak level of 0 dBm.
Set carrier frequency, modulation frequency and depth as listed in the table.
4x oversampling (4x carrier frequency) is recommended.
When using the R&S AMIQ download the listed files into the AMIQ:
File VOR_AM_ph180_m30_dev480_offset01.WV
- Measurement: Read the indications:
30 Hz AM: depth and frequency
9.96 kHz AM: depth and frequency
30 Hz FM: deviation and frequency
Voice/Ident: depth and frequency
VOR Phase

3 Adjustment

NOTICE

Risk of erroneous measurement results

Adjustment must be carried out exclusively by qualified personnel since any change can considerably affect the instrument's measurement uncertainty.

3.1 Adjustment Tool

The frequency response, the reference frequency and the YIG filter of the R&S®FSW can be adjusted automatically by the R&S®FSW Service tool. The adjustment is required when connectors in the RF signal paths have been opened or when an RF board has been changed.

In the chapter "Repair" the required tasks after changing the hardware are described. The adjustment can be performed by R&S service representations.

3.2 Adjusting the Reference Oscillator

The reference oscillator (instruments with and without option R&S®FSW-B4) can be adjusted with the R&S®FSW service tool as described in chapter [Checking the Reference Frequency Uncertainty](#) or by the sequence described here.

3.2.1 Measuring Equipment

Table 3-1: Measuring Equipment and Accessories for Manual Adjustment of the R&S®FSW Reference Oscillator

Item	Type of equipment	Recommended Specifications	Recommended Equipment	R&S Order No.	Use
1	Signal generator	Frequency: 1 GHz Output level: >-20 dBm Uncertainty of frequency: 1×10^{-9}	R&S SMA100A with SMA-B106, SMA-B22	1400.0000.02 1405.0809.02 1405.1805.02	Frequency uncertainty of the reference oscillator

3.2.2 Adjustment Sequence

Test equipment: Signal generator (see [Test Equipment](#), item 1):

- Frequency: 1000 MHz
- Level: -15 dBm
- Frequency uncertainty: $<1 \times 10^{-9}$

If the frequency uncertainty of the generator is insufficient, the generator 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 the RF input of the R&S®FSW.

R&S®FSW settings:

- [SETUP : Service : Service Function : Password = 894129]



Warming up the reference oscillator

Before the following measurement, the R&S®FSW must be on for at least ten minutes with internal reference, so that the reference oscillator is warmed up.

Measurement: ► Start automatic adjustment by entering the service function:

- [SETUP : MORE : SERVICE : SERVICE FUNCTION : 2.3.12]

The instrument performs the automatic adjustment. The new tuning values are stored in the EEPROM automatically.

3.2.3 Troubleshooting

Checking the input signal:

The automatic adjustment routine checks the level of the input signal. The adjustment is aborted if the input level is not within the range from -10 dBm to -20 dBm.

The automatic adjustment is also aborted if the input signal is not within the nominal frequency range:

- Model without option R&S®FSW-B4: 1.0 GHz $\pm$ 100 Hz
- Model with option R&S®FSW-B4: 1.0 GHz $\pm$ 10 Hz

For verification proceed as follows:

FSW settings:

- [SETUP : REFERENCE : INT]
- Toggle to internal reference.

**Signal
generator
settings:**

Frequency: as above 1000 MHz

FSW settings:

- [PRESET]
- [FREQ : 1 GHz]
- [SPAN : 100 kHz]
- [BW : RES BW MANUAL: 10 kHz]
- [MKR FUNC : SIGNAL COUNT]

Measurement:

- ▶ Read out the power level of the marker and check whether the input level is within the range from -10 dBm to -20 dBm.
- ▶ Read out the frequency value (Count:) of the marker and check whether the input signal frequency is in the nominal frequency range as shown above.

Checking appropriate warm-up of the instrument:

The automatic adjustment routine checks the drift of the internal reference oscillator. If there is too much drift (warming up is not completed) the adjustment is aborted.

Checking the R&S®FSW-B4 option

Disconnect the instrument from all power supplies, remove option R&S®FSW-B4, connect the power again and perform the automatic adjustment as described above. If this works correctly, most likely the R&S®FSW-B4 option is defective.

4 Repair

The following chapter describes how to replace modules in the FSW. The general procedures to open and complete the instrument are described in the introduction. For all descriptions, the numbers in parenthesis refer to the elements indicated in the inserted graphics.

Explanation of symbols used in the following chapter:

Tip: The hint given in this way makes the action to be done easier to do for you

Note: There is possibly a problem to finish your work if you do not follow the description given here.

NOTICE! You must carefully perform the action described in this hint because of a possible danger to hurt yourself or to damage the instrument and/or the part you are replacing.

WARNING

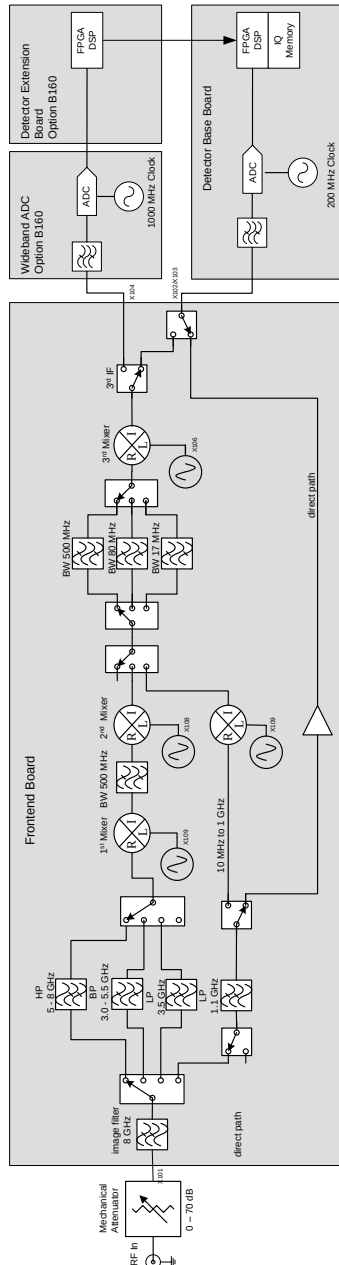
Shock hazard

Before opening the casing, make sure that the instrument is switched off and disconnected from all power supplies.

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

4.1 Functional Description

4.1.1 R&S®FSW 8



The FSW is a triple-conversion heterodyne receiver.

The frequency range depends on the instrument model.

The input signal passes a mechanical attenuator the optional electronic attenuator and the optional preamplifier.

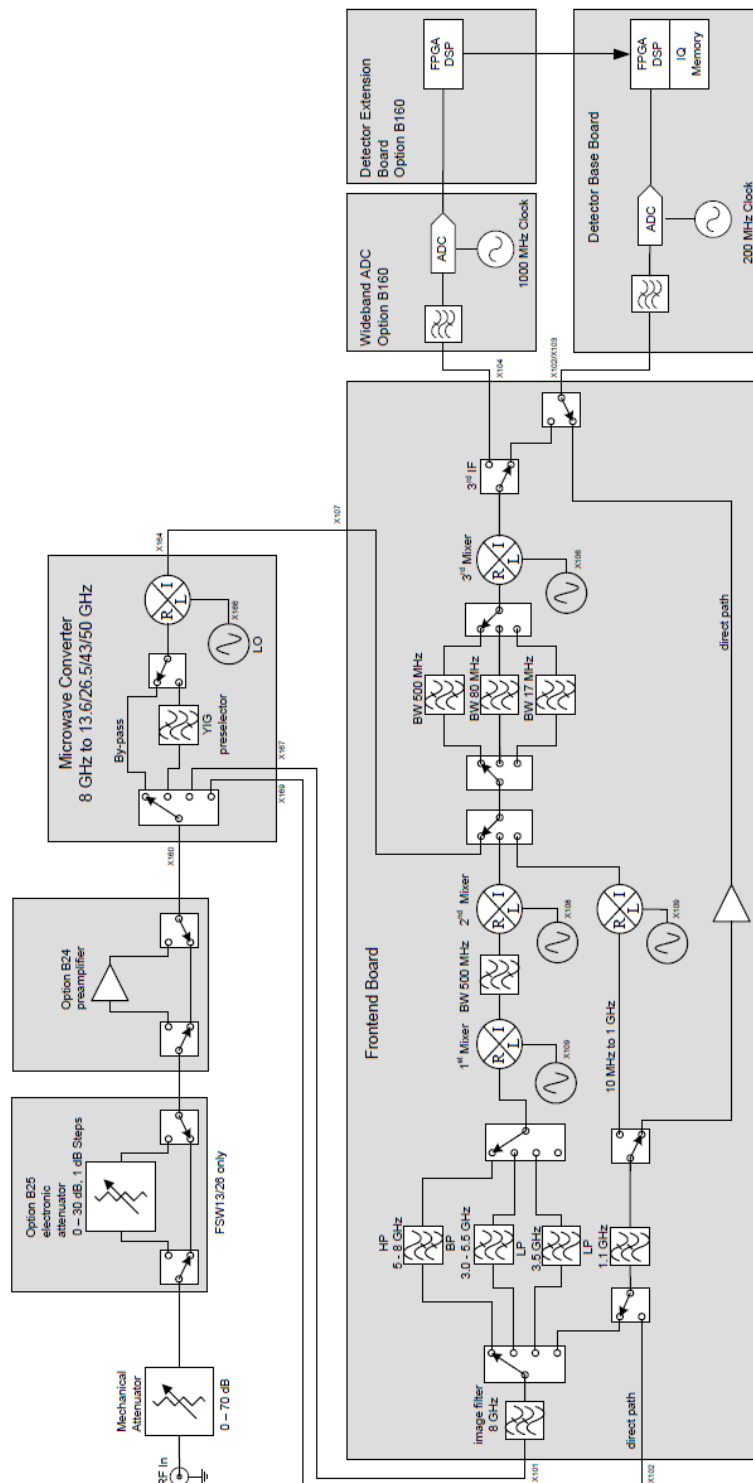
The input signal is fed to the frontend board which is basically a triple-conversion heterodyne receiver.

The synthesizer board and reference board generate the LO frequencies.

The digital IF is fed from the frontend board to the detector board where sampling and digital signal processing is provided.

An optional wideband ADC and detector extension board can be fitted behind the frontend for wide band digital signal processing. The remaining data are transferred to the host processor via a PCI express (PCIe) interface. The hardware settings are controlled via a serial interface on the detector board that is set from the host via the PCIe interface.

4.1.2 R&S®FSW 13/26/43/50



The FSW is a triple-conversion (double conversion for frequencies > 8 GHz) heterodyne receiver. The frequency range depends on the instrument model.

The input signal passes a mechanical attenuator the optional electronic attenuator and the optional preamplifier.

For frequencies below 8 GHz the input signal is fed to the frontend board which is basically a triple-conversion heterodyne receiver. For higher input frequencies the microwave converter down mixes the input signal to an intermediate frequency that is further processed by the frontend.

The synthesizer board and reference board generate the LO frequencies.

The IF is fed from the frontend board to the detector board where sampling and digital signal processing is provided.

An optional wideband ADC and detector extension board can be fitted behind the frontend for wide band digital signal processing. The remaining data is transferred to the host processor via a PCI express (PCIe) interface. The hardware settings are controlled via a serial interface on the detector board that is set from the host via the PCIe interface.

4.1.3 R&S®FSW 67

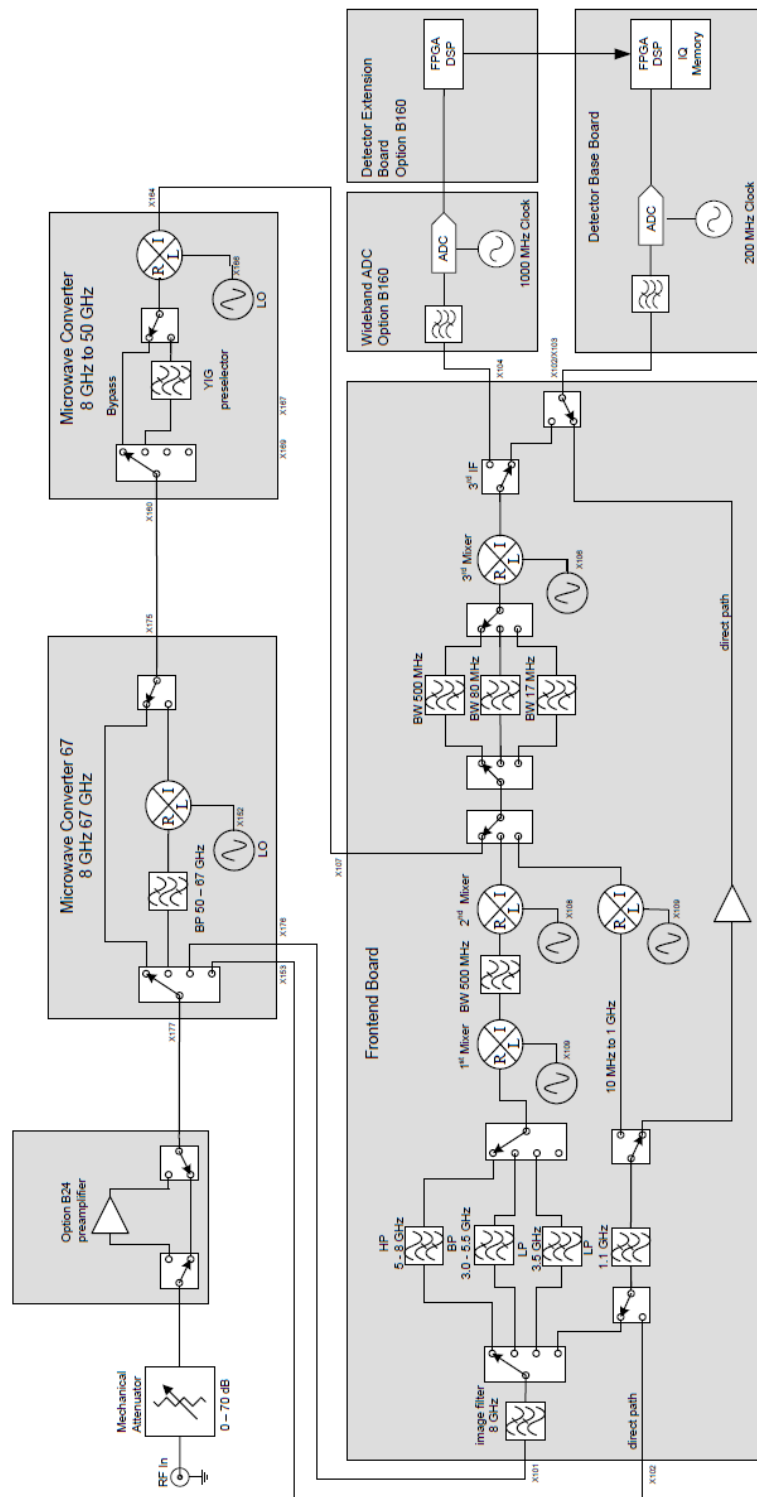
The FSW67 is a triple-conversion (double conversion for frequencies 8 GHz to 50 GHz) heterodyne receiver for frequencies > 50 GHz. The input signal passes a mechanical attenuator and if the option is installed the preamplifier. For frequencies below 8 GHz the input signal is fed to the frontend board which is basically a triple-conversion heterodyne receiver. For input frequencies between 8GHz and 50GHz the microwave converter down mixes the input signal to an intermediate frequency that is further processed by the frontend. For input frequencies above 50 GHz the input signal is first mixed down by the 67GHz converter in the frequency range of the microwave converter.

The synthesizer board and reference board generate the LO frequencies.

The IF is fed from the frontend board to the detector board where sampling and digital signal processing is provided.

An optional wideband ADC and detector extension board can be fitted behind the frontend for wide band digital signal processing.

The remaining data are transferred to the host processor via a PCI express (PCIe) interface. The hardware settings are controlled via a serial interface on the detector board that is set from the host via the PCIe interface.



4.1.4 R&S®FSW85

The FSW85 is a triple-conversion (double conversion for frequencies 8 GHz to 50 GHz) heterodyne receiver for frequencies > 43,5 GHz. Depending whether YIG-

preselector "On" or "Off" at the instrument is selected, the RF input signal is switched in the mechanical attenuator to a preselected or non preselected downconverter chain.

Both RF signals are fed to microwave modules where frequencies from 2 Hz to 43,5 GHz are fed direct to the following switch matrix module. Frequencies above 43,5 GHz are coupled to a mixer and converted to an IF at about 7,5 to 27,5 GHz. The four signals from the two 85 GHz downconverter modules are switched together in the switch matrix module and fed to the 43 GHz microwave converter. The difference to other microwave converter variants is the missing triplexer module. The triplexer is included in the switch matrix module.

If YIG-preselector "On" is selected on instrument, the two RF-signals 8 GHz to 43,5 GHz and the variable IF of the 85 GHz path of the preselected 85 GHz module are fed to the YIG path of the microwave converter and converted to an IF which is further processed by the 8 GHz frontend.

If YIG-preselector "Off" is selected on instrument, the two RF-signals 8 GHz to 43,5 GHz and the variable IF of the 85 GHz path of the Bypass module are fed to the Bypass path of the microwave converter and converted to an IF which is further processed by the 8 GHz frontend.

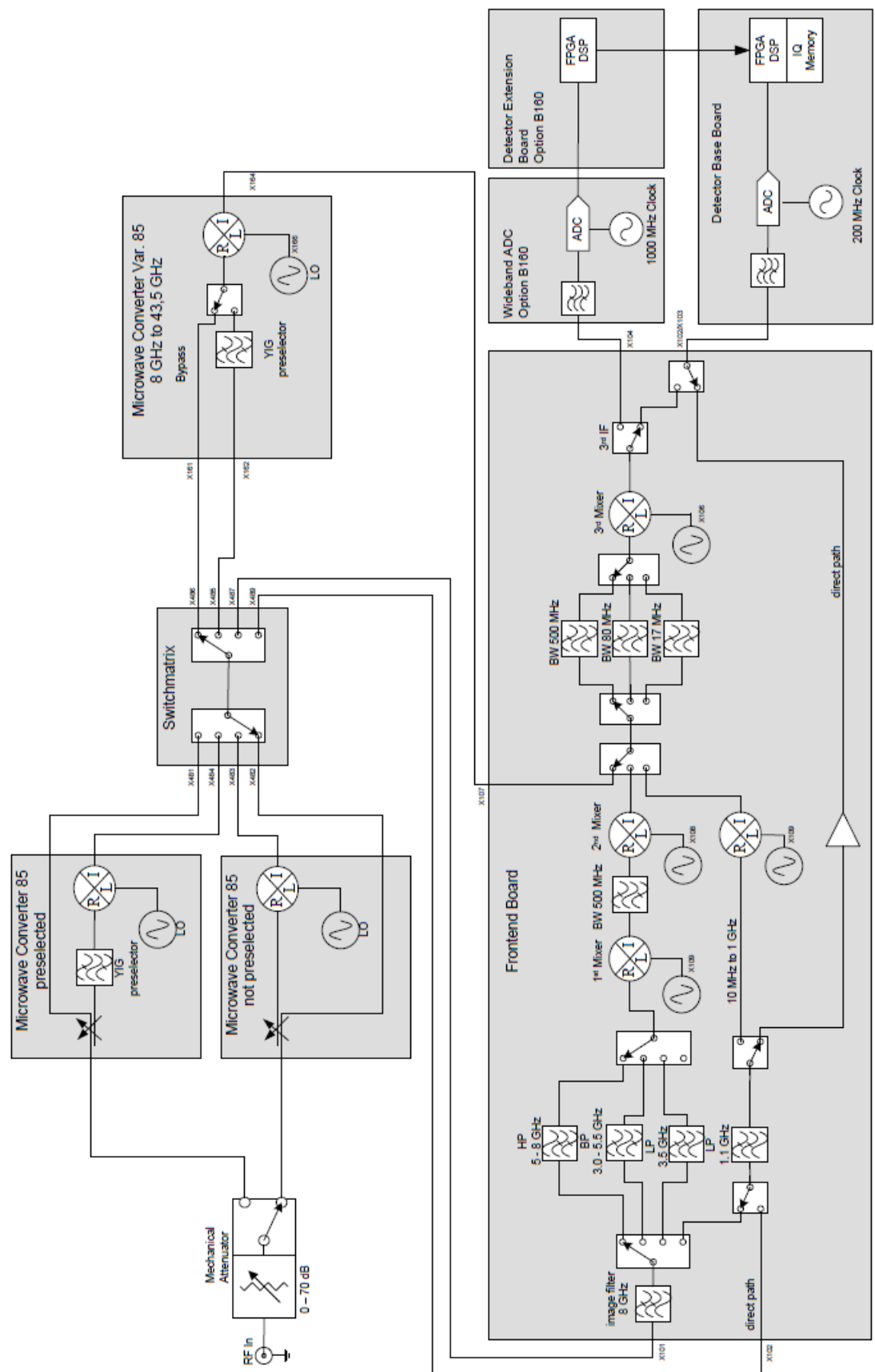
Frequencies < 8 GHz are fed direct to the 8 GHz frontend.

The synthesizer board and reference board generate the LO frequencies. The LO frequencies for the two 85 GHz converter modules are generated on the MWC Baseboard 85.

The IF is fed from the frontend board to the detector board where sampling and digital signal processing is provided.

An optional wideband ADC and detector extension board can be fitted behind the frontend for wide band digital signal processing.

The remaining data are transferred to the host processor via a PCI express (PCIe) interface. The hardware settings are controlled via a serial interface on the detector board that is set from the host via the PCIe interface.



4.1.5 Attenuator A60

The attenuator switches in 5 dB (10 dB R&S®FSW85) steps and has a maximum total attenuation of 75 dB (70 dB R&S®FSW85), it contains an AC coupling that can be bypassed and a switch for the internal calibration sources to the input.

4.1.6 Frontend Board A100

The frontend board processes input signals in the range up to 8 GHz by three different operating modes: The high band mode is a triple conversion receiver with the first IF > 8.97 GHz and the second IF >1.29 GHz. The exact IF depends on the input frequency and the selected bandwidth. In the low band mode input signals ≤ 1 GHz are directly converted to the second IF. For input frequencies up to 80 MHz the direct mode passes the input signal directly thru the frontend board without frequency conversion. Level detectors on the RF and the IFs allow overload detection and triggering.

4.1.7 Microwave Converter Unit (R&S®FSW13/26/43/50)

The R&S®FSW13/26/43/50 comprise a microwave converter consisting of two boards: The microwave converter base board A170 and the microwave converter frontend unit A160. The first includes the power supply, the YIG current source and the digital control. The latter is connected by a ribbon cable with the base board and is mounted to the YIG filter frontend unit.

The microwave converter frontend unit contains the microwave signal path: The diplexer (for R&S®FSW13/26) or the triplexer (for R&S®FSW43/50) couples the low frequency part up to 80 MHz of the input signal in the direct path. For input signals up to 8 GHz the diplexer/triplexer switches to the frontend board.

A YIG filter in front of the microwave mixer filters the input signals. A bypass path allows bypassing the YIG filter to achieve large bandwidths. The microwave mixer converts the input signal down to the second IF >1.29 GHz. Amplifiers and variable attenuators control the gain of the IF signal before it is fed in the IF input of the frontend.

4.1.8 Microwave Converter Unit (R&S®FSW67)

The R&S®FSW67 comprise a microwave converter consisting of three boards: The microwave converter base board A170 and the microwave converter frontend unit A160 and the microwave converter 67 board. The first includes the power supply, the YIG current source and the digital control. The second is connected by a ribbon cable with the base board and is mounted to the YIG filter frontend unit. The third board converts the frequency range from 50 GHz to 67 GHz to a sliding IF of 11 to 24GHz, which is converted in the standard microwave converter afterwards to standard IF2.

The microwave converter frontend unit contains the microwave signal path: the triplexer couples the low frequency part up to 80 MHz of the input signal in the direct path. For input signals up to 8 GHz the diplexer/triplexer switches to the frontend board

and otherwise to the microwave path. In the R&S®FSW67 the input signal is additionally switched to the input of the microwave converter 67 for input frequencies above 50 GHz

A YIG filter in front of the microwave mixer filters the input signals. A bypass path allows bypassing the YIG filter to achieve large bandwidths. The microwave mixer converts the input signal down to the second IF >1.29 GHz. Amplifiers and variable attenuators control the gain of the IF signal before it is fed in the IF input of the frontend.

4.1.9 Microwave Converter Unit (R&S®FSW85)

The R&S®FSW85 comprises two microwave converter stages:

The first converter stage "Microwave converter 85 frontend unit" A700 consists of four modules – the 85 GHz preselected microwave converter module "YIG filter 2 module" A490, the non preselected microwave converter unit "Converter 85 control module" A470, the switch unit "Switch Matrix controller unit" A480 and the "Microwave converter 85 Baseboard" A450.

The microwave converter unit "YIG filter 2 module" A490 contains a coupling structure to separate the frequency range from 2 Hz to 43,5 GHz and the frequency range from 43,5 GHz to 85 GHz. Furthermore the module contains a tunable filter for preselection and the downconverter for the frequency range from 43,5 GHz to 85 GHz. The module is connected via a ribbon cable to the "Converter 85 control module" A470 for bias voltages and a further ribbon cable to the "Microwave converter 85 Baseboard" A450 for the YIG filter 2 current.

The microwave converter unit "Converter 85 control module" A470 contains the downconverter for the frequency range 43,5 GHz to 85 GHz, when preselector "Off" on instrument is selected. The PCB board contains the bias circuits for both 85 GHz microwave converter. The unit is connected via a ribbon cable to the "Microwave converter 85 Baseboard" A450 for power supply and control.

The "Switch Matrix controller unit" A480 contains the switching circuit to collect and distribute the RF signals from the 85 GHz converter modules to the following converter stages. The module is connected via a ribbon cable to the "Microwave converter 85 Baseboard" A450 for power supply and control.

The "Microwave converter 85 Baseboard" A450 includes the power supply, the YIG filter 2 current source, the LO processing for the 85 GHz converters and the digital control. A part of the LO processing is done in a microwave module mounted on the PCB board.

The second converter stage consists of the microwave converter frontend unit A160 without the triplexer A340 and the microwave baseboard A170. The function of this converter stage is the same as in the R&S®FSW67.

4.1.10 Reference Board A120

The reference board generates the reference signals for the R&S®FSW. The reference frequency is obtained by an OCXO at 10 MHz which can be replaced either by the

option B4, an external reference frequency in the range 1 MHz to 20 MHz or by an external 100 MHz signal. A 128 MHz quartz oscillator (VCOCXO) is synchronized on the 10 MHz and is the central source for any other frequencies. The module provides the 128 MHz clock for FPGAs, the ADC clock at 400 MHz, a 640 MHz output, two 1280 MHz outputs for the frontend board and the synthesizer board and the LO2 at 7680 MHz and 8064 MHz. It also generates the internal level reference at 64 MHz and the comb signal for the self-alignment.

4.1.11 Synthesizer Board A140

In the synthesizer board a YIG oscillator locks on the 1280 MHz signal from the reference board to generate the local oscillator signal for the first mixers in the frontend board and in the microwave converter. There are two independent modes realized: The sweep mode is optimized for fast sweeps and allows continues output frequencies. In step mode only discrete output frequencies are possible and a very low phase noise level is achieved. A FPGA on the module controls the hardware.

4.1.12 Detector Board A200

The detector board digitizes the IF or baseband signal provided by the frontend. The module contains the digital signal processing and the sequence control for the spectrum mode. The digital baseband input and output are located on this board as well as the trigger input, the GPIB bus, the instrument interconnect and the user port. The detector board is connected to the CPU Board via PCIe bus.

4.1.13 Digital Motherboard A20

The digital motherboard provides the slots for the digital modules, the CPU Board, and the reference board. It contains signal connections and the power distribution as well as the converters for the analog module supply voltages. A FPGA, that contains the board EEPROM, controls the two main fans and the power up of the DC/DC converters.

4.1.14 Analog Motherboard A10

This complete passive board provides the slots for the analog modules. It contains the interconnects for these boards and the interconnect to the frontpanel.

4.1.15 CPU Board A90

The CPU Board contains all the necessary components on a board, including the processor, system memory (SO-DIMM modules), I/O devices (PCIe bus), lithium battery, LCD graphics controller, external DVI monitor graphics interface (monitor), controller for SATA hard drive and the USB interfaces.

4.1.16 Frontpanel

The frontpanel consists of the following components:

- Display with touch A70
- Frontconnector board A30
- Frontpanel-keyboard board A40
- Standby board (only available with the Frontpanel-keyboard board) A50
- Rotary pulse generator A42
- RF input plug X1

All these components are mounted on the front bezel.

4.1.17 Power Supply A80

The power supply unit provides the intermediate supply voltage for the whole instrument. It can be switched off by means of the power switch on the rear panel. The power supply unit is a primary clocked switching power supply. On the secondary side, it generates the following DC voltages: +12.2 V, and +12.2 V standby. A control signal controlled by the CPU Board (depending on the STANDBY/ON key on the front of the instrument frame) activates the power supply. In standby operation, it only supplies the 12.2 V-standby voltage for heating the OCXO, the LED STANDBY on the front panel and the power up control logic on the CPU Board.

4.1.18 Options

4.1.18.1 OCXO R&S®FSW-B4 A260

The R&S®FSW-B4 option contains a high performance oven-controlled crystal oscillator (OCXO). This OCXO generates a 10 MHz signal, which is routed to the reference board and used as a reference signal.

4.1.18.2 Preamplifier R&S®FSW-B24

The option R&S FSV-B24 provides an internal preamplifier which covers the whole frequency range of the instrument.

4.1.18.3 Electronic Attenuator R&S®FSW-B25

This option contains an electronic step attenuator. The attenuation can be switched in addition to the mechanical step attenuator.

4.1.18.4 Analysis Bandwidth Extension R&S®FSW-B160, R&S®FSW-B160R R&S®FSW-B320, R&S®FSW-B512, R&S®FSW-B512R

The Analysis Bandwidth Extension options consist of a wideband ADC board and a Detector Extension Board. The option expands the analysis bandwidth of the

R&S®FSW to 512 MHz. It also contains a wideband IF output at the rear panel of the R&S®FSW.

Wideband ADC Board A290 and A370

The wideband ADC board contains the digitizer for the analysis bandwidth extension options.

Detector Extension Board A220

The detector extension board contains the hardware for advanced analysis of the IF data captured with the R&S®FSW. It also provides the hardware support for the analysis bandwidth extension options.

4.1.18.5 Analysis Bandwidth Extension R&S®FSW-B1200

The Analysis Bandwidth Extension options consist of a wideband ADC board, a Detector Extension Board and a Wideband Converter Board. The option expands the analysis bandwidth of the R&S®FSW to 1200 MHz. It also contains a wideband IF output at the rear panel of the R&S®FSW.

Wideband ADC Board A290 and A370

The wideband ADC board contains the digitizer for the analysis bandwidth extension options.

Detector Extension Board A220

The detector extension board contains the hardware for advanced analysis of the IF data captured with the R&S®FSW. It also provides the hardware support for the analysis bandwidth extension options.

Wideband Converter Board A110

The wideband converter board contains the hardware to provide the signals for the wideband ADC board.

4.1.18.6 Analysis Bandwidth Extension R&S®FSW-B2000

The option FSW-B2000 consists of the RTO Calibration source board and the IF wide output.

4.1.18.7 LO/IF connections for external mixers R&S®FSW-B21 (R&S®FSW26/43/50/67)

This option provides the input and output for the use of an external mixer to extend the frequency range of the instrument to up to 110 GHz. The necessary circuits are located on the microwave converter frontend.

4.1.18.8 Analog Baseband Inputs R&S®FSW-B71 A230

This option provides 4 analog inputs for baseband signals in the frequency range up to 80MHz. The board A230 contains the analog circuitry for the inputs as well as the two A/D converters.

4.1.18.9 External Generator Control Board R&S®FSW-B10 A240

This option provides an additional GPIB port and a SUBD 9pin connector to control an external generator.

4.2 Basic Steps and Information for Module Replacement

4.2.1 Location of the Modules

4.2.1.1 On the rear side of the instrument:



Figure 4-1: Instrument equipped with option R&S FSW-B512

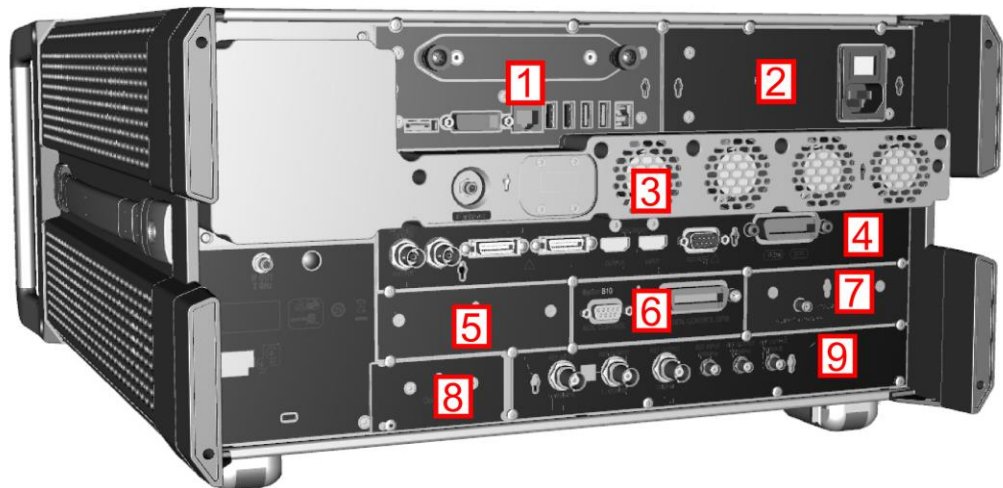


Figure 4-2: Instrument equipped with option R&S FSW-B512R or option FSW-B1200

Position	Module
1	CPU board A90 with hard disk drive A91
2	Power supply unit A80
3	Detector extension Board A220 and Wideband ADC board A370 for options FSW-B160 or FSW-B160R or FSW-B320 or FSW-B512 or FSW-B512R or FSW-B1200
4	Detector base board A220
5	Option FSW-B71 A230
6	Option FSW-B10 A240
7	Option FSW-B2000 A250
8	Option FSW-B4 A260
9	Reference board A120

4.2.1.2 On the front side of the instrument

R&S®FSW13/26/43/50

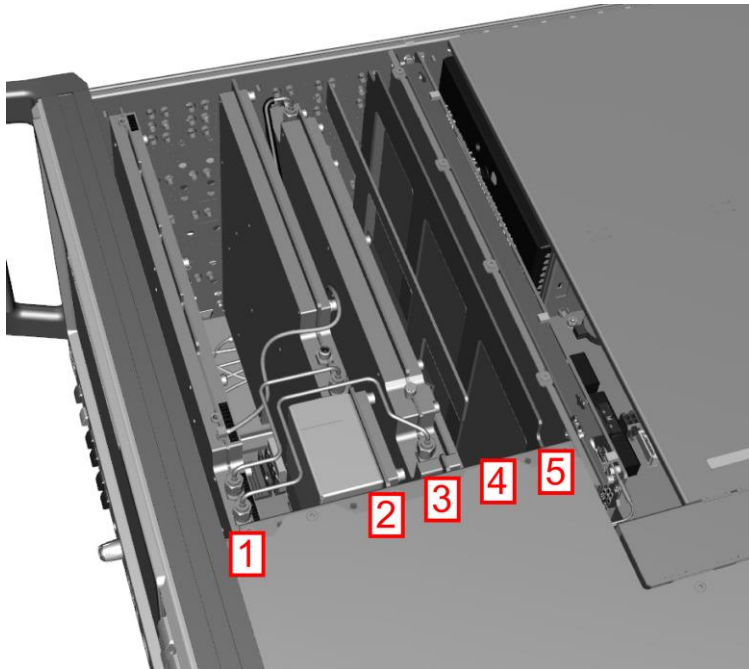


Figure 4-3: Location of modules in R&S®FSW13/26/43/50

Position	Module
1	Wideband Converter Board (instrument equipped with FSW-B1200 only)
2	Synthesizer Board A140
3	Frontend Board A100
4	Microwave Converter Baseboard A170
5	FSW-B71 Coax Relay (instrument equipped with FSW-B71 only)

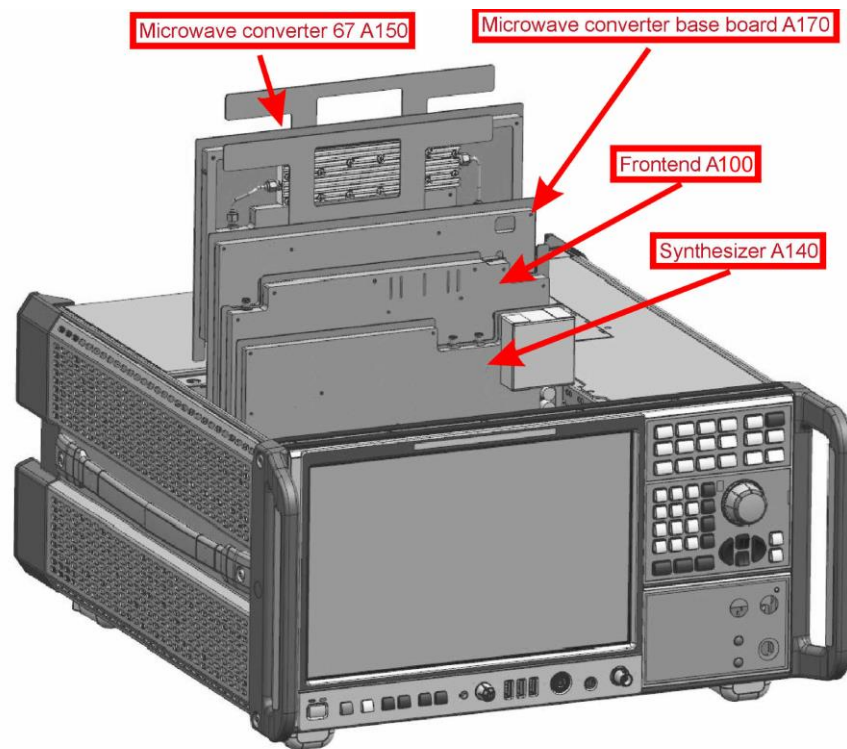
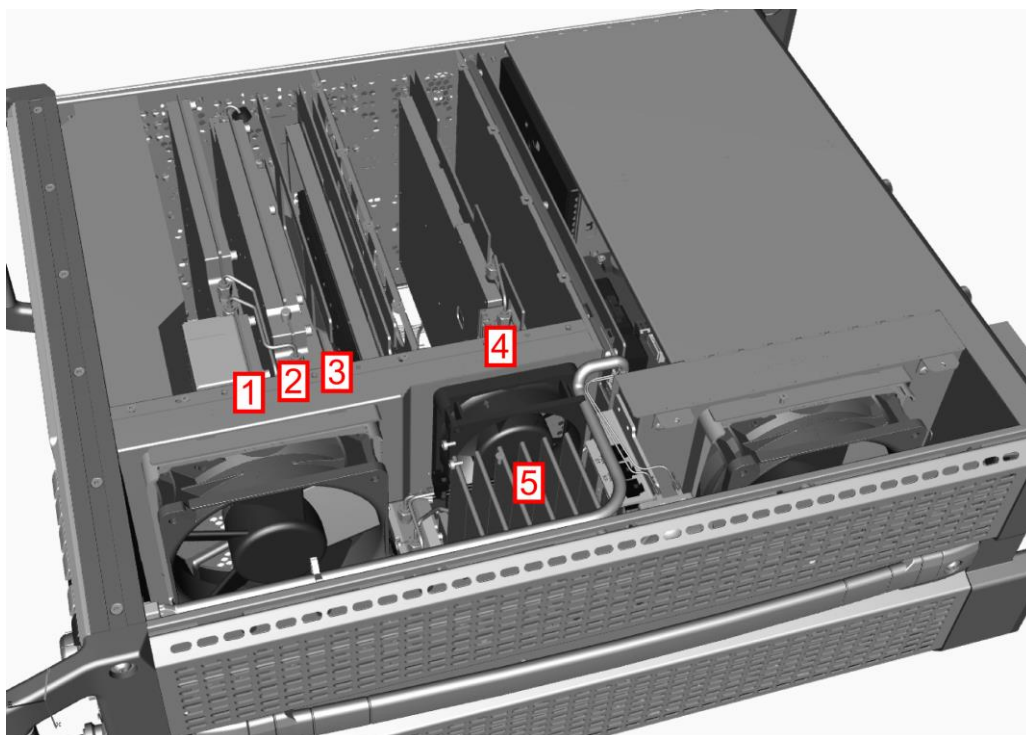
R&S®FSW67

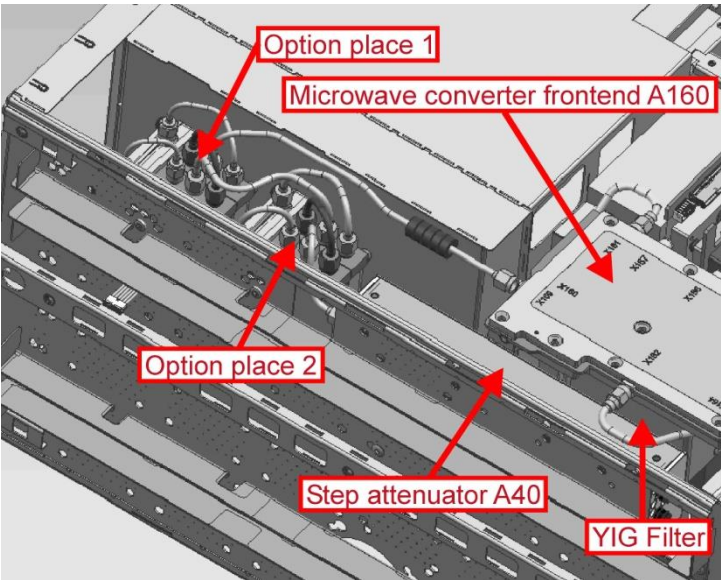
Figure 4-4: Location of modules in R&S®FSW67

R&S®FSW85**Figure 4-5: Location of modules in R&S®FSW85**

Position	Module
1	Synthesizer Board A140
2	Frontend Board A100
3	Microwave Converter Baseboard A170
4	Microwave Converter Baseboard 85 A450
5	Microwave Converter Frontend Unit

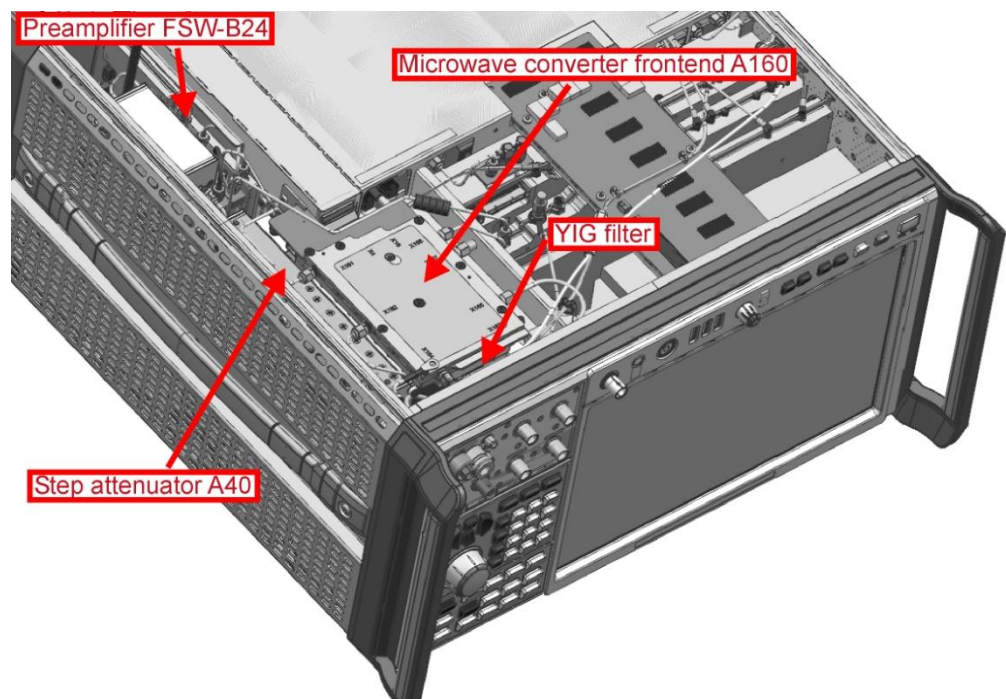
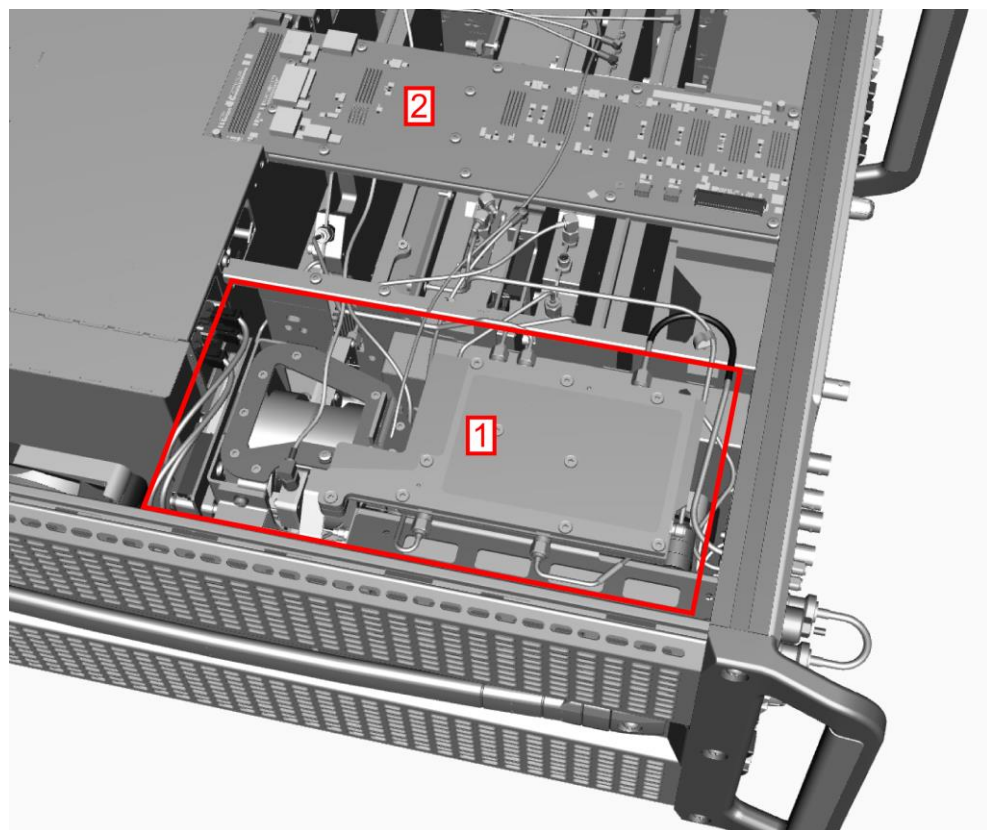
4.2.1.3 On the bottom of the instrument

R&S®FSW13/26



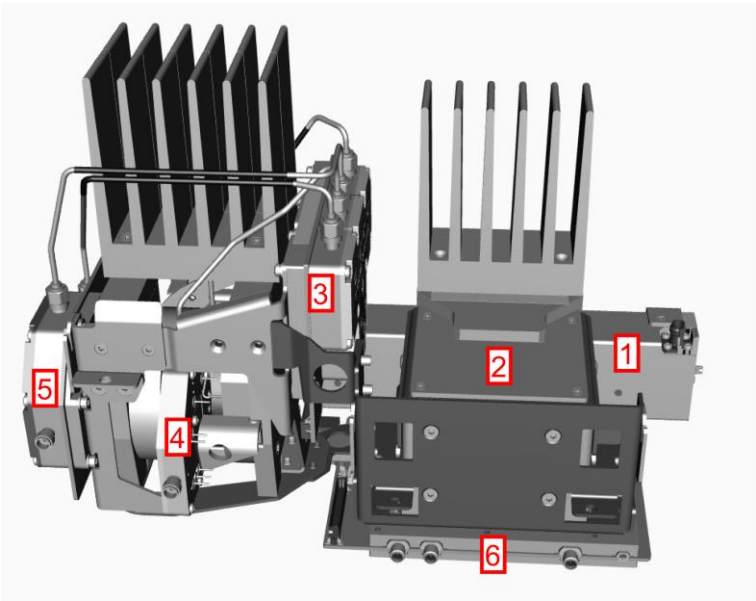
The following options can be installed:

Instrument is equipped with:	Option installed in Option Place 1	Option installed in Option Place 2
R&S®FSW-B24	None	R&S®FSW-B24
R&S®FSW-B25	None	R&S®FSW-B25
R&S®FSW-B24 and R&S®FSW-B25	R&S®FSW-B24	R&S®FSW-B25

R&S®FSW43/50/67**R&S®FSW85**

Position	Module
1	Microwave Converter Frontend Unit (for details see picture below)
2	Analog Motherboard A10

Microwave Frontend Unit:



Position	Module
1	Step Attenuator A50
2	YIG filter 1
3	Switch Matrix controller unit
4	YIG filter 2 module
5	Converter 85 control module
6	Microwave converter frontend

4.2.2 Basic Cable Routing

4.2.2.1 R&S®FSW8:

The following pictures show the cable routing of an R&S®FSW8. Depending on the options installed the routing may differ. For a schematic overview of the cable connections see chapter 5.

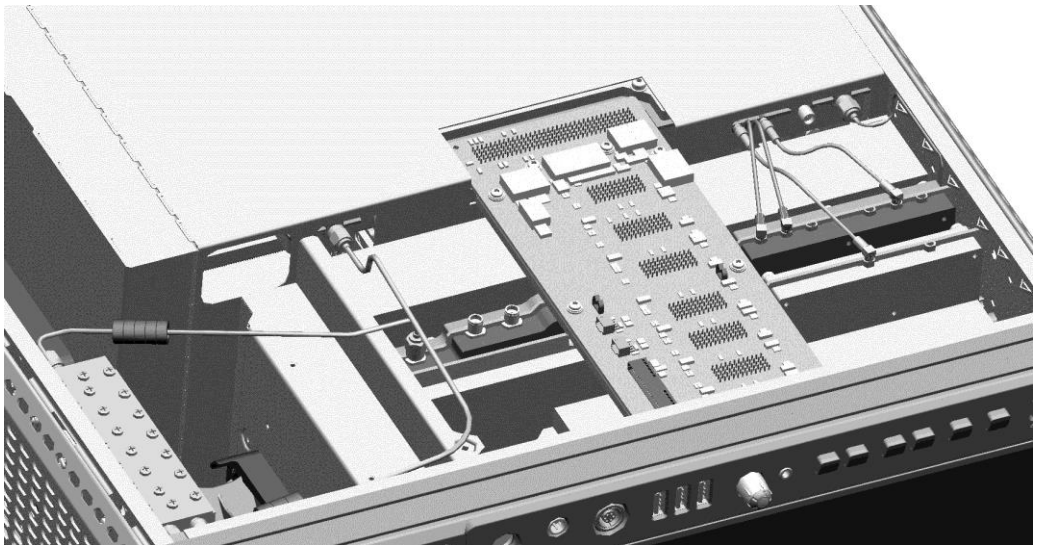


Figure 4-6: Cable routing on the lower side of an R&S®FSW8 without option R&S®FSW-B24 and R&S®FSW-B25.

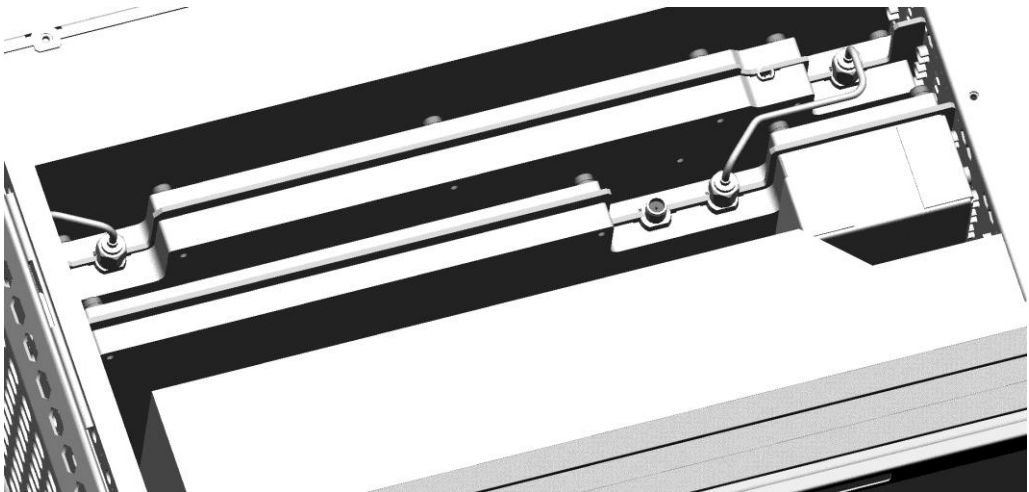


Figure 4-7: Cable routing on the upper side of an R&S®FSW8.

4.2.2.2 R&S®FSW13/26:

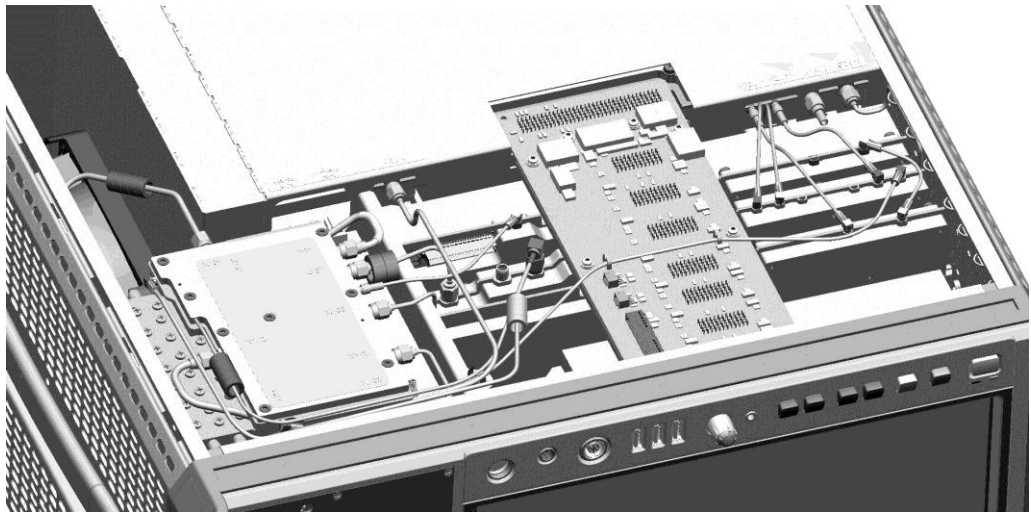


Figure 4-8: Cable routing on the lower side of an R&S®FSW13/26 without options R&S®FSW-B24 and R&S®FSW-B25.

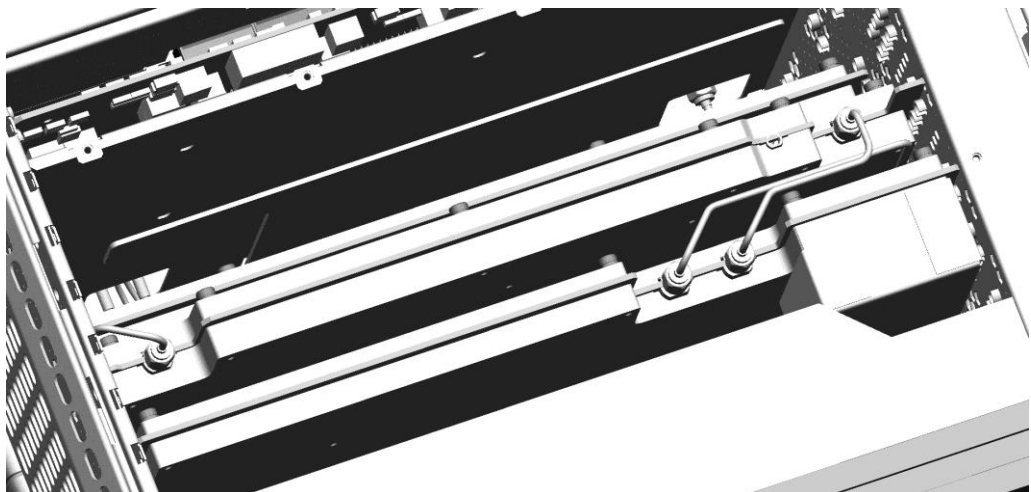


Figure 4-9: Cable routing on the upper side of an R&S®FSW13/26/43 without options R&S®FSW-B24 and R&S®FSW-B25.

4.2.2.3 R&S®FSW43/50:

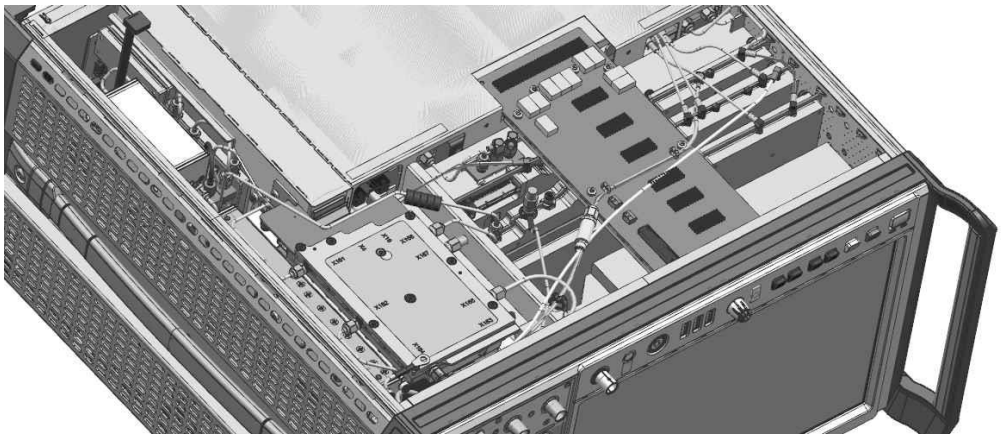


Figure 4-10: Cable routing on the lower side of an R&S®FSW43 with option R&S®FSW-B24 installed

4.2.2.4 R&S®FSW67:

The following pictures show the cable routing of an R&S®FSW67. Depending on the options installed the routing may differ. For a schematic overview of the cable connections see chapter 5.

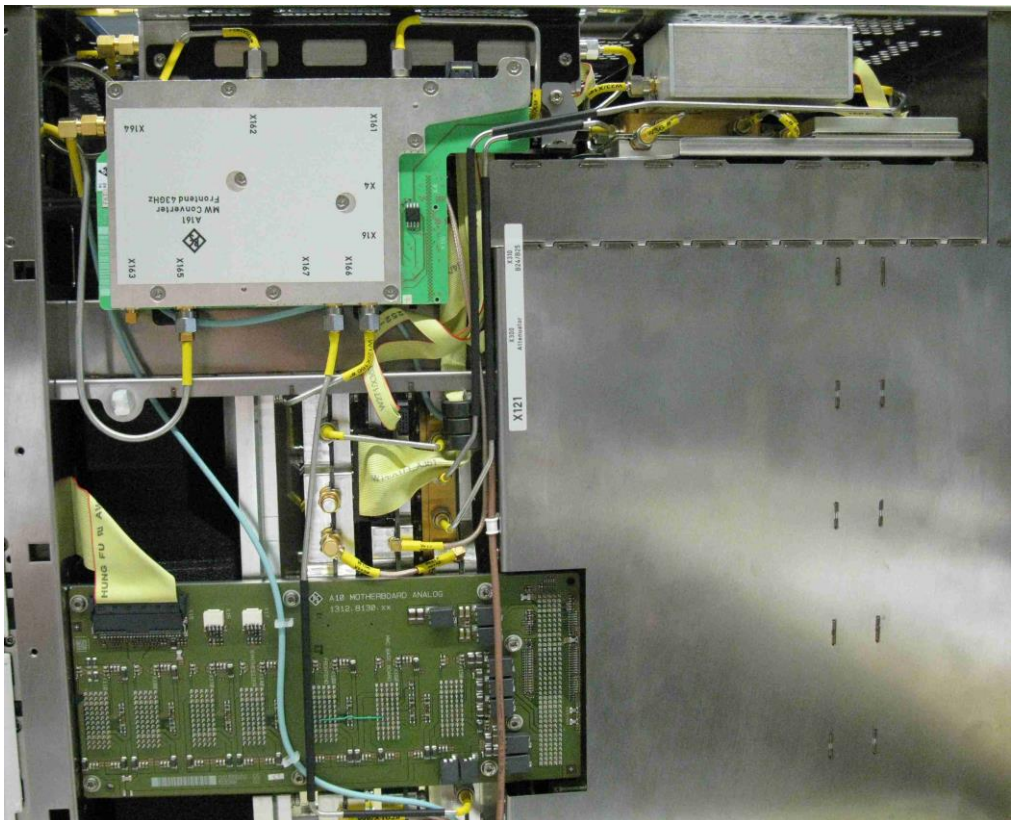


Figure 4-11: Cable routing on the lower side of an R&S®FSW67 with option R&S®FSW-B24 installed

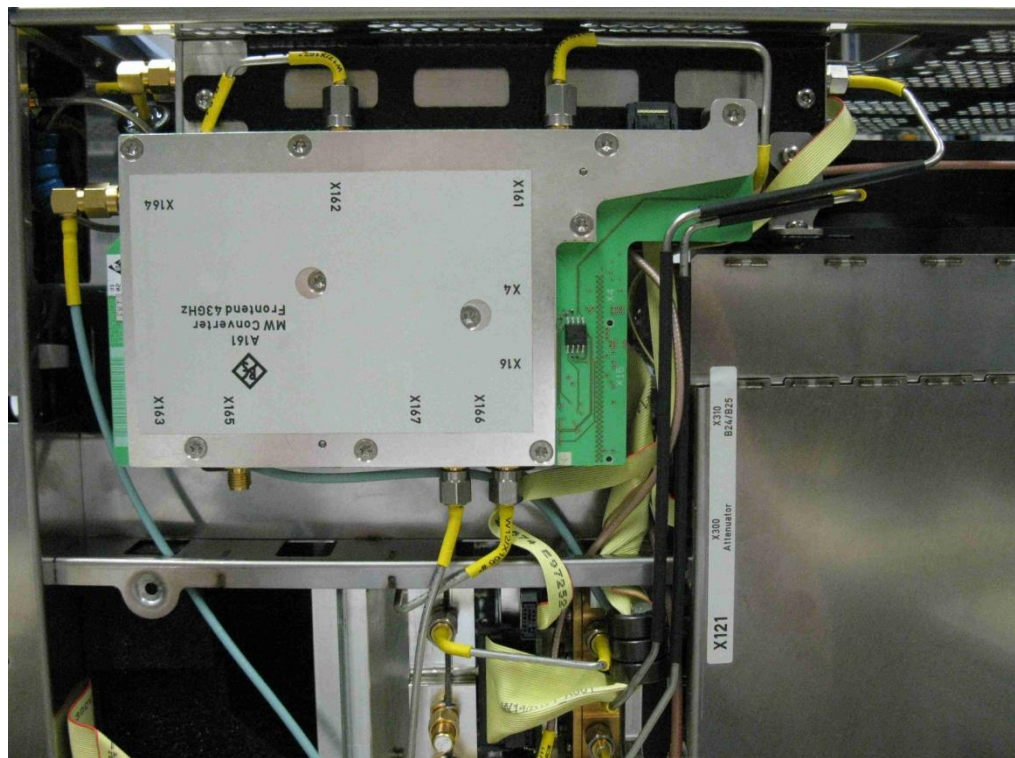


Figure 4-12: Cable routing on the lower side of an R&S®FSW67 without option R&S®FSW-B24 installed

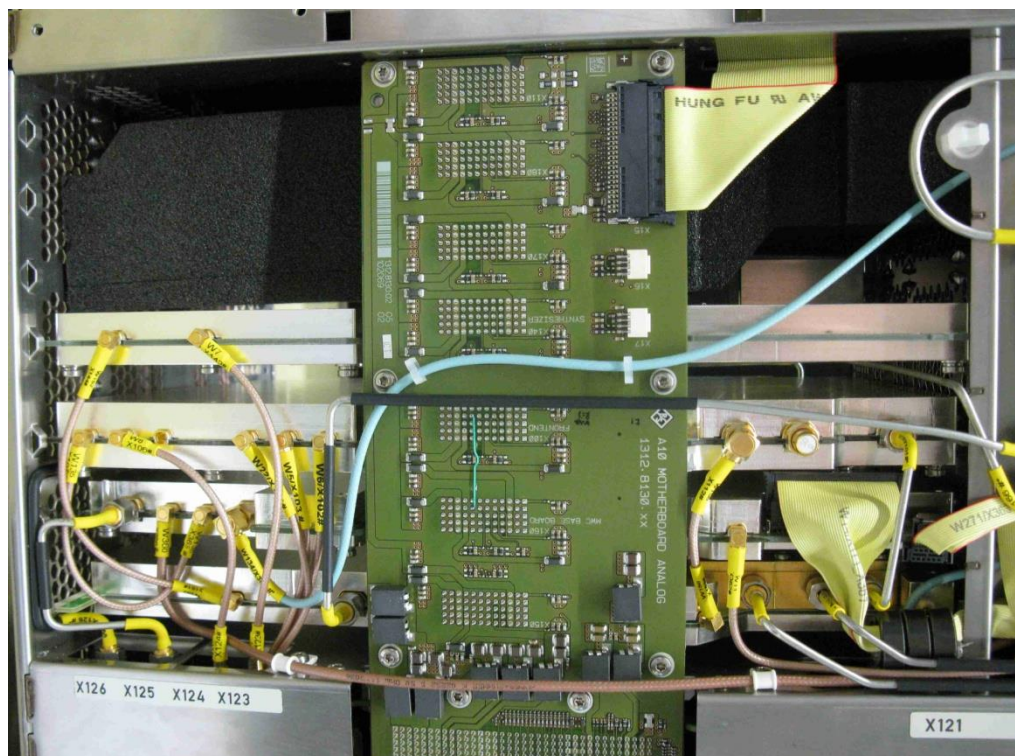


Figure 4-13: Cable routing on the lower side of an R&S®FSW67

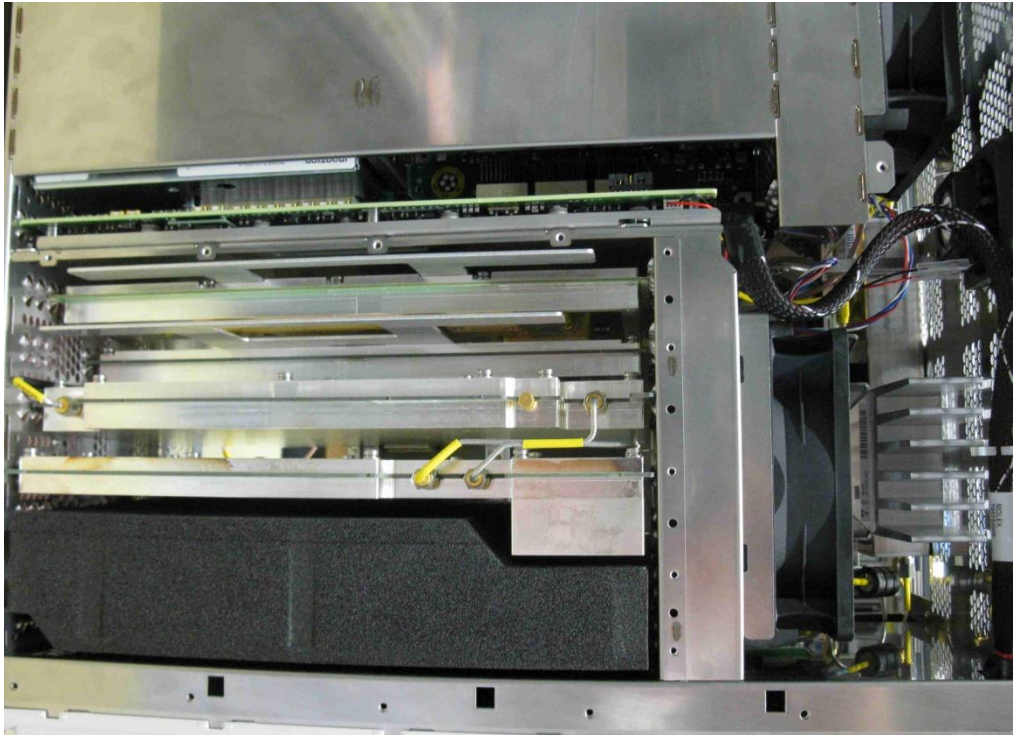
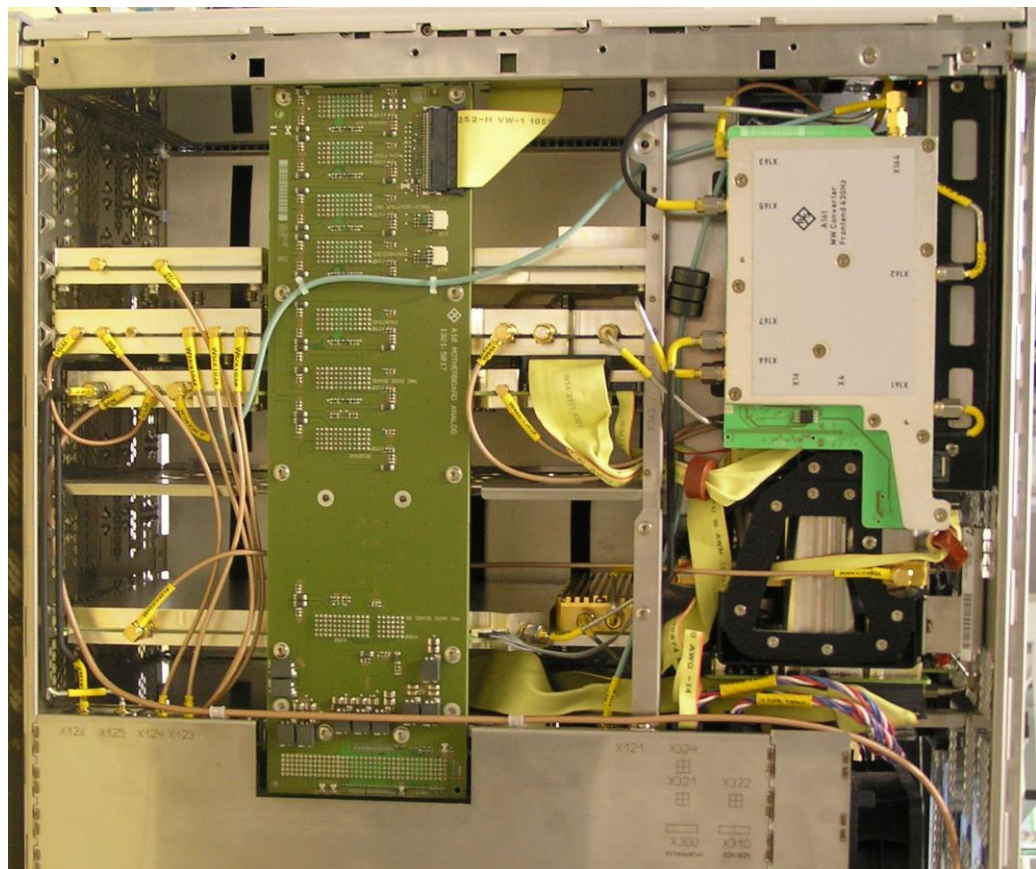
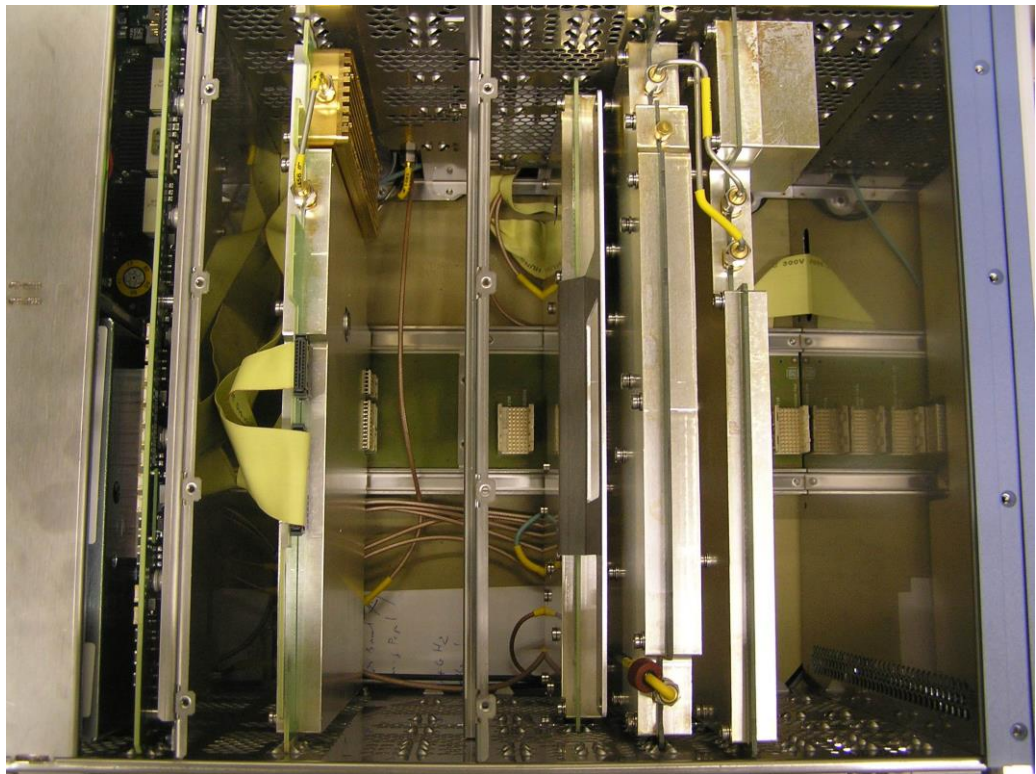


Figure 4-14: Cable routing on the top side of an R&S®FSW67

4.2.2.5 R&S®FSW85:





4.2.3 Connector types

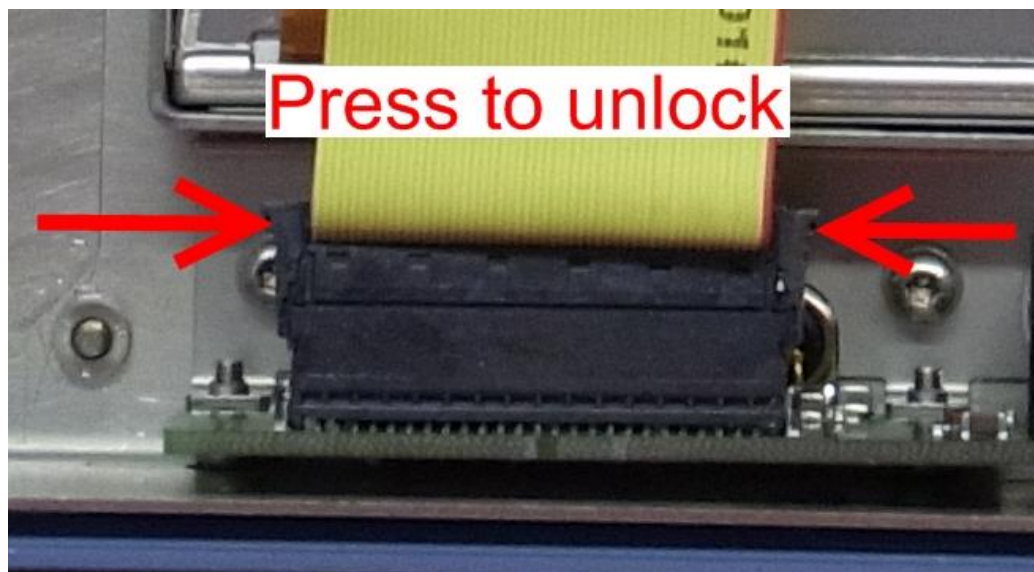
To connect the boards in the instrument different type of connectors are used. In the following releasing and plugging of the different types of connectors are described. The pictures illustrate the handling of the connectors in principle.

4.2.3.1 Flat Ribbon Cable Connector

This flat ribbon cable connector is used for the step attenuator, the preamplifier, the microwave converter frontend, the frontpanel and the front connector board. These connectors have different counts of contacts but the lock mechanism is the same.

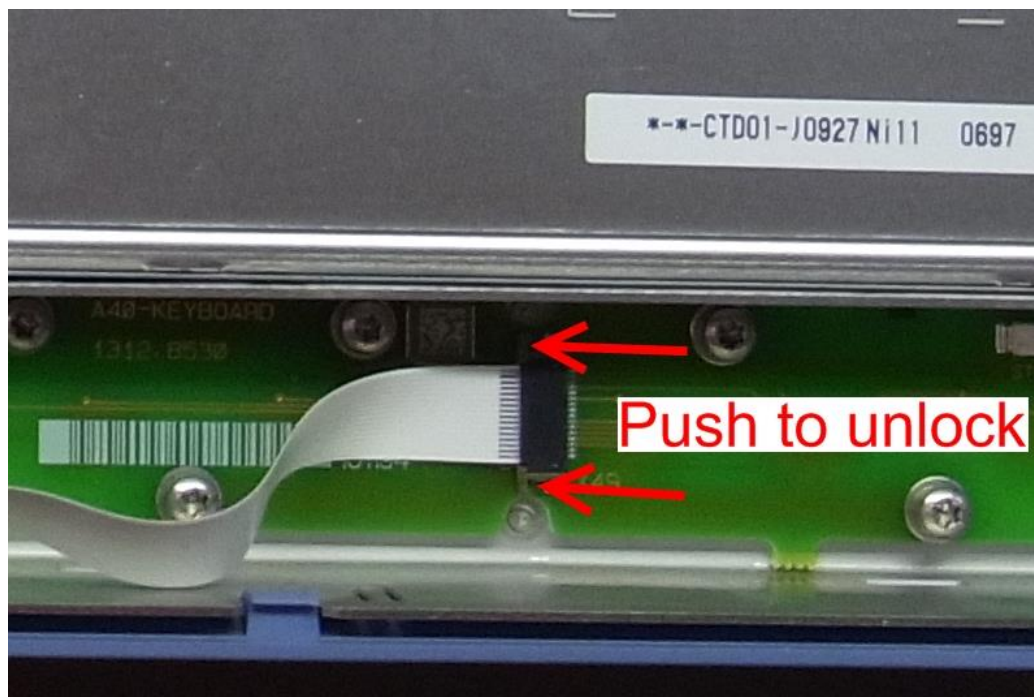
Be careful when unlocking and unplugging the connector. The connector can be damaged easily when it is not proper unlocked or not straight unplugged.

Be careful when reconnecting the connector. The pins can be destroyed when the connector is plugged in not straight ahead.



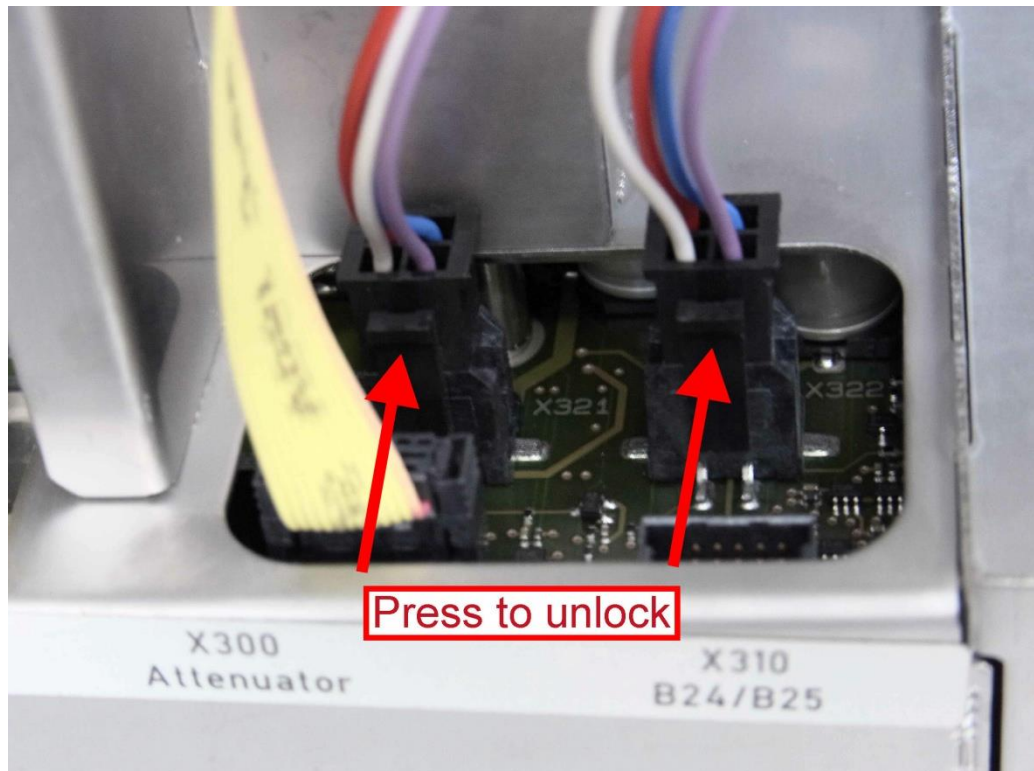
4.2.3.2 Foil Cable Connector

This connector is used at the frontpanel. The connector must be unlocked before unplugging the cable and must be locked after replugging the cable. The cable is contacted on the upper side of the cable. Be sure to plug in the cable properly otherwise some of the connections might be short-circuited.



4.2.3.3 Fan Connector

This type of connector is used to contact the fans. To unlock this connector when unplugging it press the small lever on the side of the connector and unplug it.



4.2.4 Disassembling the Instrument

Before changing any parts of the instrument you have to disassemble certain parts of the instrument. Refer to the following table first before disassembling too much.

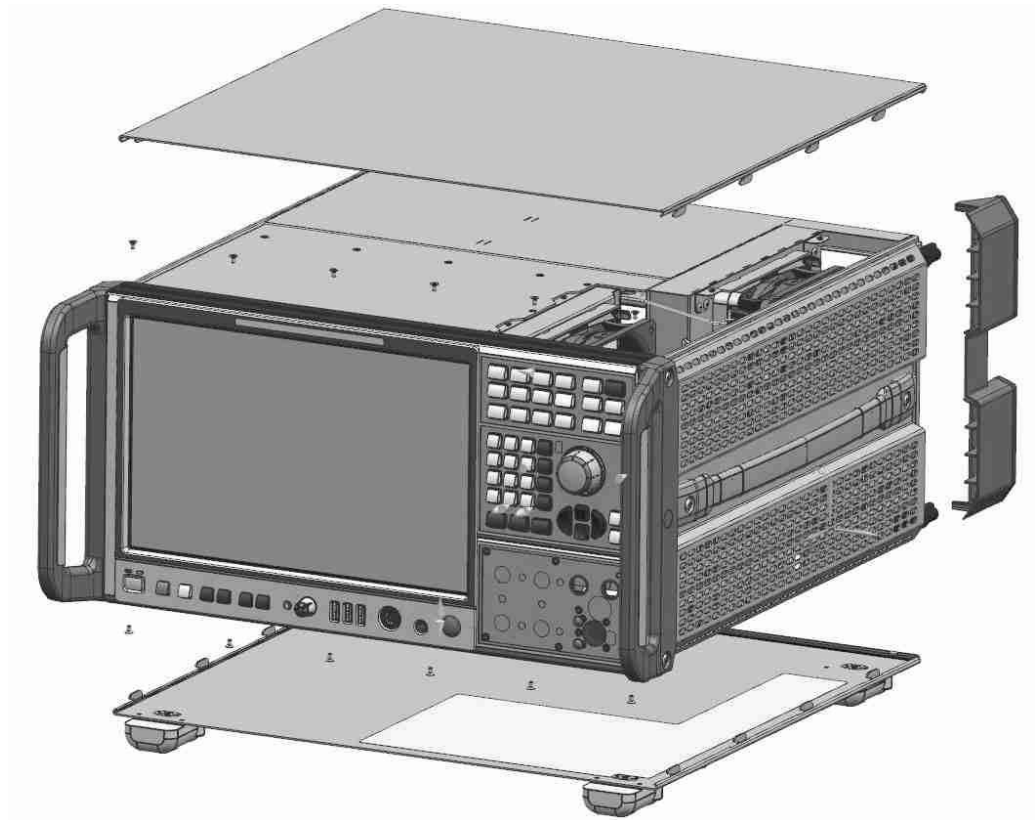
Module or part of module to replace	Unmount Upper cover	Unmount lower cover	Unmount inner lid 1or 2	Unmount right side cover	Unmount frontpanel
CPU Board A90	-	-	-	-	-
Frontpanel	X	X	2	X	X
Power supply A80	-	-	-	-	-
Frontend BoardA100	X	X	1	-	-
Detector board A200	-	-	-	-	-
Attenuator A40	-	X	-	X	R&S®FSW85 only
Digital motherboard A20	X	X	1 + 2	-	R&S®FSW85 only

Module or part of module to replace	Unmount Upper cover	Unmount lower cover	Unmount inner lid 1or 2	Unmount right side cover	Unmount frontpanel
Analog motherboard A10	-	X	-	-	-
Microwave converter Baseboard A170	X	X	1	-	-
Microwave converter frontend unit parts A160 A161 A162 (R&S®FSW13/26/43/50/67/85) and A340 (R&S®FSW43/50/67)	X	X	2	X	R&S®FSW85 only
Microwave converter 67 A150 (R&S®FSW67)	X	X	1 + 2	X	-
Microwave converter 85 Baseboard A450 (R&S®FSW 85)	X	X	1	-	-
Microwave converter 85 frontend unit A700 with A480 A470 A490(R&S®FSW 85)	X	X	1+2	X	X
Speaker, fans	X	X	2	-	-
OCXO R&S®FSW-B4 A250	-	-	-	-	-
Synthesizer board A140	X	X	1	-	-
Reference board A 120	-	X	-	-	-
Preamplifier A270 R&S®FSW- B24	-	X	2	X	-
Bandwidth Extension 160 MHz / 320MHz R&S®FSW- B160/B160R/B320 A220 and A290	-	-	-	-	-
Bandwidth Extension 512 MHz R&S®FSW-B512/B512R A220 and A370	-	-	-	-	-
Bandwidth Extension 512 MHz R&S®FSW-B512/B512R Fan Controller Board	-	-	-	-	-
Bandwidth Extension 1200MHz R&S®FSW-B1200 A220 and A370	-	-	-	-	-
Bandwidth Extension 1200MHz R&S®FSW-B1200 Fan Controller Board	-	-	-	-	-
Bandwidth Extension	X	X	1	-	-

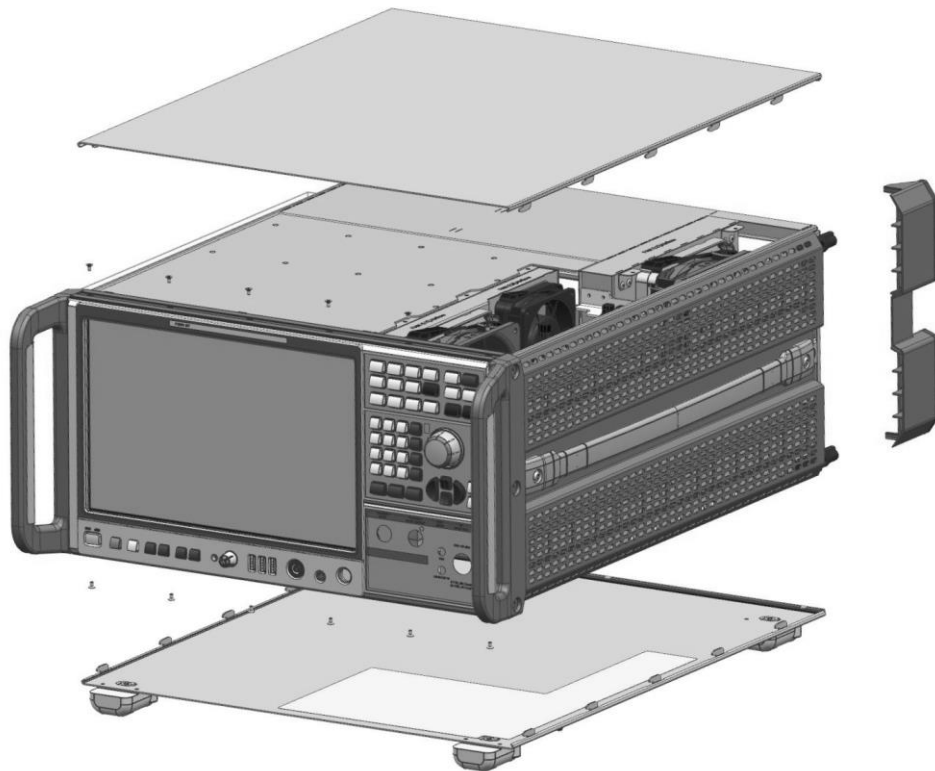
Module or part of module to replace	Unmount Upper cover	Unmount lower cover	Unmount inner lid 1 or 2	Unmount right side cover	Unmount frontpanel
1200MHz R&S®FSW-B1200 Wideband Converter Board A110					
Bandwidth Extension 2000MHz R&S®FSW-B2000 R&S®RTO Cal Source A250	-	-	-	-	-
Analog Baseband Inputs R&S®FSW-B71 Analog Baseboard A230	-	-	-	-	-
Analog Baseband Inputs R&S®FSW-B71 Input connectors	X	X	2	X	X
LO/IF connections for external mixers R&S®FSW-B21	X	X	2	X	X
External Generator Control A240 R&S®FSW-B10	-	-	-	-	-
Electronic Attenuator R&S®FSW-B25	-	X	2	X	-

4.2.4.1 Unmounting the Upper and/or Lower Cover

R&S®FSW 8/13/26/43/50/67



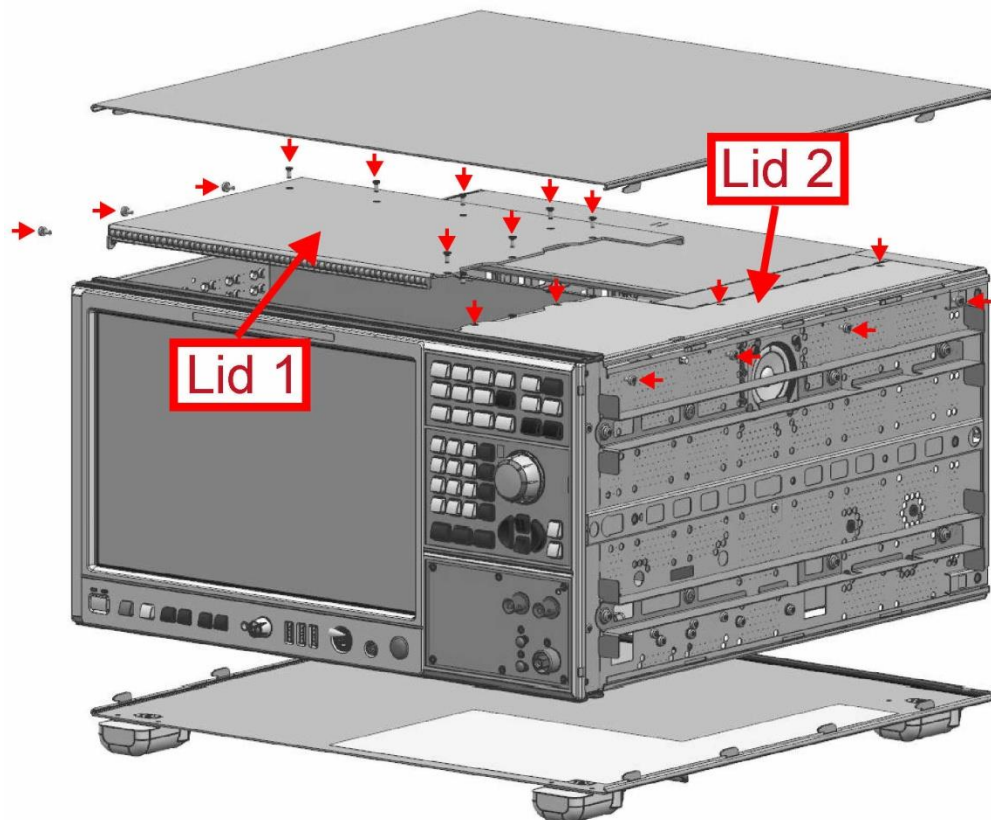
1. Switch off the instrument and disconnect the power plug.
2. Unscrew the four screws in the rear wall feet and remove them.
3. Remove the label on the upper and lower metal bead.
4. Unscrew the six screws fastening the upper and lower metal bead.
Tip: You do not need to remove the screws completely.
5. Remove the upper and/or the lower housing metal sheet by pushing it towards the back of the instrument.

R&S®FSW 85

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the four screws in the rear wall feet and remove them.
3. Remove the label on the upper and lower metal bead.
4. Unscrew the six screws fastening the upper and lower metal bead.
Tip: You do not need to remove the screws completely.
5. Remove the upper and/or the lower housing metal sheet by pushing it towards the back of the instrument.

4.2.4.2 Unmounting the Inner Lids 1 and 2

R&S®FSW 8/13/26/43/50/67



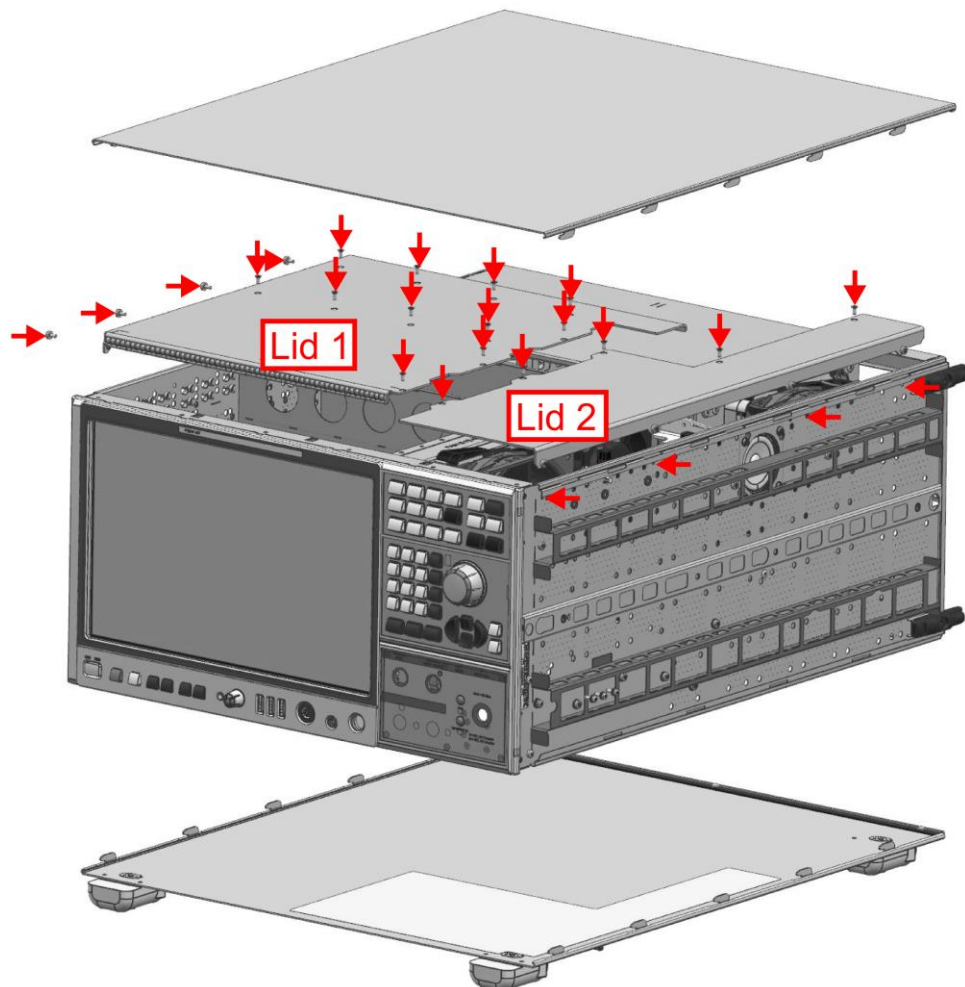
1. Switch off the instrument and disconnect the power plug.
2. Unscrew the four screws in the rear wall feet and remove them.
3. Remove the label on the upper and lower metal bead.
4. Loosen the four screws fastening the upper and lower metal bead.
Tip: You do not need to remove the screws completely.
5. Remove the upper housing metal sheet by pushing it towards the back of the instrument.

Unmounting lid 1:

- a) Remove the left side cover as described in chapter [4.2.4.3](#)
- b) Unscrew the 7 screws on the top of the instrument and the three screws on the left side of the instrument.
- c) Carefully remove the lid.
NOTICE! Do not damage the EMI shielding gaskets!

Unmounting lid 2:

- a) Remove the right side cover as described in chapter [4.2.4.3](#)
- b) Unscrew the four screws on the top of the instrument and the four screws on the right side of the instrument.
- c) Carefully remove the lid

R&S®FSW 85

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the four screws in the rear wall feet and remove them.
3. Remove the label on the upper and lower metal bead.
4. Loosen the four screws fastening the upper and lower metal bead.
Tip: You do not need to remove the screws completely.
5. Remove the upper housing metal sheet by pushing it towards the back of the instrument.

Unmounting lid 1:

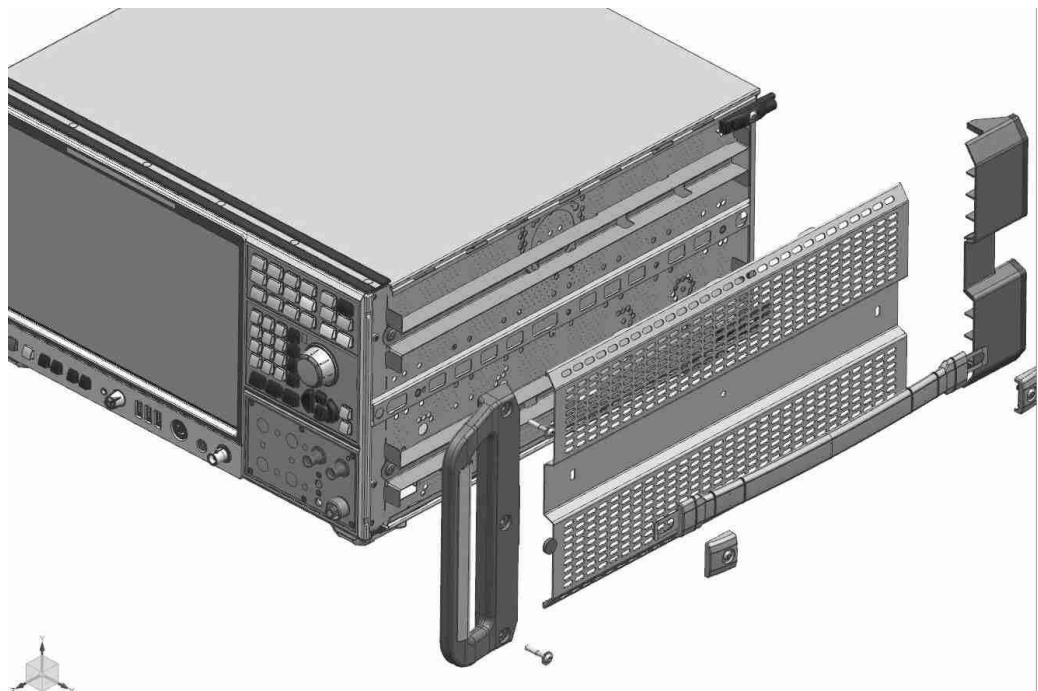
- a) Remove the left side cover as described in chapter 4.2.4.3
- b) Unscrew the 7 screws on the top of the instrument and the three screws on the left side of the instrument.
- c) Carefully remove the lid.

NOTICE! Do not damage the EMI shielding gaskets!

Unmounting lid 2:

- a) Remove the right side cover as described in chapter 4.2.4.3
- b) Unscrew the four screws on the top of the instrument and the four screws on the right side of the instrument.
- c) Carefully remove the lid

4.2.4.3 Unmounting the Side Cover

R&S®FSW 8/13/26/43/50/67

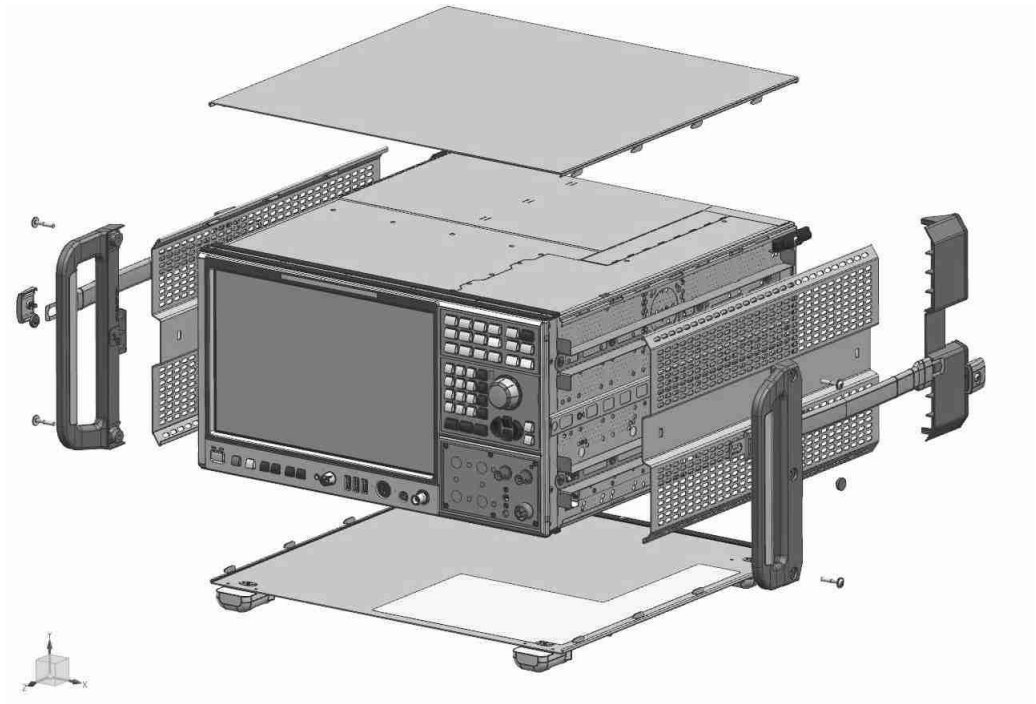
1. Switch off the instrument and disconnect the power plug.
2. Unscrew the two screws in the rear wall foot and remove the foot.
3. Unscrew the two screws fastening the flexible side handle and remove the flexible side handle.
4. Unscrew the two screws in the side handle and remove the handle.
5. Remove the side cover by pushing it towards the back of the instrument. After that remove the side covers completely.

R&S®FSW 85

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the two screws in the rear wall foot and remove the foot.
3. Unscrew the two screws fastening the flexible side handle and remove the flexible side handle.
4. Unscrew the three screws in the side handle and remove the handle.
5. Remove the side cover by pushing it towards the back of the instrument. After that remove the side covers completely.

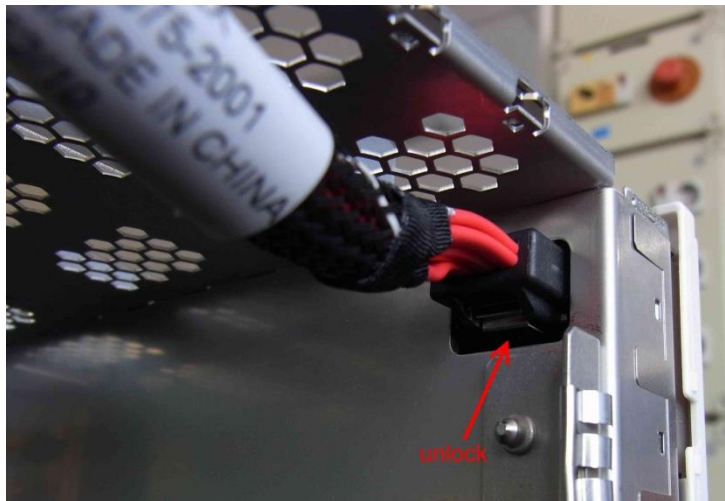
4.2.4.4 Unmounting the Frontpanel

R&S®FSW 8/13/26/43/50/67



1. Switch off the instrument and disconnect the power plug.
2. Unscrew the four screws in the rear wall feet and remove them.
3. Remove the upper and the lower housing as described in chapter [4.2.4.1](#)
4. Remove the right side cover as described in chapter [4.2.4.3](#)
5. Unmount the inner lid 2 as described in chapter [4.2.4.2](#)
6. Remove the two cable ties around the display cable, if installed.
7. Carefully unplug the display cable in the upper right corner of the frontpanel.

Note: The connector is locked. To unplug it you have to press the silver lever, as shown in the picture below. While pressing the lever gently pull the plug towards the back of the instrument.



8. Unscrew the RF input cable.

Note: You can access the connector through the cutout at the right side of the instrument after unmounting the side stabilizing beads.



If option R&S®FSW-B21 is installed:

- ▶ Remove the label on the RF input connector carrier board and unscrew the two screws fastening the two SMA connectors.
9. Remove the six screws fastening the upper and lower metal bead and remove the beads
 10. Unscrew the four screws fastening the frontpanel on the left and right side of the instrument.
 11. Carefully pull the frontpanel out of the instrument

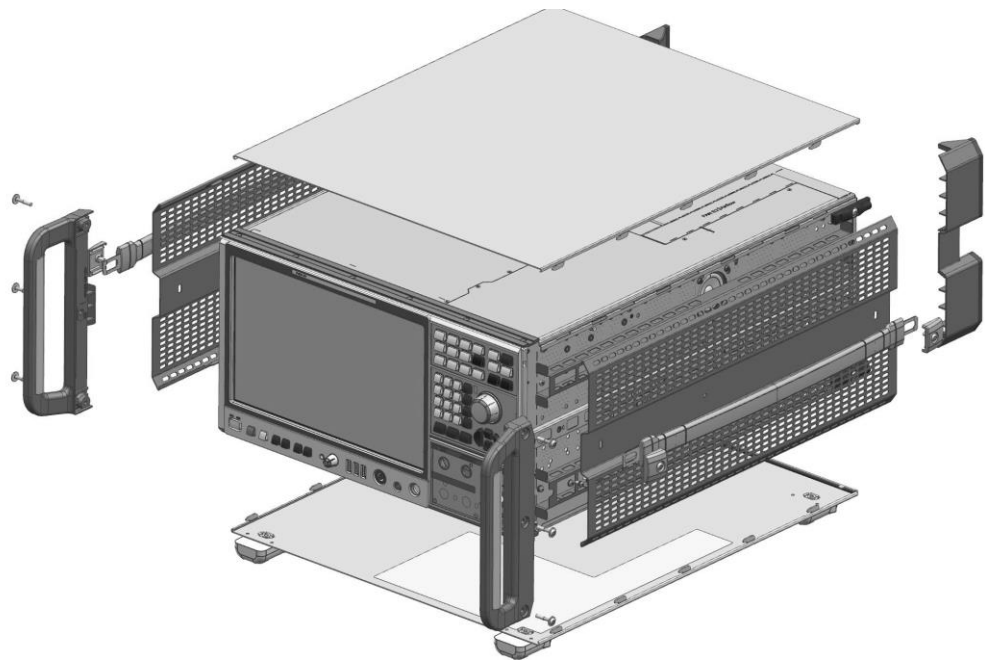
Note: The flat ribbon cable to the frontpanel is still connected! Gently remove the frontpanel and unplug the cable on the frontpanel.

12. Unplug the flat ribbon cable at the frontpanel.

If option R&S®FSW-B71 is installed:

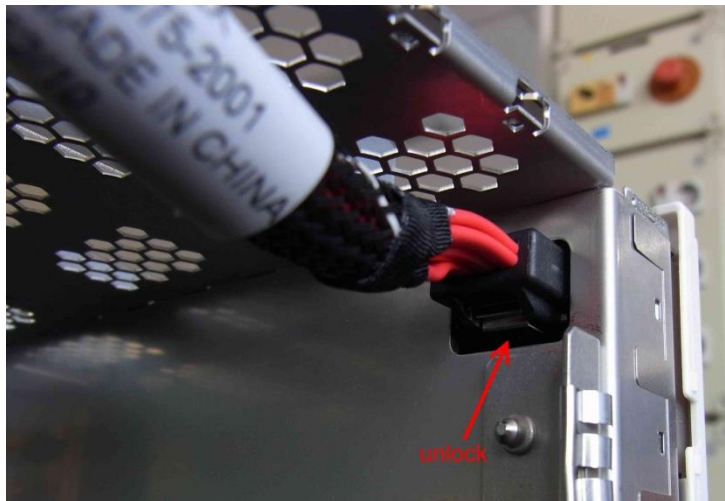
- Unplug the four SMA connectors at the BNC plug plate.

R&S®FSW 85



1. Switch off the instrument and disconnect the power plug.
2. Unscrew the four screws in the rear wall feet and remove them.
3. Remove the upper and the lower housing as described in chapter [4.2.4.1](#)
4. Remove the right side cover as described in chapter [4.2.4.3](#)
5. Unmount the inner lid 2 as described in chapter [4.2.4.2](#)
6. Remove the two cable ties around the display cable, if installed.
7. Carefully unplug the display cable in the upper right corner of the frontpanel.

Note: The connector is locked. To unplug it you have to press the silver lever, as shown in the picture below. While pressing the lever gently pull the plug towards the back of the instrument.



8. Unscrew the RF input adapter by use of the mounting tool 3 and remove it carefully. Immediately mount the metal security cap instead of the RF input adaptor to avoid any damages to the inner conductor.

NOTICE: Be careful when handling the RF input adaptor or the security cap. Any damages to inner conductor of the RF input connector will cause a complete destruction of the victim adaptor!



9. Remove the label on the RF input connector carrier board.
10. Unscrew the two screws fastening the RF input to the Rf connector carrier board.

If option R&S®FSW-B21 is installed:

- ▶ Unscrew the two screws fastening the two SMA connectors.
- 11. Remove the six screws fastening the upper and lower metal bead and remove the beads
- 12. Unscrew the four screws fastening the frontpanel on the left and right side of the instrument.
- 13. Carefully pull the frontpanel out of the instrument

Note: The flat ribbon cable to the frontpanel is still connected! Gently remove the frontpanel and unplug the cable on the frontpanel.
- 14. Unplug the flat ribbon cable at the frontpanel.

If option R&S®FSW-B71 is installed:

- ▶ Unplug the two SMA connectors at the BNC plug plate.

4.2.5 Assembling the Instrument

The instrument is assembled in the reverse order of disassembling it.

For R&S®FSW 13/26/43/50/67

1. Mount the frontpanel if unmounted.
2. Mount the upper and lower metal bead if unmounted.
3. Plug the flat ribbon cable in its connector on the frontpanel.

If option R&S®FSW-B71 is installed:

- a) Plug in the four SMA connectors at the BNC plug plate.
- b) Carefully insert the frontpanel in the instrument frame. The frontpanel must snap into the upper and lower metal bead.

NOTICE! Risk of damage to the instrument. Make sure you route the cables properly.

If option R&S®FSW-B21 is installed:

- ▶ Carefully insert the two SMA connectors in its mounting holes on the RF input connector carrier board. Fix this connectors with the screws previously removed and install a new label on the RF input connector carrier board.
- 4. Reinstall the four screws previously removed at the right and left side of the instrument.
- 5. Reinstall the six screws in the upper and lower metal bead.

Tip: Do not fasten the screws too much because the upper and lower instrument housing will be clamped by this screws after installation.
- 6. Connect the display cable.

Note: Be sure the plug is locked! The connector is locked with an audible "CLICK" when plugged in.

7. Reinstall the two cable ties to the display cable.
8. Reconnect the RF input cable.
9. Mount the inner lid 2 and reinstall the nine screws previously removed.

Note: Be sure to reinstall all EMI shielding gaskets!

10. Remount the side stabilizing beads if unmounted.
11. Remount the side cover.
12. Remount the front handles.
13. Remount the side handles by installing the two screws previously removed if unmounted.
14. Mount the top and/or bottom cover.

Note: Be sure the cover fits to the plastic beads at the front of the instrument. Maybe you have to press down the cover before pushing it towards the front of the instrument.

15. Remount the feet at the back of the instrument by fastening the two screws inside the feet.
16. Fasten the eight screws in the upper and lower metal bead. Install the label on the upper and lower metal bead covering the screws.
17. For the next steps to be carried out refer to [1](#).

For R&S®FSW85

1. Mount the frontpanel if unmounted.
2. Mount the upper and lower metal bead if unmounted.
3. Plug the flat ribbon cable in its connector on the frontpanel.

If option R&S®FSW-B71 is installed:

- a) Plug in the two SMA connectors at the BNC plug plate.
- b) Carefully insert the frontpanel in the instrument frame. The frontpanel must snap into the upper and lower metal bead.

NOTICE! Risk of damage to the instrument. Make sure you route the cables properly.

- c) Reinstall the two screws fastening the RF connector carrier board to the RF input formerly removed.

If option R&S®FSW-B21 is installed:

- a) Carefully insert the two SMA connectors in its mounting holes on the RF input connector carrier board. Fix this connectors with the screws previously removed

- b) Install a new label on the RF input connector carrier board
 - c) Uninstall the metal security cap
 - NOTICE:** Do not damage the inner conductor of the RF input!
 - d) Reinstall the RF input adaptor and fasten it by use of mounting tool 3 with a torque of 3 Nm
- 4. Reinstall the four screws previously removed at the right and left side of the instrument.
 - 5. Reinstall the six screws in the upper and lower metal bead.
 - Tip:** Do not fasten the screws too much because the upper and lower instrument housing will be clamped by this screws after installation.
 - 6. Connect the display cable.
 - Note:** Be sure the plug is locked! The connector is locked with an audible "CLICK" when plugged in.
 - 7. Reinstall the two cable ties to the display cable.
 - 8. Reconnect the RF input cable.
 - 9. Mount the inner lid 2 and reinstall the nine screws previously removed.
 - Note:** Be sure to reinstall all EMI shielding gaskets!
 - 10. Remount the side stabilizing beads if unmounted.
 - 11. Remount the side cover.
 - 12. Remount the front handles.
 - 13. Remount the side handles by installing the three screws previously removed if unmounted.
 - 14. Mount the top and/or bottom cover.
 - Note:** Be sure the cover fits to the plastic beads at the front of the instrument. Maybe you have to press down the cover before pushing it towards the front of the instrument.
 - 15. Remount the feet at the back of the instrument by fastening the two screws inside the feet.
 - 16. Fasten the eight screws in the upper and lower metal bead. Install the label on the upper and lower metal bead covering the screws.
 - 17. For the next steps to be carried out refer to [1](#).

4.2.6 Putting into Operation

After completely assembling the instrument the following steps need to be carried out depending on the replaced module. The additional tasks are described with the replacement procedure of the corresponding board. In addition to these tests it is recommended to perform a performance test according to chapter [2](#) to verify the functionality of the instrument.

Replaced Module	Basic Instrument Checks (refer to 4.2.6.1)	Frequency response correction (refer to 4.2.6.2)	Additional Tests/Tasks (refer to corresponding chapter)
CPU board A90	X	-	X
SATA HDD ADAPTOR A92	X	-	-
Lithium battery	X	-	-
Power supply A80	X	-	-
Detector board A200	X	X	-
Reference board A120	X	X	-
Synthesizer board A140	X	X	-
Microwave-converter baseboard A170	X	X	-
Microwave-converter frontend A161	X	X	X
YIG filter A162	X	X	X
Triplexer (R&S®FSW43/50/67 only) A340	X	X	-
Microwave converter 67 board A150	X	X	-
Microwave converter 67 multiplier module A440	X	X	-
Microwave converter 67 triplexer module	X	X	-
Frontend board A100	X	X	-
Display A70	X	X	X
Frontpanel keyboard board A40	X	X	X
Front connector board A30	X	X	-
Motherboard digital A20	X	X	X
Motherboard analog A10	X	-	-
Fan	X	-	-
Input Cable	X	X	-
Preamplifier (R&S®FSW43/50-B24)	X	X	X
Preamplifier relays unit or preamplifier board (R&S®FSW8/13/26 -B24)	X	X	X

Electronic attenuator relays A282 unit or electronic attenuator board A281 (R&S®FSW-B25) (R&S®FSW8/13/26 only)	X	X	X
OCXO B4 A260	X	Reference frequency adjustment only	-
Wideband ADC board A290 (R&S®FSW-B160/B160R/B320)	X	X	-
Detector extension board A220 (R&S®FSW-B160/B160R/B320)	X	X	-
Analog Baseband Inputs (R&S®FSW-B71) Board A230	X	-	X
Analog Baseband Inputs (R&S®FSW-B71) Input Connectors	X	X	X
LO/IF connections for external mixers (R&S®FSW-B21)	X	X	-
External Generator Control A240 (R&S®FSW-B10)	X	-	-
Wideband ADC board A370 (R&S®FSW-B512/B512R)	X	X	-
Detector extension board A220 (R&S®FSW-B512/B512R)	X	X	-
Wideband ADC board A370 (R&S®FSW-B1200)	X	X	-
Detector extension board A220 (R&S®FSW-B1200)	X	X	-
Wideband Converter board A110 (R&S®FSW-B1200)	X	X	-
R&S®RTO Cal source (R&S®FSW-B2000)	-	-	X
Baseboard 85 (R&S®FSW 85) board A450	X	X	-
Baseboard 85 (R&S®FSW 85) LO Module A460	X	X	-
Microwave converter frontend unit 85 (R&S®FSW 85) Converter 85 Control Unit A470	X	X	-
Microwave converter frontend unit 85 (R&S®FSW 85) Switch Matrix Controller Unit A480	X	X	-
Microwave converter frontend unit 85	X	X	-

(R&S®FSW 85) YIG filter 2 module A490			
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4.2.6.1 Basic Instrument Checks

Checking the Hardware List

When a board has been changed check the hardware list by executing

[**SETUP** : SYSTEM CONFIG : HARDWARE INFO]

and verify if the corresponding board has been correctly detected and the serial number is updated.

Checking the System Messages

Next check the system messages by executing

[**SETUP** : SYSTEM CONFIG : SYSTEM MESSAGES]

to find errors in the hardware configuration.

Performing an instrument selftest

Next run the instrument selftest by executing

[**SETUP** : Service : Selftest : Start Selftest]

and check the results.

If the selftest fails enter the service password by entering

[**SETUP** : Service : Service Function : Password = 894129]

and repeat the selftest in service mode to get more information and the check results again.

Performing an Instrument Self-alignment

Run the instrument self-alignment by executing

[**SETUP** : Alignment : Start Self Alignment]

and check the results.

4.2.6.2 Performing a Frequency Response Correction

The frequency response correction is required only in the cases listed in the table above or when you have opened any connector in the RF signal path. Without the frequency response correction the instrument may not achieve the required performance. For details see chapter [2.2](#).

4.3 Module Replacement

WARNING

Danger of injury during module replacement

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

Observe the safety instructions for units with a removable casing.

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

WARNING

Shock hazard

Before opening the casing, make sure that the instrument is switched off and disconnected from all power supplies.

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

NOTICE

Risk of electrostatic discharge

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

NOTICE

Risk of damage to the instrument

When connecting cables or other equipment to the input connector of the instrument be sure to use the correct torque when tightening the connector!

Tools recommended for module replacement:

Tool	Part to replace
------	-----------------

Tool	Part to replace
BW2010 TOOL (1174.0301.00)	CPU Board, Power supply, Detector board Reference board
Extra-long screwdriver Tx 8x200 (e.g. Carl Kammerling "Triton ESD TX08x200" T4718ESD 0820)	
USB Keyboard and USB Mouse	Front board, Display
SMP Connector removal Tool (e.g. Rosenberger extraction tool Order No. 11W101-000)	Digital Motherboard

For FSW85 only:

Tool	Part to replace
Mounting tool 1: 1325.3283.00	Victim adapter on input connector
Mounting tool 2: 1177.2905.00	Victim adapter on input connector
Mounting tool 3: 1177.2886.00	Removal of the Frontunit
Torque Wrench for mounting tool 1to2: ATORN TBN Knicker 0.2 – 2Nm 50030023	See above
Torque Wrench for mounting tool 3: Drehmotec	See above
Torque Wrench for 1mm connector: ZN- ZTW 1328.8534.11	For connecting the 1mm input connector
Security cap for victim adaptor: 1177.2286.00	Remove of the frontunit

4.3.1 CPU Board A90

4.3.1.1 Replacing the whole CPU Board

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the two knurled screws and remove the hard disk drive on the rear.
3. Unscrew six screws fastening the CPU Board.

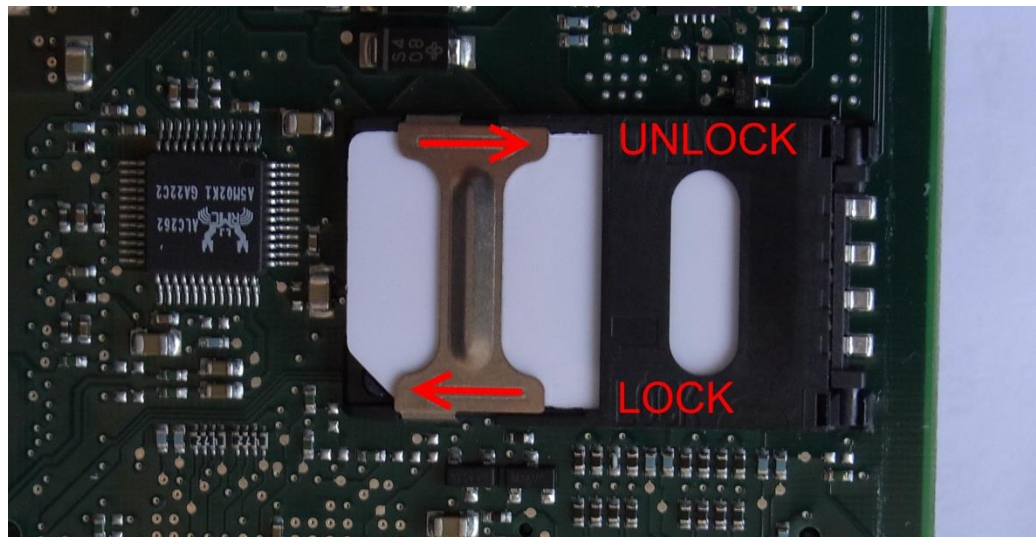
Note: You can easily remove the CPU board using the BW2010 KEY tool. To remove the CPU board push the BW2010 KEY tool in the corresponding holes on the rear side of the module. The top side of the tool is marked with the sign "TOP". After inserting the tool gently turn the tool on the right side of the module clockwise for 90° and the tool on the left side of the module counterclockwise for 90°. Now the module can be removed by gently pulling on the BW2010 KEY tools. The tools can be removed by turning them to the initial position with the "TOP" marked side up.

4. Gently pull the controller out of the instrument.

Note: Be sure to pull out the controller straight ahead.

5. Remove the smart card from the controller. The smart card is located at the bottom side of the CPU Board. Release the holder by gently pushing the silver lever towards the outline of the CPU Board board as shown in the picture below. Open the holder by pulling up the smart card at the left side and remove the smart card from the holder.

NOTICE! Do not damage the smart card! Otherwise the instrument may be unusable.

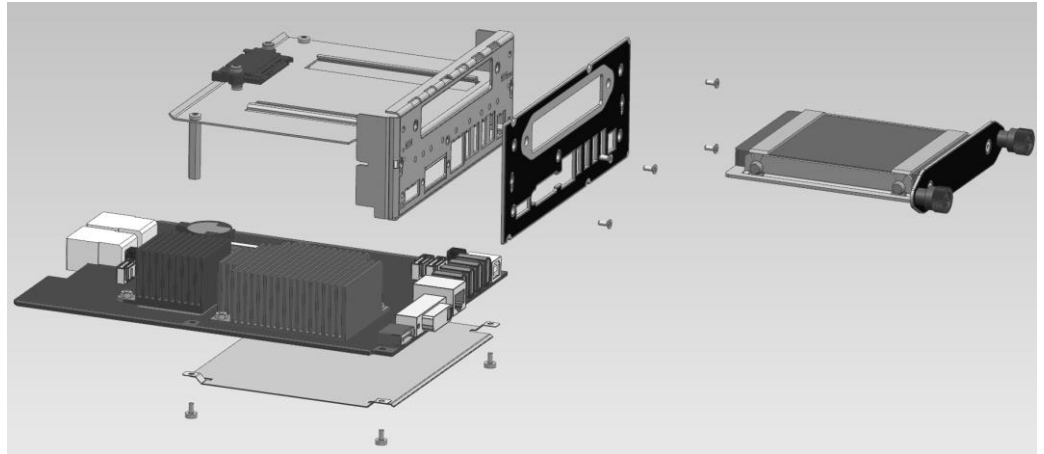


6. Insert the smart card in the new controller board. First open the holder as described above and put in the smart card properly. Then close the holder and lock it.

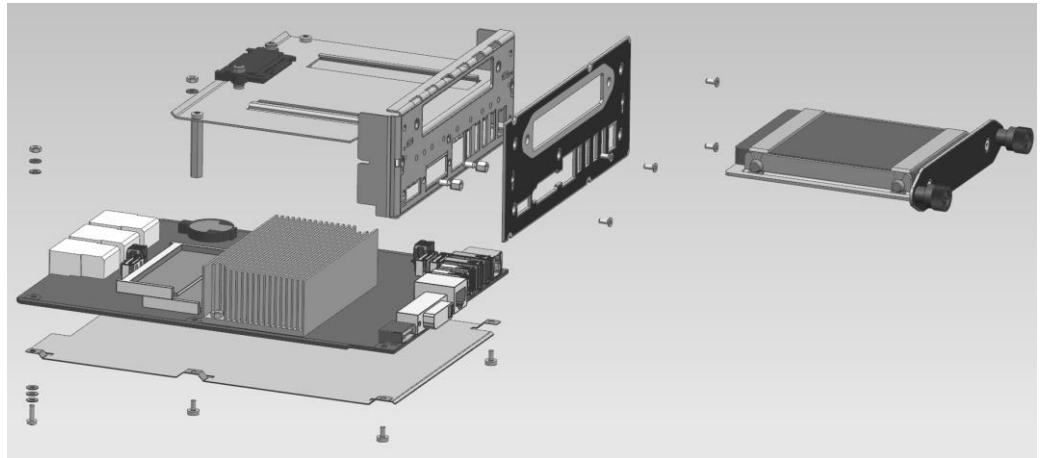
NOTICE! Risk of damage to the CPU Board board! Be careful when closing the smart card holder: if the smart card is not inserted properly the holder can break when closing it roughly.

7. The new CPU board comes without backplane and hard disk holder. This parts must be unmounted from the old CPU board and reused with the new CPU board.

An IPC10 CPU board:



An IPC11 CPU board:

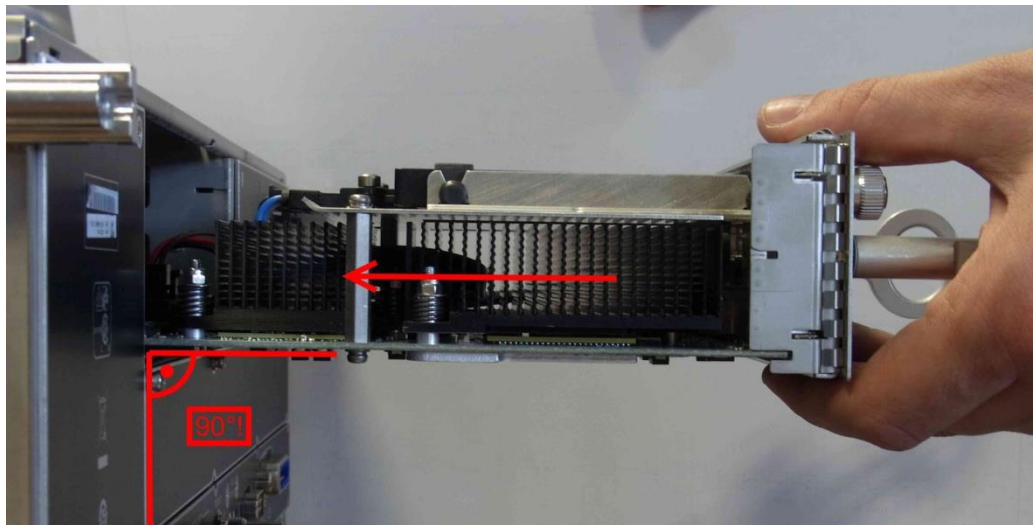


- a) Unplug the hard disk drive data cable and the power cable at the CPU board.
- b) Remove the two screws at the DVI port.
- c) Remove the four screws fastening the hard disk holder and remove it.
- d) Uninstall the screening shield on the bottom of the CPU board.
- e) Reinstall the parts formerly removed to the new CPU board.
- f) Reconnect the hard disk drive data cable and power cable.

NOTICE! Do not mount the mechanical parts of an IPC10 to an IPC11 CPU board and vice versa! The board could be damaged by short circuits and mechanical stress.

8. Insert the new controller board in the instrument.

NOTICE! Risk of damage to the CPU Board board! Be careful when inserting the controller! Push the controller with an angle of 90° towards the back of the instrument in its slot. Otherwise there is the risk of damaging components on the bottom side of the controller board.



9. Fasten the new CPU board by reinstalling the six screws formerly removed.
10. Reinstall the hard disk drive formerly removed.
11. Connect the instrument to the mains and switch on the power switch on the back of the instrument. The instrument is now in standby mode. Start the instrument by pressing the ON/OFF button on the front.
12. Wait for firmware to come up.
13. Perform a BIOS update.

NOTICE

Risk of causing instrument unusability

During the BIOS update, do not switch off the instrument.

If you terminate the update procedure before it is completed, the instrument will likely not boot again. In this case, contact your Rohde & Schwarz service center.

Note: To perform the bios update you need an USB flash drive and an USB keyboard.

Note: There are two different CPU boards fitted in the instruments: IPC10 and IPC11 CPU boards. To identify the CPU board have a look in the Hardware info dialog of the instrument. (refer to chapter 4.2.6.1) If the instrument doesn't boot the firmware you can identify the CPU board by the following attributes:

IPC10 CPU board	IPC11 CPU board
Two heat sinks	One big heat sink
Order No: 1206.0223.00	Order No: 1206.3216.00
Two backplane connectors	Three backplane connectors
All USB connectors on the back of the CPU board have the same color	Three USB connectors are blue the other two connectors are black

- a) Download the program archive for preparation of the USB flash drive from Gloris, section "Firmware/Software". In Gloris select "FW by type" and choose "R&S®FSW". Download the file R&S®FSWBiosStick-x-x.xx_R&S®FSW.msi for IPC11 CPU boards if an IPC11 CPU board is installed or for IPC10 CPU boards if this board is installed. This archive contains the program to prepare the stick, the bios files and the documentation how to update the bios.
 - b) Install the program archive on your computer.
 - c) Follow the instructions in the PDF file delivered with the program archive on how to create the bootable USB flash drive and to update the BIOS.
14. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#)

4.3.1.2 Replacing Lithium Battery on CPU Board

The lithium battery is located on the CPU Board.

WARNING

Risk of intoxication and explosion

Observe the safety regulations for batteries in the Grouped Safety Messages at the beginning of the manual.

Enter measures to avoid the situation.

1. Switch off the instrument and disconnect the power plug.
2. Remove the CPU board as described in chapter [4.3.1.1](#)
3. Carefully push the contact springs of the battery holder and remove the battery.
4. Carefully push the contact springs of the battery holder and insert the battery into the holder beneath the springs.

Note: The plus pole (+) of the battery points upwards.

NOTICE! Risk of damage to the instrument. Do not short circuit the battery!

5. Reinstall the CPU board to the instrument (see chapter [4.3.1.1](#)).

NOTICE! Risk of damage to the controller board! Be careful when inserting the controller! Push the controller with an angle of 90 degree towards the back of the instrument in its slot. Otherwise there is the risk of damaging components on the bottom side of the controller board.

6. Reinstall the hard disk drive.
7. Connect the instrument to the mains and switch on the power switch on the back of the instrument. The instrument is now in standby mode. Start the instrument by pressing the ON/OFF button on the front.
8. Wait for firmware to come up.

9. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

4.3.1.3 Replacing SATA Hard Drive A91

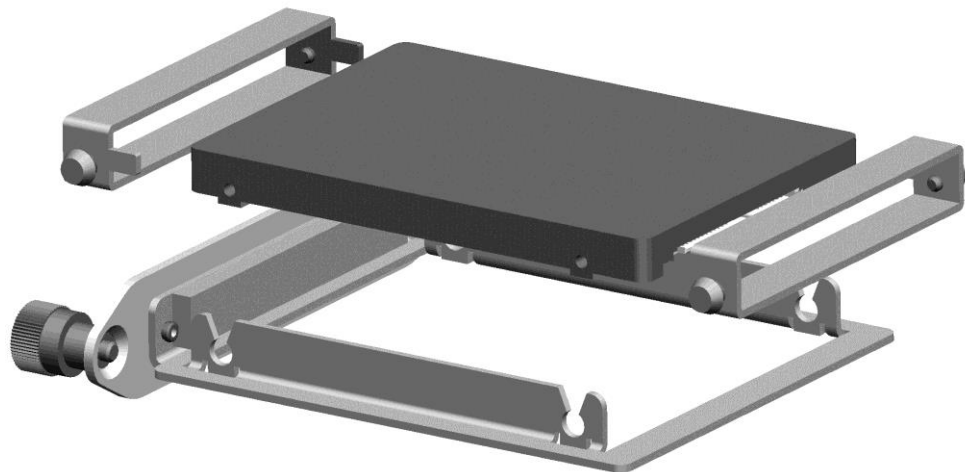
The spare part is already formatted for the FSW and contains the complete software.

NOTICE

Risk of losing important information

Important information about the type of instrument, installed hardware, options, etc., is stored on the motherboard, the hard drive and the smart card. This information is required in order to restore the instrument in case of errors. Thus, do not replace the motherboard, the hard drive and the smart card at the same time, as doing so will cause this information to be lost. If the instrument does not function after the hard drive has been replaced, do not replace the motherboard or the smart card. Instead, re-install the old hard drive and then replace the motherboard and/or smart card.

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the two knurled screws and remove the hard disk drive on the rear.
3. Carefully remove the hard disk drive together with the two holders from the sheet-metal part.
4. Remove the two holders from the hard disk drive.



5. Push the new hard disk drive together with the two holders into the holes of the sheet-metal part.

Note: Make sure that all parts are orientated as shown in the picture above and that they lock in place. The connectors have to be on the rear of the hard drive and the labels above.

Note: there are two different firmware images. One for IPC11 and one for IPC10. Be sure to order the hard disk with the correct image! Otherwise the instrument wont boot!

6. Insert the hard disk drive and fasten the two knurled screws.
7. Connect the instrument to the mains and switch on the power switch on the back of the instrument. The instrument is now in standby mode. Start the instrument by pressing the ON/OFF button on the front.
8. Wait for firmware to come up.

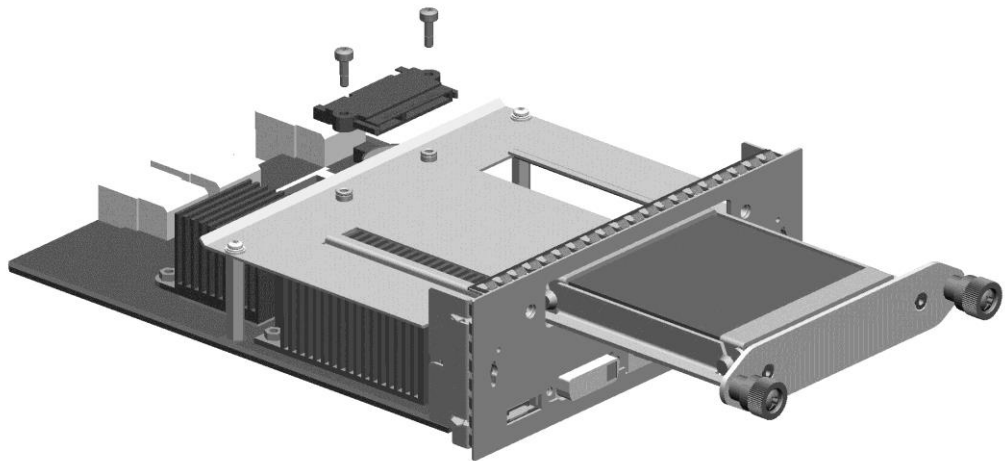
NOTICE

Blue screen after replacing a hard drive

If a blue screen appears after starting the instrument, make sure that the knurled screws are fixed properly and the hard disk drive has a contact to the SATA adaptor.

9. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
10. If needed, update the FW to the latest version.

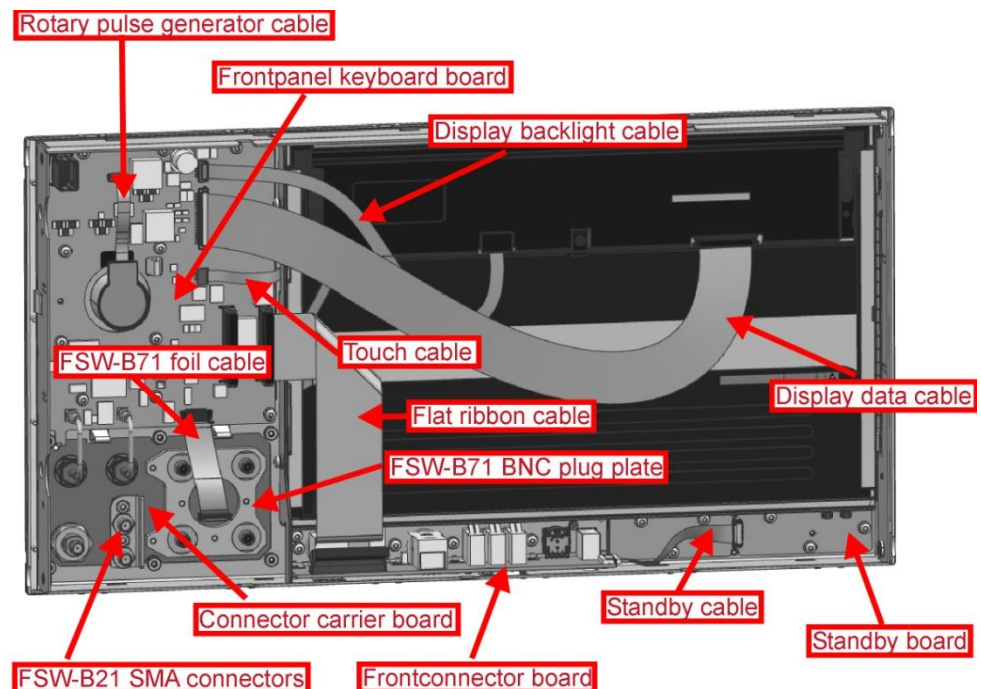
4.3.1.4 Replacing the SATA Adaptor A92



1. Switch off the instrument and disconnect the power plug.
2. Remove the CPU Board as described in chapter [4.3.1.1](#).
3. Unplug the SATA data cable and the SATA power cable from the SATA adaptor.
4. Unscrew the two screws fastening the adaptor.
5. Fix the new adaptor with the two screws previously removed.

NOTICE**Blue screen after replacing a hard drive**

if a blue screen appears after starting the instrument, make sure that the knurled screws are fixed properly and the hard drive has a contact to the SATA adaptor.

4.3.2 Front Unit**4.3.2.1 Replacing the Display with Touch Screen A70**

1. Unmount the frontpanel (refer to 0).
2. Unplug the display data cable and display backlight cable at the plugs on the display.
3. Unplug touch cable.
4. Unplug flat ribbon cable on both sides and remove it.
5. Loosen the four screws fastening the display on the left and the right side of the display.

Tip: You can use a long screwdriver to access the screws through the holes at the left side of the frontpanel.

6. Remove the display from the frontpanel.

Note: The display is connected to ground by EMI gaskets all the way round. To remove it, gently press from the front of the display.

7. Reinstall the new display.

NOTICE: Risk of damage to the display! Be careful when inserting the display. Do not break the front glass by pushing it to the front bezel. Be sure to route the touch cable properly!

8. Reinstall the flat ribbon cable.
9. Plug in the display data cable and the display backlight cable.
10. Plug in the touch cable.
11. Mount the frontpanel to the instrument (refer to [Assembling the Instrument](#)).
12. Mount the right side cover (refer to [Assembling the Instrument](#)).
13. Mount the upper and lower cover (refer to [Assembling the Instrument](#)).
14. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
15. To calibrate the touch screen you need an USB mouse or an USB keyboard with a touch ball. Connect it to an USB port and run using the keyboard:
[SETUP : Alignment : Touch Screen Alignment],
and follow the instructions on the screen.
16. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
17. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.2.2 Replacing the Frontpanel-Keyboard A40

The frontpanel keyboard comes with the standby board A50. Before you can install the boards you have to separate them. To do so just break the board at intended place by folding the board.

1. Unmount the frontpanel (refer to [0](#)).
2. Unplug touch cable and rotary pulse generator cable on the frontpanel keyboard.
3. Unplug flat ribbon cable on frontpanel keyboard.
4. Unplug the two RF cables.

If Option R&S®FSW-B71 is installed:

- Unplug the B71 foil cable on the frontpanel keyboard board.
5. Loosen the eight screws fastening the frontpanel keyboard and remove the board.
 6. Reinstall the new frontpanel keyboard and fasten the eight screws previously removed.

Note: Be sure the push-button board is inserted correctly in the front bezel.

7. Replug the display data cable and display backlight cable.
8. Replug the touch cable and rotary pulse generator cable.
9. Replug the flat ribbon cable.
10. Replug the two RF cables.

If Option R&S®FSW-B71 is installed:

- ▶ Replug the B71 foil cable on the frontpanel keyboard board
11. Mount the frontpanel to the instrument (refer to [Assembling the Instrument](#)).
 12. Mount the right side cover (refer to [Assembling the Instrument](#)).
 13. Mount the upper and lower cover (refer to [Assembling the Instrument](#)).
 14. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
 15. To calibrate the touch screen you need an USB mouse or an USB keyboard with a touch ball. Connect it to an USB port and run:
[SETUP : Alignment : Touch Screen Alignment]
and follow the instructions on the screen.
 16. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
 17. Start the key test program by
[SETUP : Service : Enter Password = 894129]
[SETUP : Service : Enter Service Function: 2.0.14.0]
 18. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
 19. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.2.3 Replacing the Standby Board A50

The standby board can only be ordered with the frontpanel keyboard! The frontpanel keyboard comes with the standby board A50. Before you can install the boards you have to separate them. To do so just break the board at intended place by folding the board.

1. Unmount the frontpanel (refer to [0](#)).
2. Unplug standby cable at the plug on the standby board.
3. Unscrew the five screws fastening the standby board.
4. Replace standby board by the new one.
Note: Be sure the push button board is inserted properly.
5. Fasten the five screws previously removed.
6. Plug in standby cable.

Note: The plug is contacting the cable on the top side!

7. Mount the frontpanel to the instrument (refer to [Assembling the Instrument](#)).
8. Mount the right side cover (refer to [4.2.5](#)).
9. Mount the upper and lower cover (refer to [4.2.5](#)).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#)
12. Start the key test program by
[SETUP : Service : Enter Password = 894129]
[SETUP : Service : Enter Service Function: 2.0.14.0]
13. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
14. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.2.4 Replacing the Front Connector Board A30

1. Unmount the frontpanel (refer to [0](#)).
2. Unplug flat ribbon cable at the plug on the front connector board.
3. Unplug standby cable at the plug on the front connector board.
4. Remove headphone volume adjust knob.
5. Unscrew the four screws fastening the front connector board.
6. Replace front connector board by the new one.
7. Fasten the four screws previously removed.
8. Plug in standby cable.

Note: The plug is contacting the cable on the top side!

9. Plug in flat ribbon cable.
10. Remount headphone volume adjust knob.
11. Mount the frontpanel to the instrument (refer to [4.2.5](#)).
12. Mount the right side cover (refer to [4.2.5](#)).
13. Mount the upper and lower cover (refer to [4.2.5](#)).
14. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
15. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
16. Start the key test program by

[SETUP : Service : Enter Password = 894129]
[SETUP : Service : Enter Service Function: 2.0.14.0]

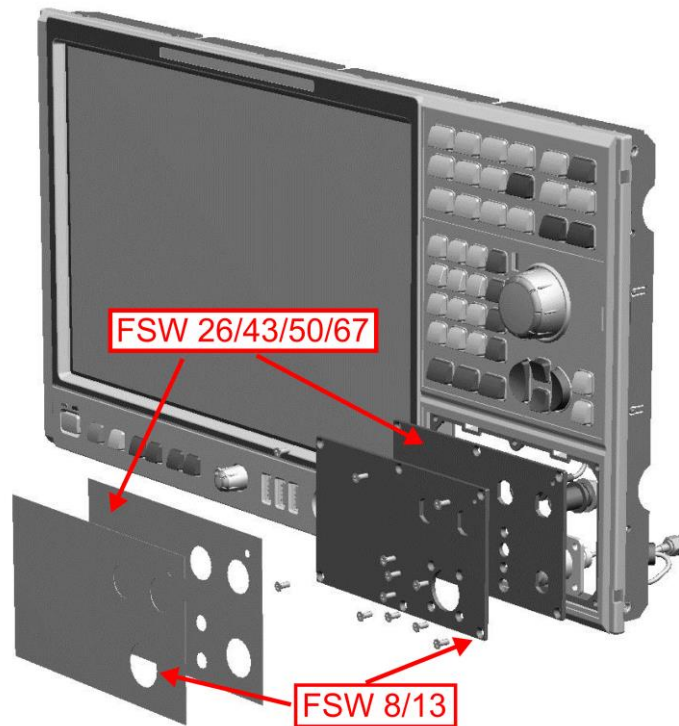
17. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
18. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.2.5 Replacing the Rotary Pulse Generator A42

1. Unmount the frontpanel (refer to [0](#)).
2. Unplug rotary pulse generator cable at the plug on the rotary pulse generator.
3. Remove knob from rotary pulse generator.
4. Unscrew the nut on the rotary pulse generator.
5. Replace rotary pulse generator by a new one.
6. Fasten the nut.
7. Plug in rotary pulse generator cable.
Note: The plug is contacting the cable on the bottom side!
8. Reinstall the knob.
9. Mount the frontpanel to the instrument (refer to [4.2.5](#)).
10. Mount the right side cover (refer to [4.2.5](#)).
11. Mount the upper and lower cover (refer to [4.2.5](#)).
12. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
13. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
14. Start the key test program by
[SETUP : Service : Enter Password = 894129]
[SETUP : Service : Enter Service Function: 2.0.14.0]
15. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
16. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.2.6 Replacing the RF Input Connector X1

R&S®FSW 8/13/26/43/50/67



1. Unmount the frontpanel (refer to 0).

For R&S®FSW8/13:

- a) Remove the label R&S®FSW connector around the input connector.
- b) Unscrew the four screws fastening the N-type input connector.
- c) Replace the input connector by a new one.
Note: The holder of the old input connector is reused. So disassemble the input connector and install the holder with the new input connector.
- d) Fasten the four screws previously removed.
- e) Add a new label R&S®FSW connector.

For R&S®FSW26/43/50/67:

- a) Unscrew the nut fastening the input connector.
- b) Replace the input connector to a new one.
- c) Fasten the nut previously removed.
2. Mount the frontpanel to the instrument (refer to 4.2.5).
3. Mount the right side cover (refer to 4.2.5).
4. Mount the upper and lower cover (refer to 4.2.5).
5. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.

6. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
7. Perform a frequency response correction as described in chapter [4.2.6.2](#).

R&S®FSW 85

The input connector of the R&S®FSW 85 consist of two independently changeable parts: The ball bearing mounted head and the inner conductor provided by the victim adaptor.

Changing the ball bearing mounted head:

1. Unmount the ball bearing mounted head by use of the mounting tool 3.

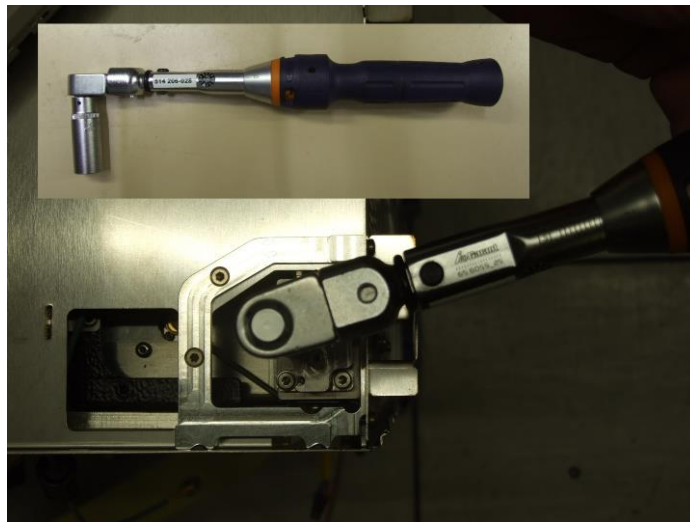
NOTICE: Do not damage the inner conductor!

2. Replace the ball bearing mounted head by a new one.
3. Reinstall the ball bearing mounted head by use of the mounting tool 3 and fasten it with 3Nm.

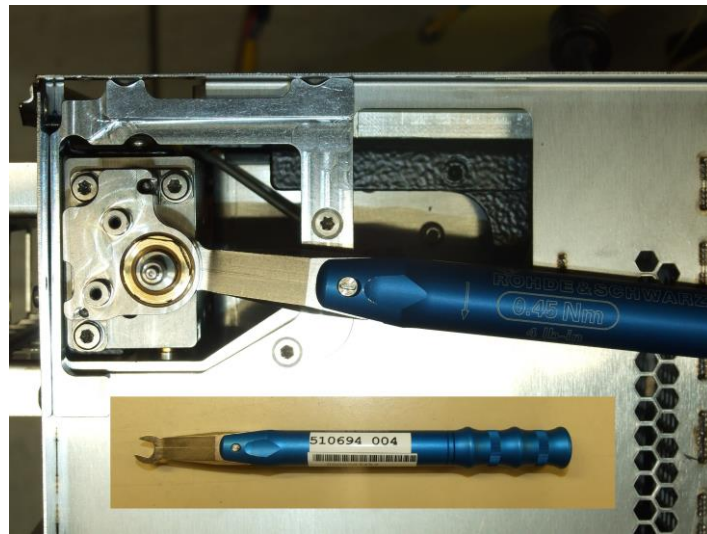
NOTICE: Do not damage the inner conductor!

Changing the victim adaptor (the inner conductor of the RF input connector):

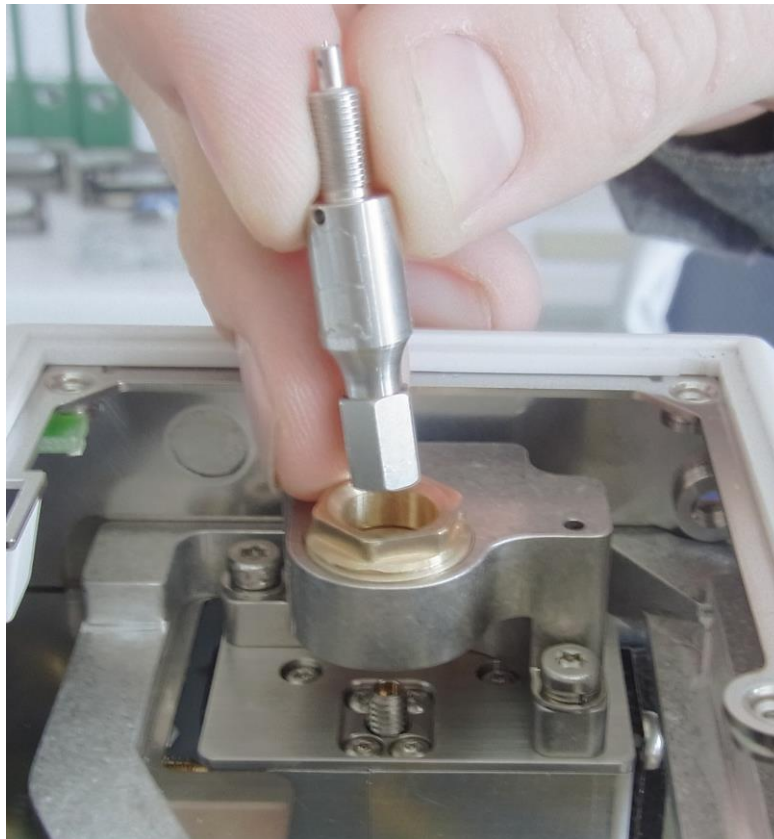
1. Unmount the upper and lower cover (refer to [4.2.4.1](#)).
2. Unmount the frontpanel (refer to [4.2.5](#)).
3. Loosen the bracket of the victim adaptor by use of mounting tool 2.



4. Loosen the 1mm connector at the step attenuator by use of the mounting tool 1.



5. Carefully remove the victim adaptor.



6. Replace the victim adaptor by a new one.
7. Insert the new victim adaptor carefully to the bracket
NOTICE: Do not damage the 1mm connector at the step attenuator!
8. Tighten the 1mm connector at the step attenuator by use of mounting tool 1 with 0.45Nm

NOTICE: Do not overtight the connector! This will cause damaging of the step attenuator!

9. Tighten the bracket of the victim adaptor by use of mounting tool 2 with 5Nm.
10. Mount the frontpanel to the instrument (refer to chapter [4.2.5](#)).
11. Install a new label on the connector carrier board.

Note: Be sure to mount the label properly. It can only be installed once!

12. Mount the upper and lower cover (refer to chapter [4.2.5](#)).
13. Reinstall the ball bearing mounted head and tighten it by use of the mounting tool 3 with 3Nm
14. Remove the green security cap over the inner conductor of the RF input connector.

NOTICE: Do not damage the inner conductor of the RF input connector.

15. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
16. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
17. Perform a frequency response correction as described in chapter [4.2.6.2](#).

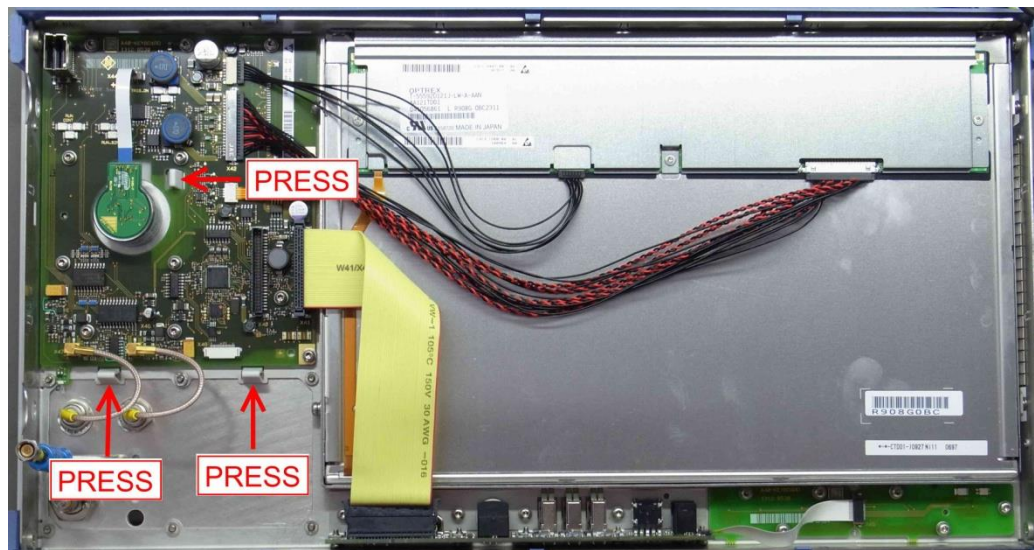
4.3.2.7 Replacing the Frontcover

1. Unmount the frontpanel (refer to [4.2.5](#)).
2. Unplug display data cable and display backlight cable at the plugs on the front board.
3. Unplug touch cable and rotary pulse generator cable on the frontpanel keyboard.
4. Unplug flat ribbon cable on front board.

If Option R&S®FSW-B71 is installed:

- Unplug the B71 foil cable on the frontpanel keyboard board
5. Unscrew the eight screws fastening the frontpanel keyboard and remove it.
6. Unsnap the frontcover from the sheet metal.

Note: unlock the front cover by unlocking the three hooks marked in the picture below. Then unlock the hooks at the rim of the frontpanel.



7. Snap the new front cover onto the sheet metal.
8. Reinstall the frontpanel keyboard and fasten the eight screws.
Note: Be sure the push-button board is inserted correct in the front bezel.
9. Replug the display data cable and display backlight cable.
10. Replug the touch cable and rotary pulse generator cable.
11. Replug the flat ribbon cable.

If Option R&S®FSW-B71 is installed:

- ▶ Replug the B71 foil cable on the frontpanel keyboard board
12. Mount the frontpanel to the instrument (refer to chapter 4.2.5).
 13. Install the new labels on the front cover.
Note: Be sure to mount the labels properly. They can only be installed once!
 14. Mount the upper and lower cover (refer to chapter 4.2.5).
 15. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
 16. Perform the Basic Instrument Checks according to chapter 4.2.6.1.
 17. Start the key test program by
[SETUP : Service : Enter Password = 894129]
[SETUP : Service : Enter Service Function: 2.0.14.0]
 18. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
 19. Perform a frequency response correction as described in chapter 4.2.6.2.

4.3.2.8 Replacing the Pushbutton Board Upper Half

1. Unmount the frontpanel (refer to [4.2.5](#)).
2. Unplug display data cable and display backlight cable at the plugs on the front board.
3. Unplug touch cable and rotary pulse generator cable on the frontpanel keyboard.
4. Unplug flat ribbon cable on frontpanel keyboard.
5. Unplug the two RF cables.

If Option R&S®FSW-B71 is installed:

- ▶ Unplug the B71 foil cable on the frontpanel keyboard board
6. Unscrew the eight screws fastening the frontpanel keyboard and remove the board.
 7. Replace the pushbutton board by a new one.
 8. Reinstall the frontpanel keyboard and fasten the eight screws previously removed.
- Note:** Be sure the push-button board is inserted correct in the front bezel.
9. Replug the display data cable and display backlight cable.
 10. Replug the touch cable and rotary pulse generator cable.
 11. Replug the flat ribbon cable.
 12. Replug the two RF cables.

If Option R&S®FSW-B71 is installed:

- ▶ Replug the B71 foil cable on the frontpanel keyboard board
13. Mount the frontpanel to the instrument (refer to chapter [4.2.5](#)).

For FSW 8/13/26/43/50/67:

- ▶ Mount the right side cover (refer to chapter [4.2.5](#)).
14. Mount the upper and lower cover (refer to chapter [4.2.5](#)).
 15. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
 16. To calibrate the touch screen you need an USB mouse or an USB keyboard with a touch ball. Connect it to an USB port and run:
[SETUP : Alignment : Touch Screen Alignment],
and follow the instructions on the screen.
 17. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
 18. Start the key test program by
[SETUP : Service : Enter Password = 894129]
[SETUP : Service : Enter Service Function: 2.0.14.0]

19. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
20. Perform a frequency response correction as described in chapter 4.2.6.2.

4.3.2.9 Replacing the Pushbutton Board Lower Half

1. Unmount the frontpanel (refer to chapter 4.2.5)
2. Unplug standby cable at the plug on the standby board.
3. Unscrew the five screws fastening the standby board.
4. Remove the standby board.
5. Replace push button board by a new one.
6. Reinstall the standby board.

Note: Be sure the push button board is inserted properly and the plastic rim around the ON/OFF key is installed.

7. Fasten the five screws previously removed.
8. Plug in standby cable.
Note: The plug is contacting the cable on the top side!
9. Mount the frontpanel to the instrument (refer to chapter 4.2.5).

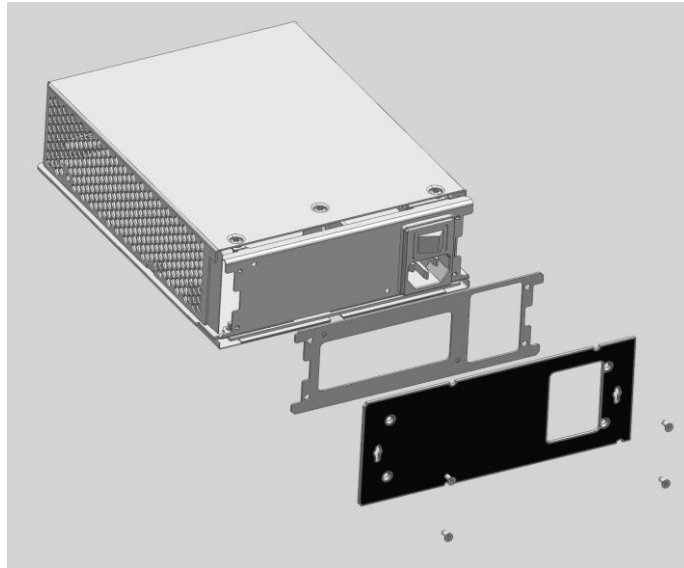
For FSW 8/13/26/43/50/67:

- Mount the right side cover (refer to chapter 4.2.5).
10. Mount the upper and lower cover (refer to chapter 4.2.5).
11. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
12. Perform the Basic Instrument Checks according to chapter 4.2.6.1.
13. Start the key test program by
[SETUP : Service : Enter Password = 894129]
[SETUP : Service : Enter Service Function: 2.0.14.0]
14. Press each hardkey until every key on the key test program lights up green. The key for the on-screen keyboard (labeled "pskb" in the tool) remains gray, but displays the on-screen keyboard. Press the key twice to close the on-screen keyboard again.
15. Perform a frequency response correction as described in chapter 4.2.6.2.

4.3.3 Replacing the Power Supply Unit A80

1. Switch off the instrument and disconnect the power plug.

2. Unscrew the six screws fastening the power supply
3. Remove the power supply using the BW2010 KEY tool.
4. Unscrew the four screws fastening the back panel and the distance plate and remove it from the power supply.
5. Install the back panel and the distance plate on the new power supply by fastening the four screws formerly removed.



6. Insert the new power supply carefully into the instrument frame.
7. Reinstall the six screws formerly removed.
8. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
9. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

4.3.4 Replacing the Frontend Board A100

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to [4.2.4.1](#)).
3. Unmount the inner lid1 (refer to [4.2.4.2](#)).
4. Unplug all RF cables at the frontend board, if installed.
Note: There are two cables routed on the upper side of the instrument!
5. Remove the frontend board carefully.
6. Install the new frontend board.
7. Reconnect all RF cables at the frontend board (for detailed cable routing refer to chapter [4.2.2](#)).

Tip: The connector to plug in is written on the yellow tube on the cable.

8. Mount the inner lid (refer to chapter [4.2.5](#)).
9. Mount the upper and lower cover (refer to chapter [4.2.5](#)).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
12. Perform a frequency response correction as described in chapter [4.2.6.2](#).

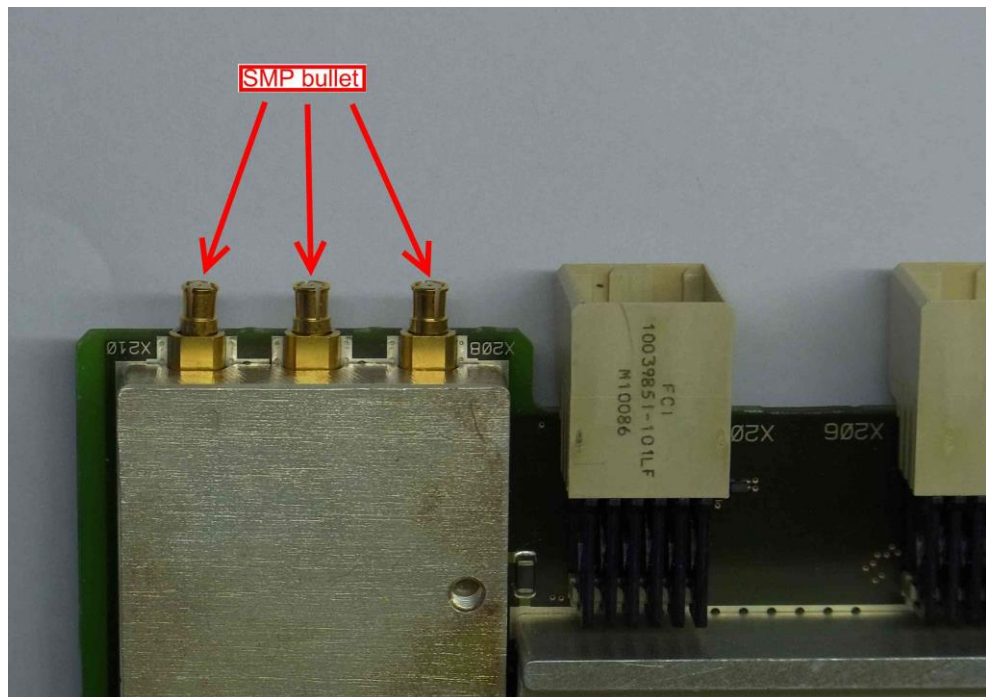
4.3.5 Replacing the Detector Board A200

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the eight screws on the back cover of the instrument.
3. Remove the detector board using the BW2010 tool.

Tip: The board sticks very strongly to the motherboard. It can be removed more easily by gently moving the board to the left and to the right while pulling it out of the frame of the instrument.

4. Reinstall the new module.

Note: Be sure to plug in the module properly. The back panel must seat solidly to the instrument frame. **Do not forget to install the three SMP bullets.**



5. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

Note: If the firmware shows a "DCM unlock" error (refer to [4.4.3.2](#)) when booting the instrument check the SMP bullets in the detector board for proper installation!

4.3.6 Attenuator A40

4.3.6.1 R&S®FSW 8/13/26/43/50/67:

For R&S®FSW 8/13/26/43: The attenuator is mounted to the side wall of the instrument.

For R&S®FSW 50/67: The attenuator is mounted on the microwave converter frontend unit.

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to [4.2.4.1](#)).
3. Unmount the right side cover (refer to [4.2.4.3](#)).
4. Disconnect the RF cable to the frontpanel at the side of the step attenuator.
5. Disconnect the calibration signal cable at the side of the step attenuator.

For R&S®FSW8:

- a) Remove RF cable to the frontend.
- b) Unscrew the three screws fastening the attenuator from the right side of the instrument.

For R&S®FSW13/26:

If option R&S®FSW-B24 and /or R&S®FSW-B25 is installed:

- o Remove the microwave converter frontend unit. For removing the microwave converter frontend unit refer to chapter [4.3.8](#).
- a) Remove RF cable to the microwave converter frontend.
- b) Unscrew the four screws fastening the attenuator from the right side of the instrument.

For R&S®FSW43:

- a) Remove the microwave converter frontend unit. For removing the microwave converter frontend unit refer to chapter [4.3.9.2](#).
- b) Unscrew the four screws fastening the attenuator from the right side of the instrument.

For R&S®FSW50/67:

- a) Remove the microwave converter frontend unit. For removing the microwave converter frontend unit refer to chapter [4.3.10.2](#).
- b) Remove RF cable to the microwave converter frontend.
- c) Unscrew the screws fastening the attenuator to the microwave converter frontend unit.
6. Unplug the flat ribbon cable at the plug on the attenuator.

Note: the connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

7. Carefully remove the attenuator from the instrument.
8. Replug the flat ribbon cable to the new attenuator.

NOTICE! Risk of serious damage to the instrument! Be sure you have plugged in the flat ribbon cable in the correct connector. The information where to plug in the cable is given on the bottom of the frame of the instrument!

For R&S®FSW8:

- a) Install the new attenuator to the instrument.
- b) Fasten the three screws previously removed.
- c) Reinstall the RF cable to the frontend.

For R&S®FSW13/26:

- a) Install the new attenuator to the instrument.
- b) Fasten the four screws previously removed.

If option R&S®FSW-B24 and /or R&S®FSW-B25 is installed:

- Reinstall the microwave converter frontend unit to the instrument. For reinstalling the microwave converter frontend unit refer to chapter [4.3.8.2](#) for R&S®FSW13/26 and to chapter [4.3.9.4](#) for R&S®FSW43.
- c) Reinstall the RF cable to the microwave converter frontend.

For R&S®FSW43:

- a) Reinstall the microwave converter frontend unit to the instrument. For reinstalling the microwave converter frontend unit refer to chapter [4.3.8.2](#) for R&S®FSW13/26 and to chapter [4.3.9.4](#) for R&S®FSW43.
- b) Reinstall the RF cable to the microwave converter frontend.

For R&S®FSW50/67:

- a) Reinstall the step attenuator to the microwave converter frontend unit by fastening the screws formerly removed.
 - b) Reinstall the RF cable to the microwave converter frontend.
 - c) Reinstall the microwave converter frontend unit. For reinstalling the microwave converter frontend unit refer to chapter [4.3.10.3](#).
 - d) Fasten the four screws previously removed.
9. Reconnect the RF cable to the frontpanel at the step attenuator side.
10. Reconnect the calibration signal cable at the step attenuator side.
11. Mount the right side cover (refer to [4.2.5](#)).
12. Mount the lower cover (refer to chapter [4.2.5](#))
13. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
14. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
15. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.6.2 R&S®FSW 85:

The step attenuator is mounted on the microwave converter frontend unit.

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to [4.2.4.1](#)).
3. Unmount the frontpanel (refer to chapter [4.2.5](#))
4. Unmount the microwave converter frontend unit (refer to chapter [4.3.11](#) [Uninstalling the microwave converter frontend unit](#))

5. Disconnect the two RF cables at the output of the attenuator

NOTICE! Do not damage the connectors!

6. Unplug the flat ribbon cable at the plug on the attenuator.

Note: the connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

7. Remove the two screws fastening the attenuator to the microwave converter frontend unit.

8. Remove the attenuator from the microwave converter frontend unit.

9. Reinstall the new attenuator.

10. Reinstall the two screws fastening the attenuator to the microwave converter frontend unit formerly removed. Do not tighten the screws! The attenuator must be able to slide a little bit to equalize the mechanical tolerances.

11. Reconnect the two RF cables.

NOTICE! The 1 mm connectors must be tightened with 0.45Nm!

12. Reconnect the attenuator control flat ribbon cable.

13. Reinstall the microwave converter frontend unit to the instrument (refer to chapter [4.3.11](#))

14. Mount the frontpanel to the instrument (refer to chapter [4.2.5](#)).

15. Mount the upper and lower cover (refer to chapter [4.2.5](#)).

16. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.

17. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

18. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.7 Digital Motherboard A10

NOTICE

Risk of losing important information

Important information about the type of instrument, installed hardware, options, etc., is stored on the motherboard, on the hard drive and the smart card. This information is required in order to restore the instrument in case of errors. Thus, do not replace the motherboard, the hard drive and the smart card at the same time, as doing so will cause this information to be lost. If the instrument does not function after the hard drive has been replaced, do not replace the motherboard or the smart card. Instead, re-install the old hard drive and then replace the motherboard or the smart card.

4.3.7.1 Replacing the Digital Motherboard

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to [4.2.4.1](#)).
3. Unmount the inner lid1 and inner lid2 (refer to [4.2.4.2](#)).
4. Remove the CPU Board using the BW2010 tool (refer to [4.3.1.1](#)).
5. Remove the power supply unit using the BW2010 tool (refer to [4.3.3](#)).

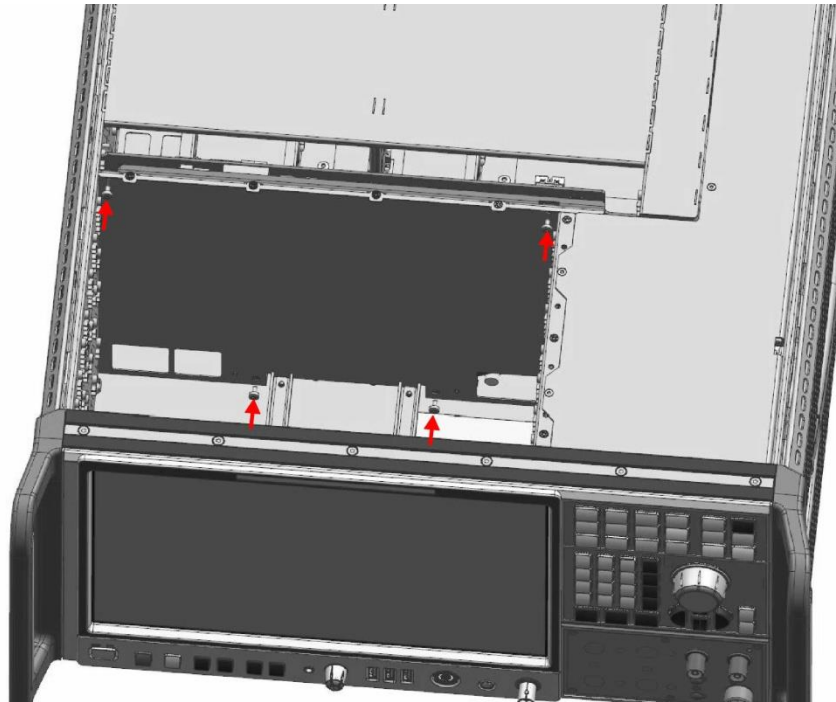
If option R&S®FSW-B71 is installed:

- a) Unmount the frontpanel (refer to [0](#)).
Note: For details on how to route the R&S®FSW-B71 cables refer to chapter [4.3.24.1](#).
 - b) Unplug the RF cables on the BNC plug plate at the frontpanel.
 - c) Loosen the cable ties on the R&S®FSW-B71 cables
6. Remove the microwave converter frontend unit for R&S®FSW 13/26 according to chapter [4.3.8](#), for R&S®FSW 43 according to chapter [4.3.9.2](#), for R&S®FSW 50/67 according to chapter [4.3.10.2](#), for R&S®FSW 85 according to chapter [4.3.11](#)
 7. Unplug the fans at the digital motherboard.
Note: The connectors are locked! To unlock press the lever down and disconnect the cable carefully!
 8. Unplug the attenuator and the preamplifier, if installed, on the digital motherboard.
Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
 9. Unplug the display cable to the frontpanel from the connector on the digital motherboard.

Note: The connector is locked! To unlock it press the silver lever down and disconnect the cable carefully!

10. Remove the screws fastening the digital motherboard with its holder.

Tip: You can access two screws from the top of the instrument and two screws from the bottom of the instrument. There is no need to remove the analog modules before removing the digital motherboard!



11. Remove the digital motherboard with its holder carefully from the instrument frame.

Note: Be sure to have unplugged all cables and modules from the digital motherboard! If option R&S®FSW-B71 is installed be careful to route the R&S®FSW-B71 cables properly when removing the digital motherboard.

12. Remove the screws fastening the holder of the digital motherboard.
13. Remove the RF cables from the digital motherboard using the SMP removal tool.



14. Install the previously removed cables to the new digital motherboard. Make sure you install the connectors at the right position! The connector identifier is printed on the yellow tube on the cable as well as on the motherboard near the hole for the connector. Route the cables as shown below! In R&S®FSW 85 with installed option R&S®FSW-B71 only X256 and X258 are populated!

Note: The SMP connectors must be pushed into the motherboard in a right angle. Be careful not to damage any components on the motherboard! The connectors snap to the motherboard if correctly installed and can only be removed with the removal tool! Route the cables as shown in the picture below.

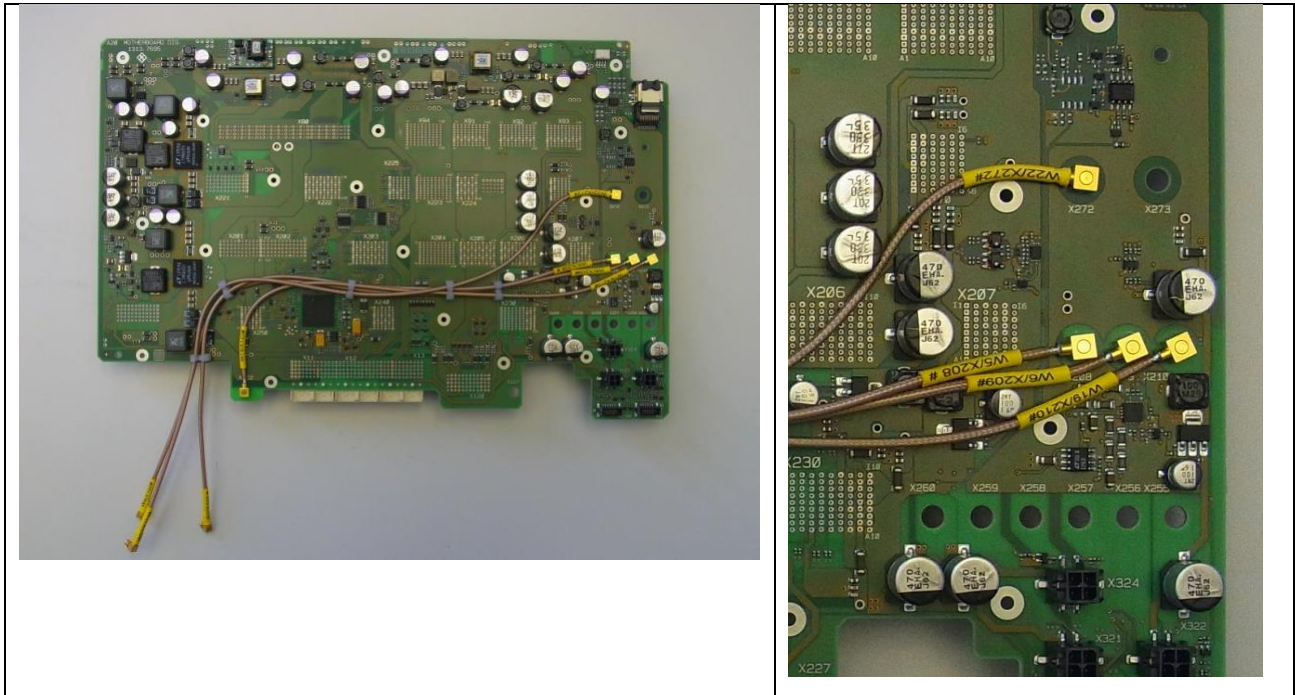


Figure 4-15: Cable routing without option R&S®FSW-B71 and without option R&S®FSW-B1200 installed

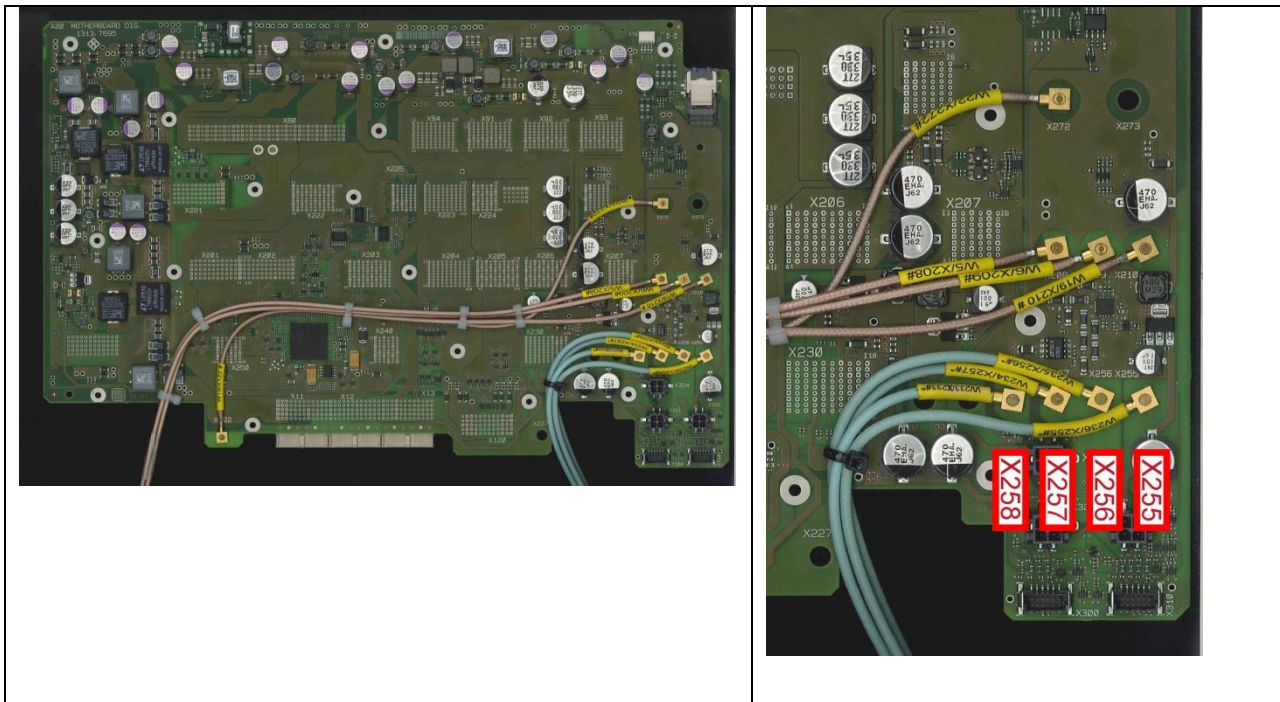


Figure 4-16: Cable routing in R&S®FSW 8/13/26/43/50/67 with option R&S®FSW-B71 and without option R&S®FSW-B1200 installed

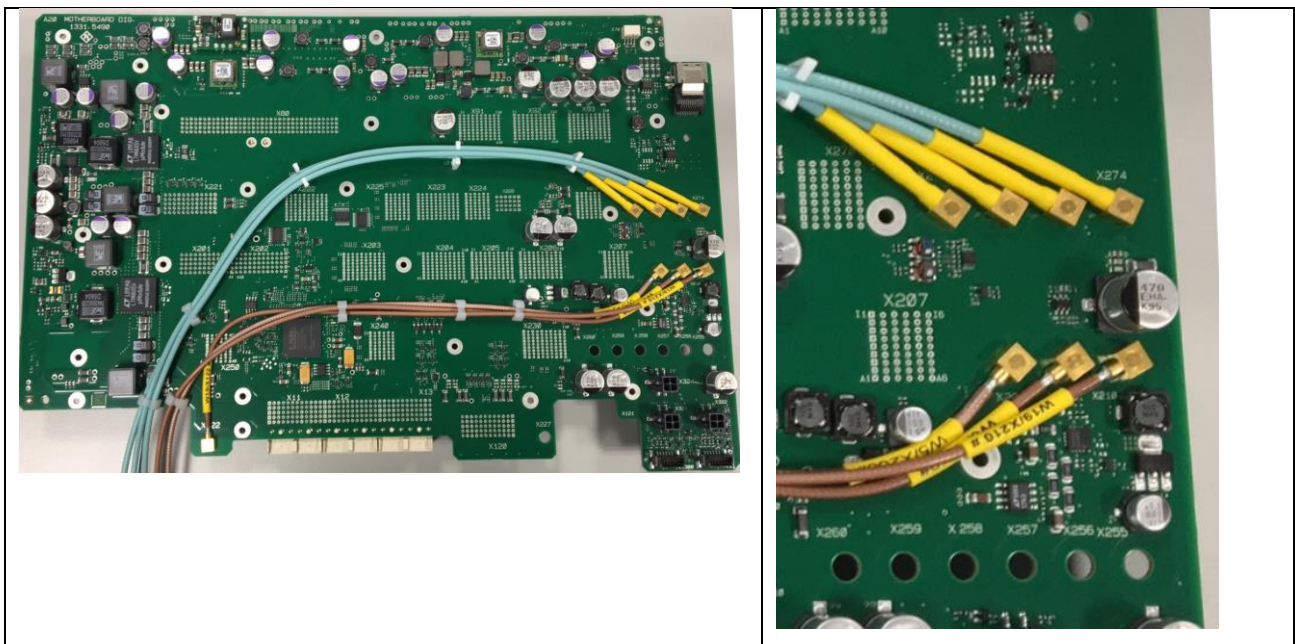


Figure 4-17: Cable routing in R&S®FSW 43/50/67 without option R&S®FSW-B71 and with option R&S®FSW-B1200 installed.

15. Replace the old digital motherboard by the new one and install it on the old holder. Reinstall the screws previously removed.

16. Carefully install the motherboard with the holder in the frame of the instrument.

Note: The three RF cables must be routed through the right hole in the frame of the instrument as shown on the picture below. Be careful to route the R&S®FSW-B71 cables properly!



Figure 4-18: Cable routing without option R&S®FSW-B71 and without option R&S®FSW-B1200 installed

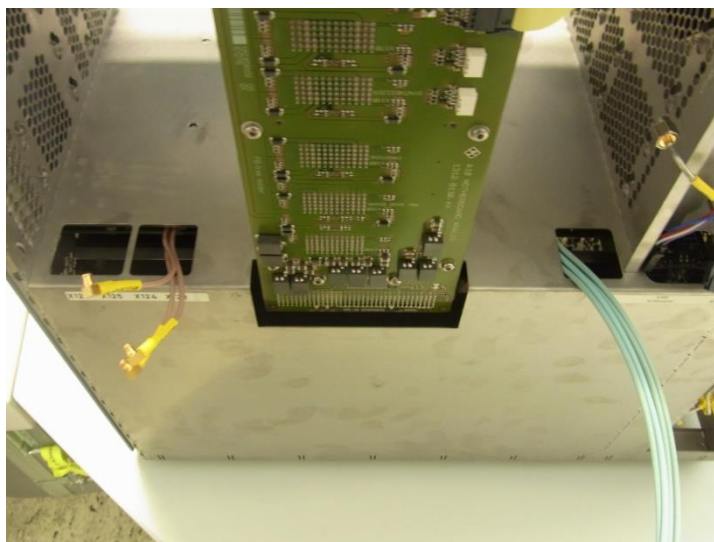


Figure 4-19: Cable routing with option R&S®FSW-B71 and without option R&S®FSW-B1200 installed

17. Remount the motherboard to the instrument frame using the previously removed screws.
18. Reinstall the CPU Board (refer to chapter [4.3.1.1](#)).
19. Reinstall the power supply unit (refer to chapter [4.3.3](#)).

If option R&S®FSW-B71 is installed:

- a) Reinstall the relay with its holder and replug the RF cables.
 - b) Replug the R&S®FSW-B71 cables to the BNC plug plate on the front panel.
(refer to chapter [4.3.24.1](#))
 - c) Reinstall the front panel (refer to chapter [4.2.5](#))
 - d) Reinstall the cable ties to R&S®FSW-B71 cables.
20. Plug in the fans as described in chapter [4.3.13.2](#)
- Note:** Be sure to connect the fans to the correct connector.
21. Plug in the attenuator and, if installed, the preamplifier.
22. Reinstall the microwave converter frontend unit for R&S®FSW 13/26 according to chapter [4.3.8](#), for R&S®FSW 43 according to chapter [4.3.9.3](#), for R&S®FSW 50/67 according to chapter [4.3.10.3](#), for R&S®FSW 85 according to chapter [4.3.11](#)
23. Plug in the display cable.
- Note:** Be sure the display cable connector is locked! When inserting the plug in its corresponding connector you may hear some "CLICK".
24. Mount the right side cover (refer to [4.2.5](#)).
25. Unmount the upper and lower cover (refer to [4.2.4.1](#)).
26. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
27. Restore the data stored on the motherboard EPROM by performing the following service function:
[SETUP : Service : Enter Password = 20122004]
[SETUP : Service : Enter Service Function: 10.0.3]
28. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
29. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.7.2 Replacing a Defective Fuse

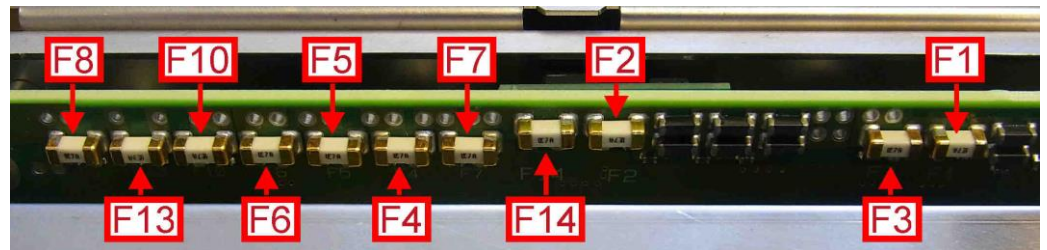
1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper cover (refer to [4.2.4.1](#)).
3. Unmount the inner lid1 (refer to [4.2.4.2](#)).
4. The fuses are located on the upper side of the digital motherboard.
5. To identify the blown fuse refer to chapter [4.4](#).
6. Carefully desolder the defective fuse.

Note: Be careful not to damage the board! A good practice is to use one solder iron for each pin of the fuse to desolder it.

7. Clean the pads on the board carefully using a desolder wick.

Note: Replace the defective fuse only by an original spare part! Otherwise you will lose the safety approbation of the instrument! The fuses and its spare parts are listed in the following table:

F1	2079.5994.00	7A FF	Power supply rail for DC/DC converter 6,5V A
F2	2079.5994.00	7A FF	Power supply rail for DC/DC converter 6,5V B
F3	2079.5994.00	7A FF	Power supply rail for DC/DC converter 3,3V, - 6,5V, probe supply, 5V, 30V
F4	2079.5994.00	7A FF	Power supply rail for digital boards
F5	2079.5994.00	7A FF	Power supply rail for analog boards
F6	2079.5994.00	7A FF	Power supply rail for main fans
F7	2079.5994.00	7A FF	Power supply rail for microwave converter
F8	2079.5994.00	7A FF	Supply rail for detector extension board #1
F10	2079.5994.00	7A FF	Supply rail for CPU Board
F13	6100.7862.00	3A FF	Standby supply rail
F14	2079.5994.00	7A FF	Supply rail for detector extension board #2



8. Solder carefully the fuse to the corresponding pads on the motherboard using a Pb free solder tin.

Note: Be careful not to overheat the fuse. This may result in a defective fuse! Make sure there is no short circuit on the board!

9. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.

Note: Mains voltage is applied to the power supply.

10. Check the power rail with the replaced fuse by measuring the corresponding voltage on both sides of the fuse. The voltage on all fuses is rated by $12.2V \pm 5\%$.

Tip: If the fuse is blown again check the boards supplied by this power rail. See chapter 4.4 for further details.

11. Switch off the instrument and disconnect the power plug.
12. Mount the inner lid1 (refer to 4.2.4.2).
13. Mount the upper cover (refer to 4.2.4.1).

14. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
15. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

4.3.7.3 Replacing the Analog Motherboard

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to [4.2.4.1](#)).
3. Remove the eight (for R&S®FSW 85: 12) screws fastening the analog motherboard.
4. Carefully remove the analog motherboard.
5. Carefully plug in the new module.
6. Fasten the eight (for R&S®FSW 85: 12) screws previously removed.
7. Mount the lower cover (refer to chapter [4.2.5](#))
8. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
9. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

4.3.8 Microwave Converter A160, A161 and A162, A170 (R&S®FSW13/26)

4.3.8.1 Replacing the Base Board A170

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to [4.2.4.1](#)).
3. Unmount the inner lid1 (refer to [4.2.4.2](#)).
4. Unplug the flat ribbon cable at the microwave converter base board side.
Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
5. Unplug the RF cables from the microwave converter base board.
6. Carefully replace the microwave converter base board by a new one.
7. Reconnect the flat ribbon cable.
8. Reconnect the RF cables.
Tip: The connector to plug in is written on the yellow tube on the cable.
9. Mount the upper and lower cover (refer to chapter [4.2.5](#))
10. Mount the inner lid1 (refer to [4.2.5](#)).
11. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.

12. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
13. Perform a frequency response correction as described in chapter [4.2.6.2](#).

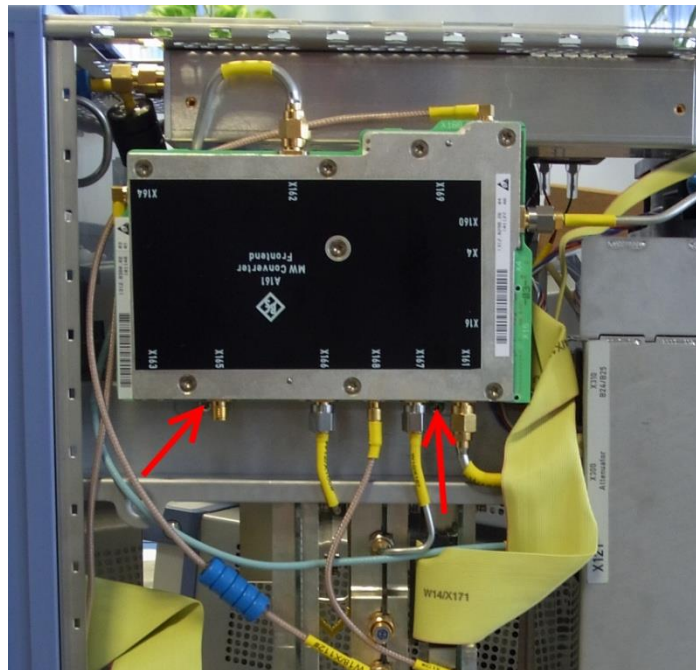
4.3.8.2 Replacing the Microwave Converter Frontend A161

The microwave converter frontend is located on the bottom of the instrument close to the RF attenuator. The board is mounted on the microwave converter frontend unit. In the figure for cable routing of the R&S®FSW13/26 in [4.2.2](#) the location of the microwave converter frontend is shown.

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to [4.2.4.1](#)).
3. Unmount the right side cover (refer to [4.2.5](#)).
4. Unplug the flat ribbon cable at the microwave converter frontend side.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

5. Unplug all RF cables from the microwave converter frontend except the cables at the connectors X161 and X162.
6. Unscrew the two screws at the bottom of the microwave converter frontend unit as shown on the picture below.



7. Remove the microwave converter frontend unit from the instrument.

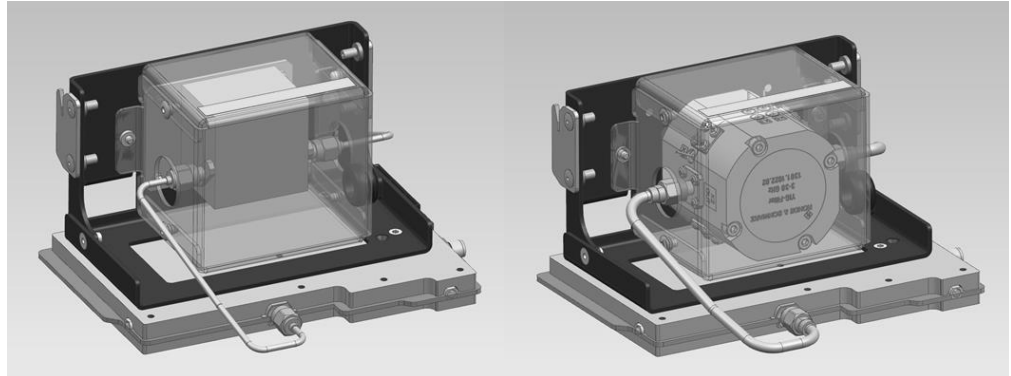
Note: You can remove the microwave converter frontend unit by pulling it out of the instrument towards the bottom of the instrument

8. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.

9. Unplug the YIG filter control cable.
10. Uninstall the two RF cable on the YIG filter.
11. Uninstall the shielding cap of the YIG filter.
12. Unscrew the four screws fastening the microwave converter frontend to the microwave converter frontend unit.

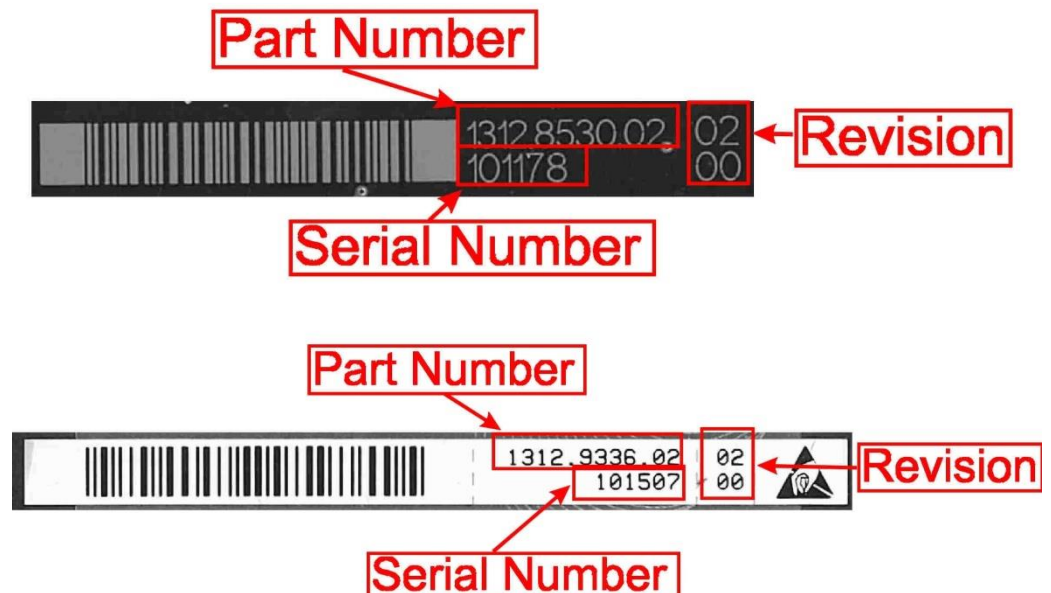
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13. Replace the microwave converter frontend by a new one and fasten the four screws previously removed.
14. Write down the serial number, the part number and the revision of the new board.

Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the Eeprom!)



15. Reinstall the shielding cap of the YIG filter
16. Replug the YIG filter control cable to the new microwave converter frontend.

17. Reconnect the RF cables at connector X161 and X162 and the YIG filter
18. Reinstall the microwave converter frontend unit to the instrument

Note: The hooks on both sides on the microwave converter frontend unit must fit to the corresponding trench in the instrument chassis.

19. Reinstall the two screws formerly removed.
20. Reconnect all RF cables to its corresponding plugs.
Tip: The connector to plug in is written on the yellow tube on the cable.
21. Plug in the flat ribbon cable.
22. Mount the right side cover (refer to chapter 4.2.5).
23. Mount the upper and lower cover (refer to chapter 4.2.5).
24. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
25. Update the EPROM data of the microwave converter frontend.

a) Enter the service password
[SETUP : Service : Service Function : Password = 30473035]

b) Enter the service function
3.7.7.1.FRONTEND.xxxx.xxxx.xx.yyyyyy.zz.zz
in the service dialog

[SETUP : MORE : SERVICE : SERVICE FUNCTION]

where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 15!

NOTICE

Risk of losing important information

This service function must be carried out after the first boot of the firmware after replacing the hardware! Otherwise the EEPROM data, necessary to run the instrument properly, is lost!

26. Enter the service function
[3.7.7.0.FRONTEND]
and verify the displayed data with the data of the new installed hardware.
27. Reset the service password
[SETUP : MORE : SERVICE : SERVICE FUNCTION]
[Reset Password]
28. Perform the Basic Instrument Checks according to chapter 4.2.6.1.

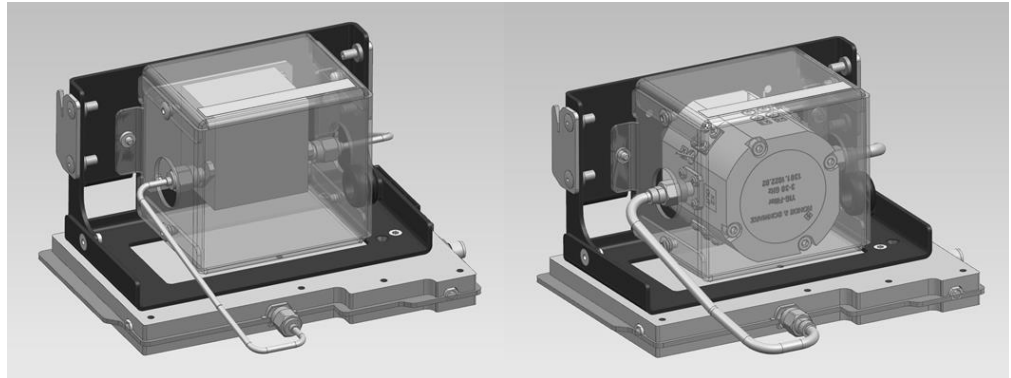
29. Perform a frequency response correction as described in chapter 4.2.6.2.

4.3.8.3 Replacing the YIG Filter A162

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter 4.2.4.1).
3. Unmount the right side cover (refer to 4.2.4.3).
4. Unplug the flat ribbon cable at the microwave converter frontend side.
Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
5. Unplug all RF cables from the microwave converter frontend except the cables at connector X161 and X162.
6. Unmount the microwave converter frontend unit from the instrument as described in 4.3.8.2.
7. Unscrew the two screws fastening the shielding cover of the YIG filter and remove the cover.
8. Unplug the RF cables at connector X161 and X162 at the YIG filter side.
Note: the RF cables can be unmounted if the YIG filter shielding cab is slid.
9. Unplug the YIG filter control cable.

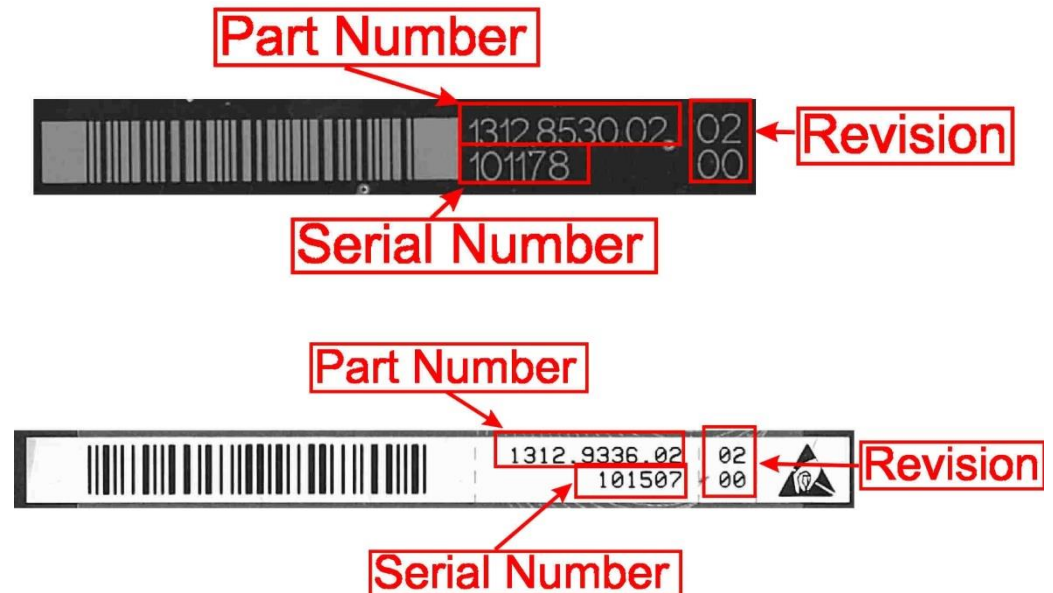
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10. Unscrew the four screws fastening the YIG filter to the microwave converter frontend unit.
11. Replace the YIG filter by a new one.
Note: Be sure to reinstall the shielding metal sheet between YIG filter and the frontend unit frame.
12. Write down the serial number, the part number and the revision of the new YIG filter unit.

Tip: You find this information on the barcode label on the printed circuit board. There are two different barcode labels: (The numbers shown in the picture are only for illustration. Do not use them for updating the Eeprom!)



13. Fasten the four screws previously removed.
14. Reinstall the shielding cover.

Note: Be sure to route the YIG filter control cable properly!
15. Reconnect the YIG filter control cable
16. Reconnect the RF cables to connector X161 and X162.
17. Reinstall the microwave converter frontend unit to the instrument and fasten it as described in chapter [4.3.8.2](#)
18. Reconnect all RF cables to its corresponding plugs.

Tip: The connector to plug in is written on the yellow tube on the cable.
19. Plug in the flat ribbon cable.
20. Mount the right side cover (refer to chapter [4.2.5](#)).
21. Mount the upper and lower cover (refer to chapter [4.2.5](#)).
22. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
23. Update the EPROM Data of the YIG filter
 - a) Enter the service password
[SETUP : Service : Service Function : Password = 30473035]
 - b) Enter the service function
3.7.7.1.YIG_UNIT.xxxx.xxxx.xx.yyyyyy.zz.zz
in the service dialog

[SETUP : MORE : SERVICE : SERVICE FUNCTION]

where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 12.

Note: This service function will be available with the firmware version 1.40 and higher.

24. Enter the service function

[3.7.7.0.YIG_UNIT]

and verify the displayed data with the data of the new installed hardware.

25. Reset the service password

[SETUP : MORE : SERVICE : SERVICE FUNCTION]

[Reset Password]

26. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

27. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.9 Microwave Converter A160, A161 and A162, A170 (R&S®FSW43)

The microwave converter consist of two parts: the microwave converter base board and the microwave converter frontend unit. This microwave converter frontend unit consists of the frontend and the YIG filter and the triplexer and optional the preamplifier. If any of the parts mounted on the microwave converter frontend unit has to be changed the whole frontend unit must be unmounted from the instrument.

4.3.9.1 Replacing the Base Board A170

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter [4.2.4.1](#)).
3. Unmount the inner lid 1 (refer to chapter [4.2.4.2](#)).
4. Unplug the flat ribbon cable to the microwave converter frontend at the microwave converter base board side.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

5. Unplug the flat ribbon cable to the microwave converter triplexer at the microwave converter base board side.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

If option R&S®FSW-B24 is installed:

- Unplug the cable to the preamplifier at the base board.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

6. Unplug the RF cables from the microwave converter base board.
7. Set the dip switches on the new board according to the label on the board.
8. Carefully replace the microwave converter base board by a new one.
9. Reconnect the flat ribbon cables.

NOTICE

Risk of damaging connector contacts

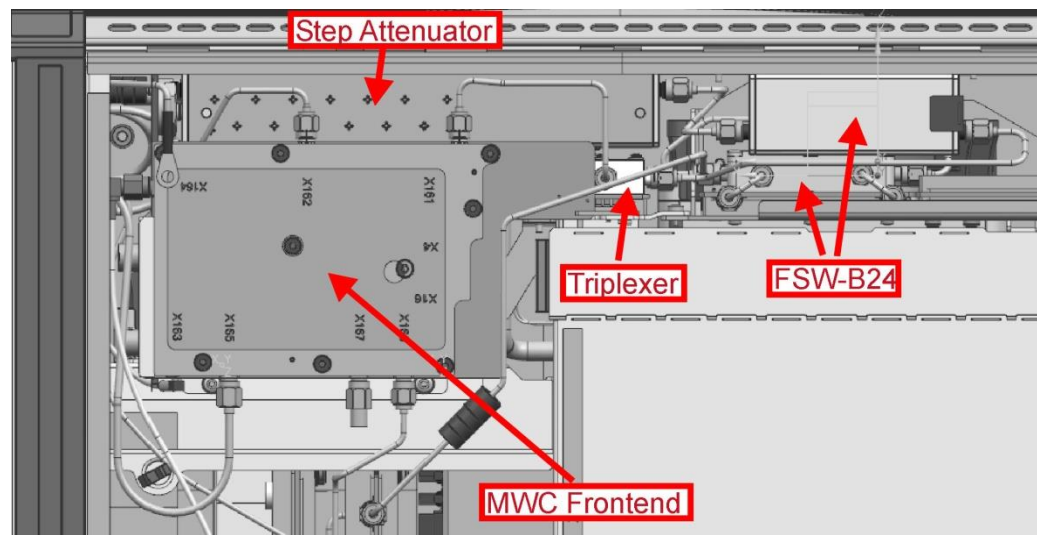
Make sure you plug in the flat ribbon cable connectors in a right angle. Otherwise, the contacts inside the connector may be damaged.

10. Reconnect the RF cables.

Tip: The connector to plug in is written on the yellow tube on the cable.

11. Mount the upper and lower cover (refer to chapter 4.2.5).
12. Mount the inner lid (refer to chapter 4.2.5).
13. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
14. Perform a frequency response correction as described in chapter 4.2.6.1.
15. Perform the Basic Instrument Checks according to chapter 4.2.6.2.

4.3.9.2 Unmounting the Microwave converter frontend unit A160

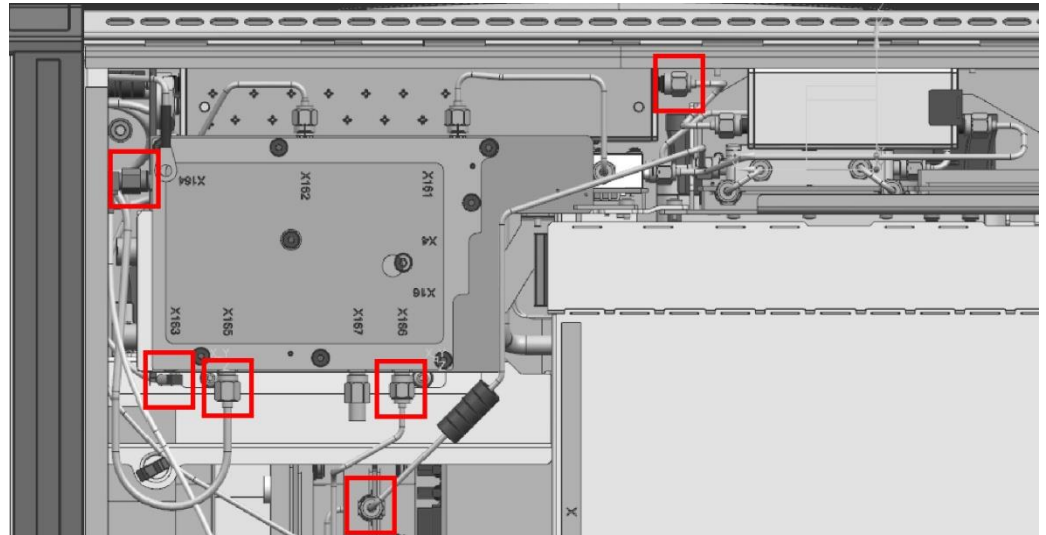


1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to chapter 4.2.4.1).
3. Unplug the flat ribbon cable at the microwave converter frontend side.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

4. Unplug all RF cables marked in the picture below from the microwave converter frontend unit.

Note: The picture shows an instrument with option R&S®FSW-B24 installed.

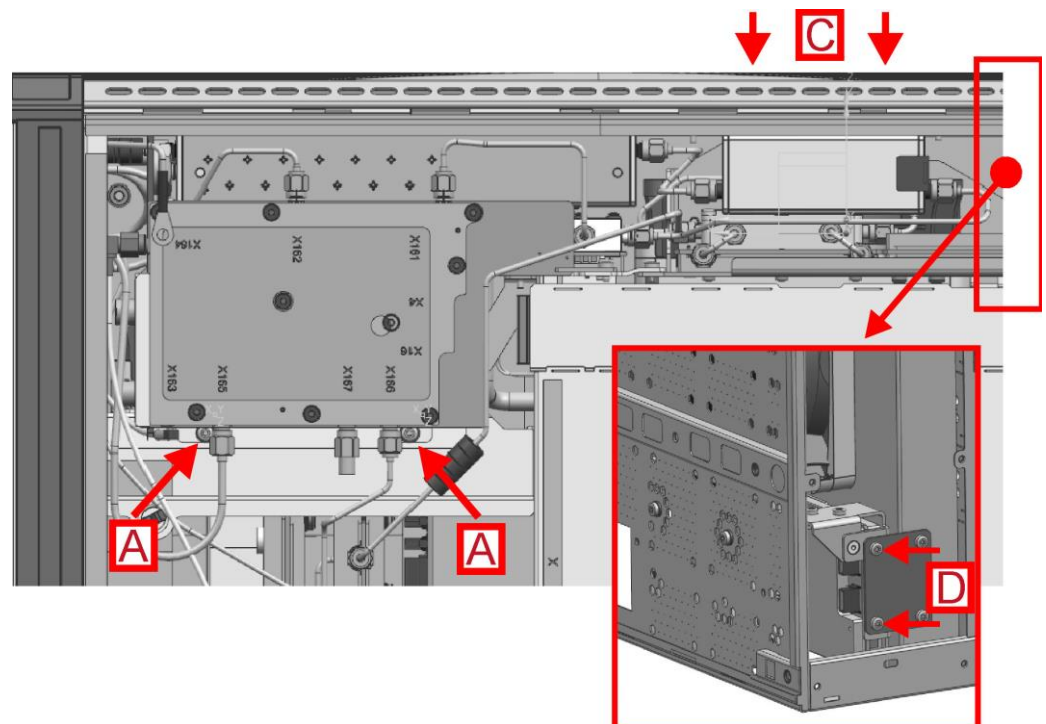


5. Unscrew the two screws marked with A fastening the microwave converter frontend unit.

Note: The picture shows an instrument with option R&S®FSW-B24 installed.

If option R&S®FSW-B24 is installed:

- a) Unscrew the eight screws fastening the left metal sheet on the back of the instrument and remove it.
- b) Unscrew the two screws at the left side of the instrument, marked with C in the picture below, and the two screws from the backside of the instrument also marked with D in the picture below.



6. Remove the microwave converter frontend unit from the instrument by pulling it towards the bottom out of the instrument. The microwave converter frontend unit is fastened to the instrument chassis by two hooks.

4.3.9.3 Installing the microwave converter frontend unit A160

1. Carefully insert the microwave converter frontend unit into the instrument chassis.

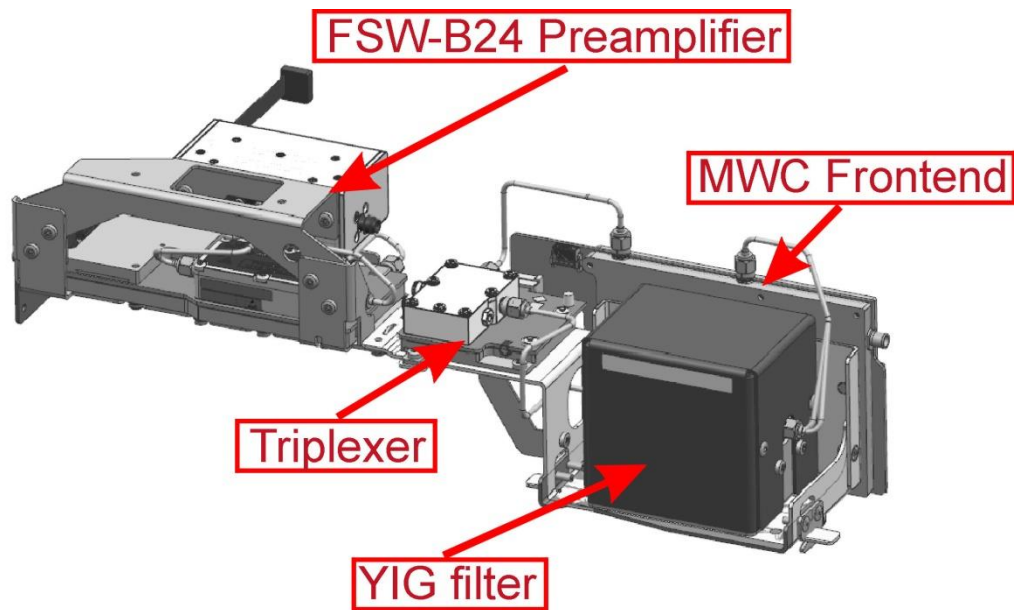
NOTICE: the hooks on both sides of the microwave converter frontend unit must match the trenches in the instrument chassis.



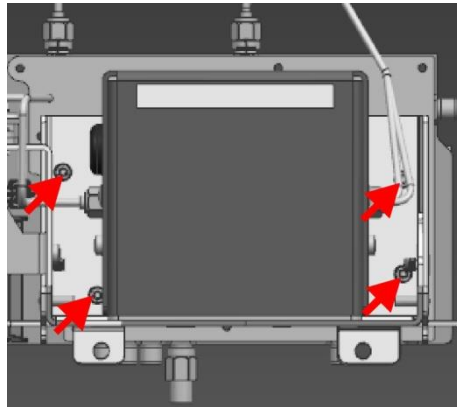
2. Fasten the microwave converter frontend unit by installing the screws previously removed
3. Reconnect all RF cables previously removed.
4. Reconnect the flat ribbon cables at the microwave converter base board.
5. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
6. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.9.4 Replacing the Microwave Converter Frontend A161

The microwave converter frontend is part of the microwave converter frontend unit. For replacing the frontend board first uninstall the microwave converter frontend unit as described in chapter 4.3.9 . The picture below shows the microwave converter frontend unit with installed option R&S®FSW-B24.

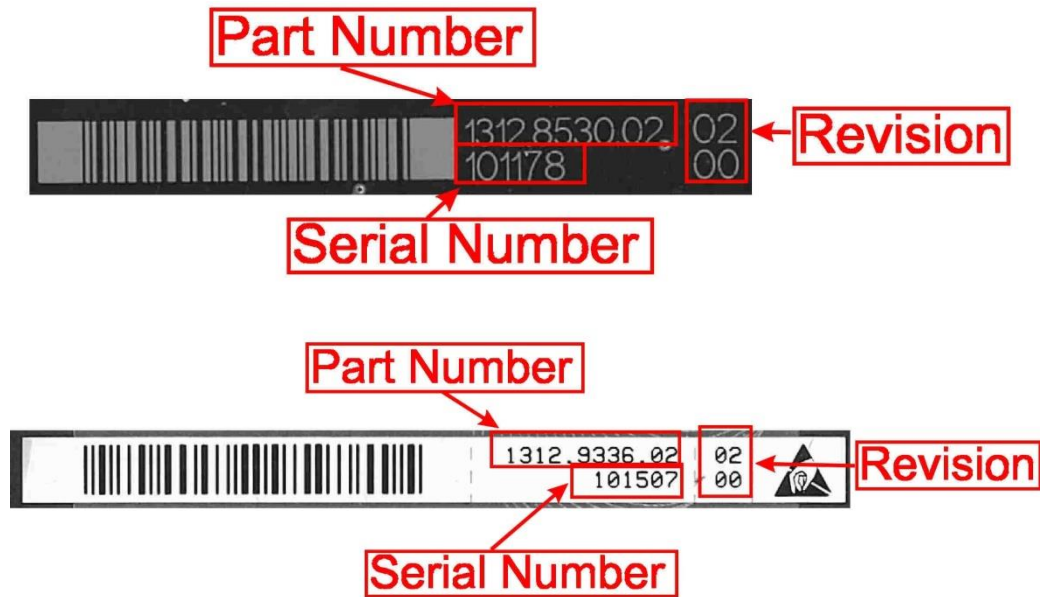


1. Unmount the microwave converter frontend unit as described in chapter [4.3.9.2](#)
2. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
3. Unscrew the four screws fastening the microwave converter frontend to the frontend unit holder.



4. Replace the microwave converter frontend by a new one and fasten the four screws previously removed.
5. Write down the serial number, the part number and the revision of the new board.

Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the Eeprom!)



6. Reinstall the YIG filter with the shielding cap.
7. Replug the YIG filter control cable to the new microwave converter frontend.
8. Reconnect the RF cables at connector X161 and X162 and the YIG filter
9. Reinstall the frontend unit to the instrument as described in chapter [4.3.9.3](#)
10. Mount the upper and lower cover (refer to chapter [4.2.5](#)).
11. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
12. Update the EPROM data of the microwave converter frontend.

a) Enter the service password
[SETUP : Service : Service Function : Password = 30473035]

b) Enter the service function
3.7.7.1.FRONTEND.xxxx.xxxx.xx.yyyyyy.zz.zz
in the service dialog

[SETUP : MORE : SERVICE : SERVICE FUNCTION]

where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 11!

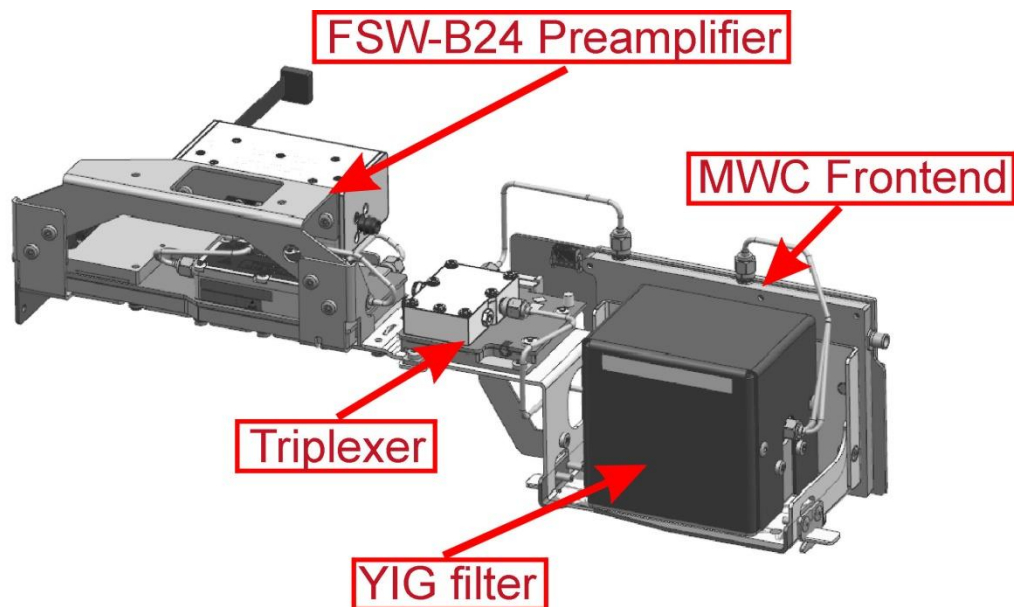
NOTICE**Risk of losing important information**

This service function must be carried out after the first boot of the firmware after replacing the hardware! Otherwise the EEPROM data, necessary to run the instrument properly, is lost!

13. Enter the service function
[3.7.7.0.FRONTEND]
and verify the displayed data with the data of the new installed hardware.
14. Reset the service password
[SETUP : MORE : SERVICE : SERVICE FUNCTION]
[Reset Password]
15. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
16. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.9.5 Replacing the YIG Filter A162

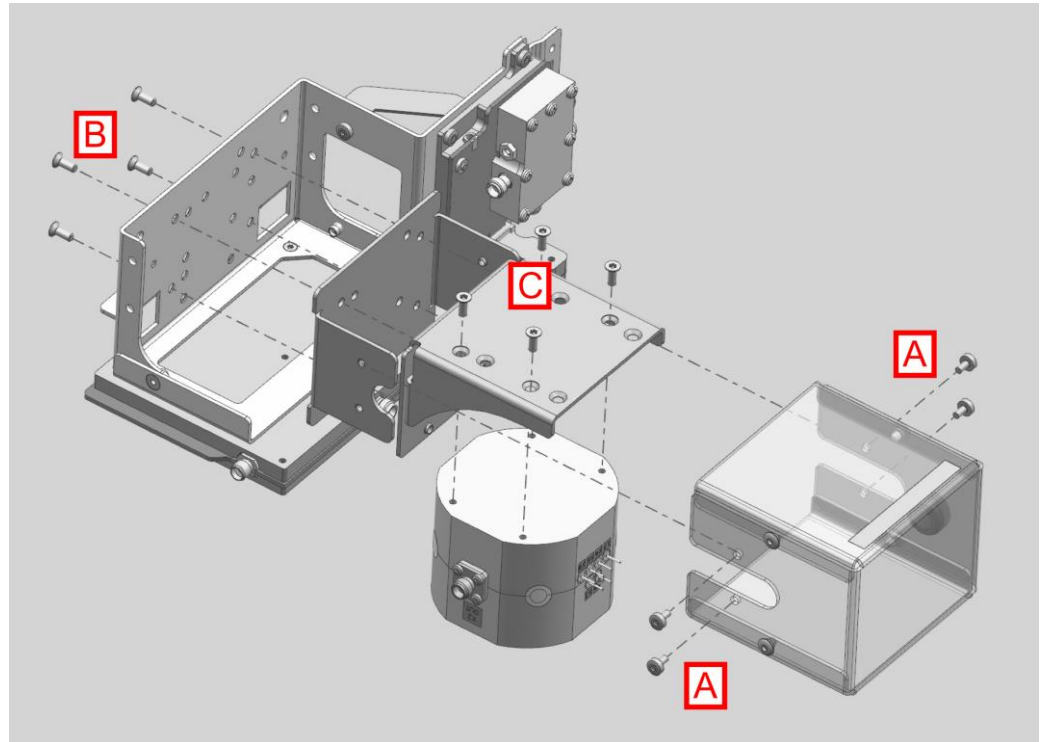
The YIG filter is mounted on the microwave converter frontend unit. To replace it the whole microwave converter frontend unit has to be removed from the instrument.



1. Unmount the microwave converter frontend unit as described in chapter [4.3.9.2](#)
2. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
3. Unplug the YIG filter control cable.

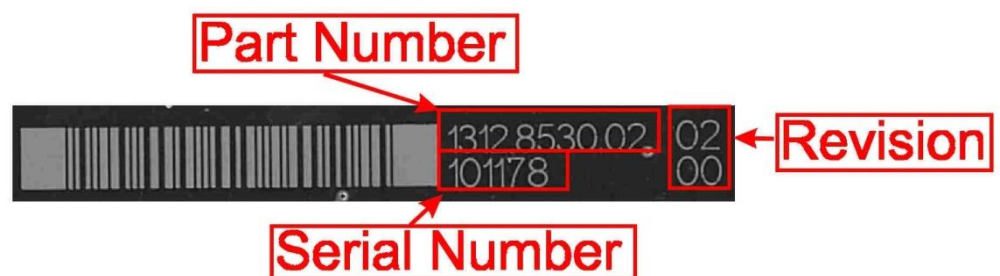
4. Uninstall the two RF cable on the YIG filter.
5. Uninstall the shielding cap of the YIG filter by unscrewing the four screws marked with A in the picture below.

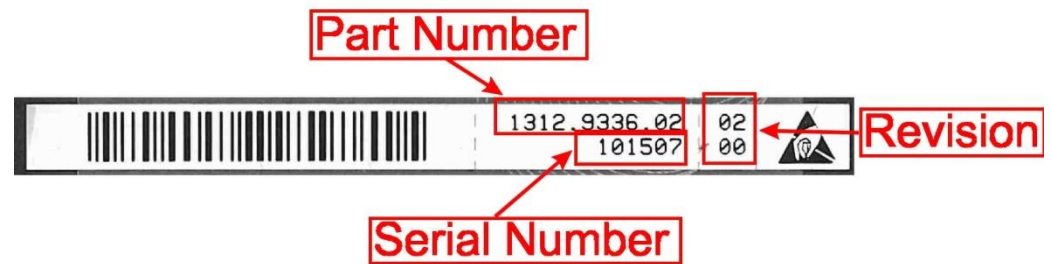
NOTICE: Do not damage the YIG filter control cable when uninstalling the shielding cap!



6. Unmount the YIG filter with its holder from the microwave converter frontend unit by unscrewing the four screws marked with B in the picture above.
7. Unmounts the YIG filter from its holder by unscrewing the four screws marked with C in the picture above.
8. Replace the YIG filter by a new one.
9. Write down the serial number, the part number and the revision of the new filter.

Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the Eeprom!)





10. Reinstall the YIG filter, its holder and the shielding cap in the inverted order of unmounting them. Use the screws formerly removed.
11. Replug the YIG filter control cable to the microwave converter frontend.
12. Reconnect the RF cables at connector X161 and X162 and the YIG filter
Tip: The connector to plug in is written on the yellow tube on the cable.
13. Reinstall the frontend unit to the instrument as described in chapter [4.3.9.3](#)
14. Mount the lower cover (refer to chapter [4.2.5](#)).
15. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.

16. Update the EPROM Data of the YIG filter

- a) Enter the service password
 [SETUP : Service : Service Function : Password = 30473035]

- b) Enter the service function
 3.7.7.1.YIG_UNIT.xxxx.xxxx.xx.yyyyyy.zz.zz

in the service dialog

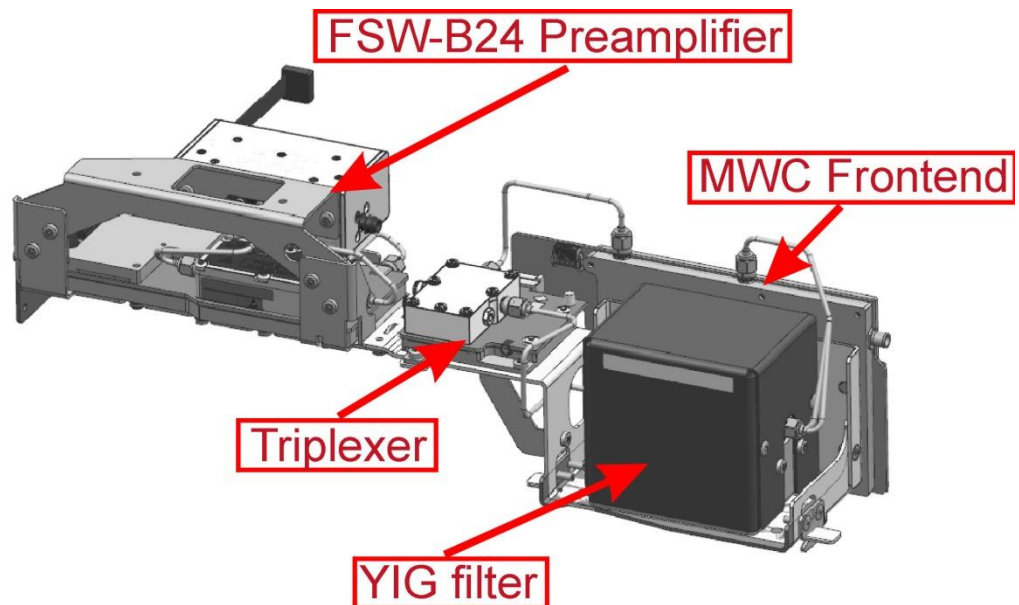
[SETUP : MORE : SERVICE : SERVICE FUNCTION]

where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 9.

Note: This service function will be available with the firmware version 1.40 and higher.

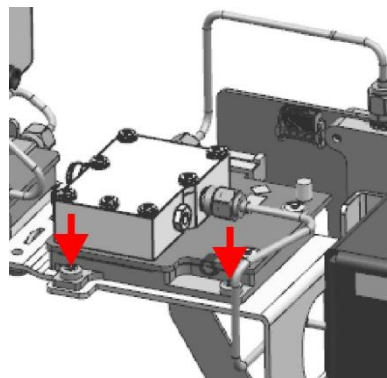
17. Enter the service function
 [3.7.7.0.YIG_UNIT]
 and verify the displayed data with the data of the new installed hardware.
18. Reset the service password
 [SETUP : MORE : SERVICE : SERVICE FUNCTION]
 [Reset Password]
19. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
20. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.9.6 Replacing the Triplexer A340



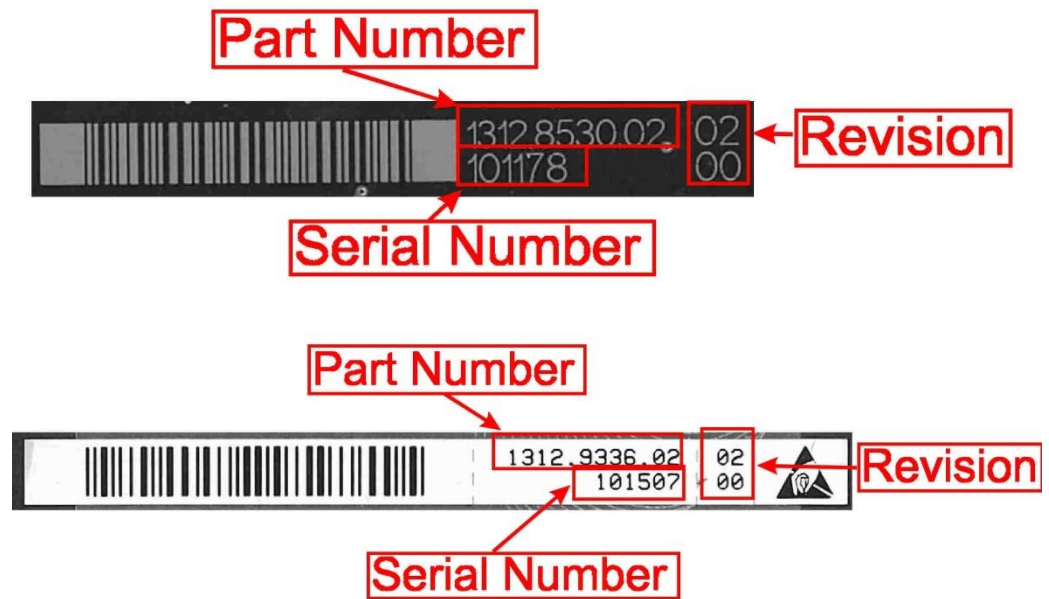
The triplexer is located on the microwave converter frontend unit.

1. Unmount the microwave converter frontend unit as described in chapter [4.3.9.2](#)
2. Uninstall the three RF cables to the triplexer.
3. Unscrew the two screws fastening the triplexer.



4. Carefully unplug the triplexer from the microwave converter frontend.
5. Replace the triplexer by a new one.
6. Replug the triplexer to the microwave converter frontend.
7. Fasten the triplexer by the screws previously removed.
8. Write down the serial number, the part number and the revision of the new triplexer.

Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the Eeprom!)



9. Reinstall the three RF cables.

Tip: The connector to plug in is written on the yellow tube on the cable.

10. Reinstall the microwave converter frontend unit to the instrument as describe in chapter 4.3.9.3
11. Mount the upper and lower cover (refer to chapter 4.2.5).
12. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
13. Update the EPROM Data of the triplexer

- a) Enter the service password
[SETUP : Service : Service Function : Password = 30473035]

- b) Enter the service function
3.7.7.1.TRIPLEXER.xxxx.xxxx.xx.yyyyyy.zz.zz

in the service dialog

[SETUP : MORE : SERVICE : SERVICE FUNCTION]

where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 8.

Note: This service function will be available with the firmware version 1.40 and higher.

14. Enter the service function

[3.7.7.0.TRIPLEXER]

and verify the displayed data with the data of the new installed hardware.

15. Reset the service password

[SETUP : MORE : SERVICE : SERVICE FUNCTION]
 [Reset Password]

16. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
17. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.10 Microwave Converter A160, A161 and A162, A170 (R&S®FSW 50/67)

The microwave converter consist of two parts: the microwave converter base board and the microwave converter frontend unit. This microwave converter frontend unit consists of the frontend and the YIG filter and the triplexer and the step attenuator and optional the preamplifier. If any of the parts mounted on the microwave converter frontend unit has to be changed the whole frontend unit must be unmounted from the instrument.

4.3.10.1 Replacing the Base Board A170

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter [4.2.4.1](#)).
3. Unmount the inner lid 1 (refer to chapter [4.2.4.2](#)).
4. Unplug the flat ribbon cable to the microwave converter frontend at the microwave converter base board side.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

5. Unplug the flat ribbon cable to the microwave converter triplexer at the microwave converter base board side.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

If option R&S®FSW-B24 is installed:

- Unplug the cable to the preamplifier at the base board.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

6. Unplug the RF cables from the microwave converter base board.
7. Set the dip switches on the new microwave converter baseboard according to the label on the board.
8. Carefully replace the microwave converter base board by a new one.
9. Reconnect the flat ribbon cables.

NOTICE**Risk of damaging connector contacts**

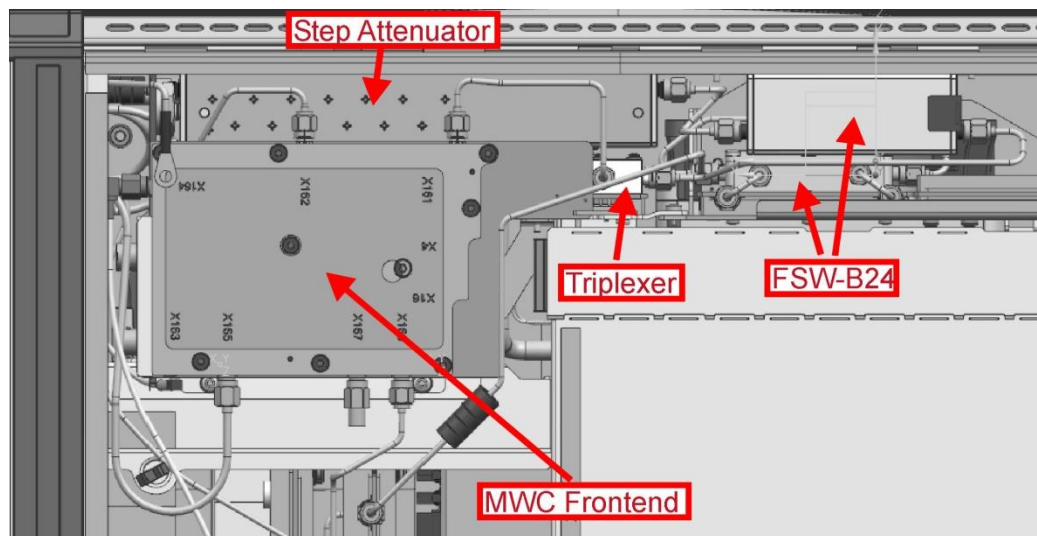
Make sure you plug in the flat ribbon cable connectors in a right angle. Otherwise, the contacts inside the connector may be damaged.

10. Reconnect the RF cables.

Tip: The connector to plug in is written on the yellow tube on the cable.

11. Mount the upper and lower cover (refer to chapter 4.2.5).
12. Mount the inner lid 1(refer to 4.2.5).
13. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
14. Perform a frequency response correction as described in chapter 4.2.6.2.
15. Perform the Basic Instrument Checks according to chapter 4.2.6.1.

4.3.10.2 Unmounting the Microwave converter frontend unit A160



1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to chapter 4.2.4.1).
3. Unmount the right side cover (refer to chapter 4.2.4.3).
4. Unplug the flat ribbon cable at the microwave converter frontend side.

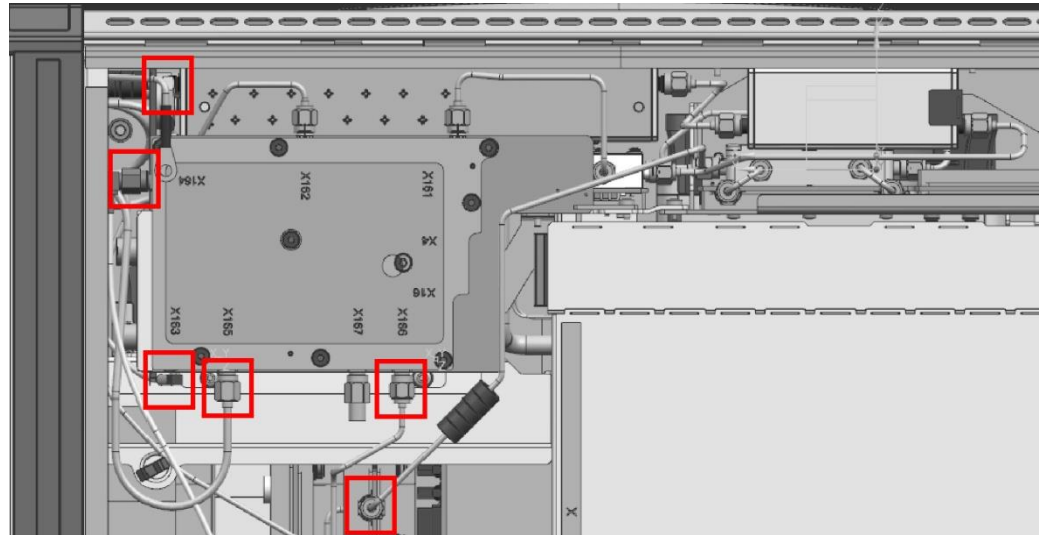
Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

5. Unplug the flat ribbon cable of the step attenuator at the motherboard side.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

6. Unplug all RF cables marked in the picture below from the microwave converter frontend unit.

Note: The picture shows an instrument with option R&S®FSW-B24 installed.

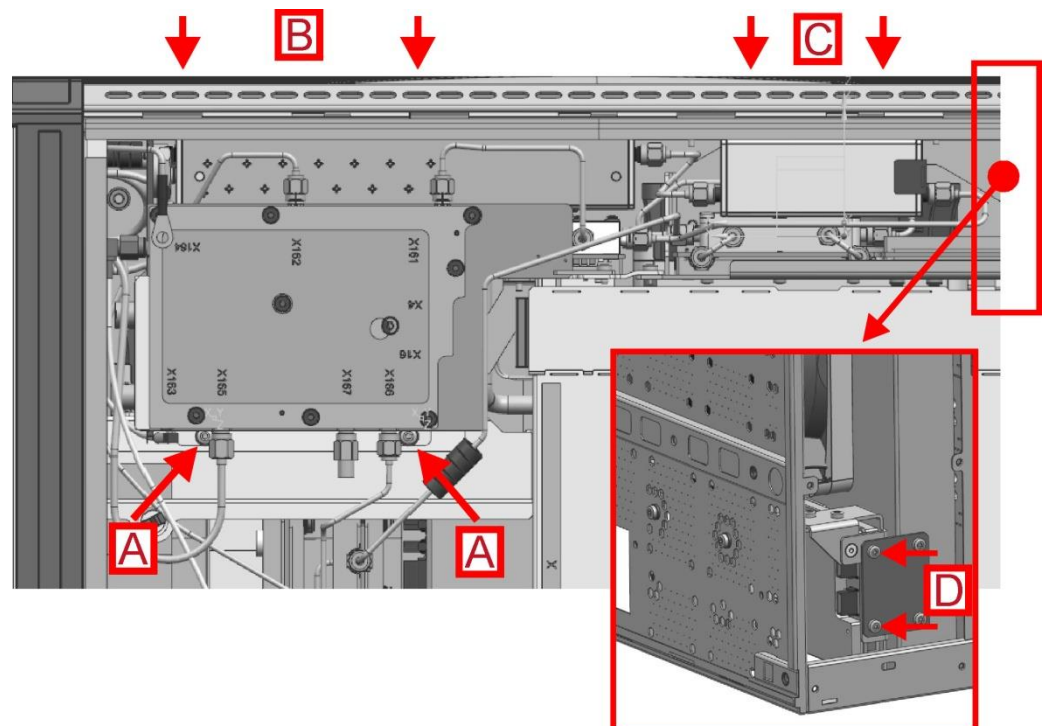


7. Unscrew the two screws marked with A fastening the microwave converter frontend unit.

Note: The picture shows an instrument with option R&S®FSW-B24 installed.

If option R&S®FSW-B24 is installed:

- a) Unscrew the eight screws fastening the left metal sheet on the back of the instrument and remove it.
- b) Unscrew the two screws at the left side of the instrument, marked with C in the picture below, and the two screws from the backside of the instrument also marked with D in the picture below.

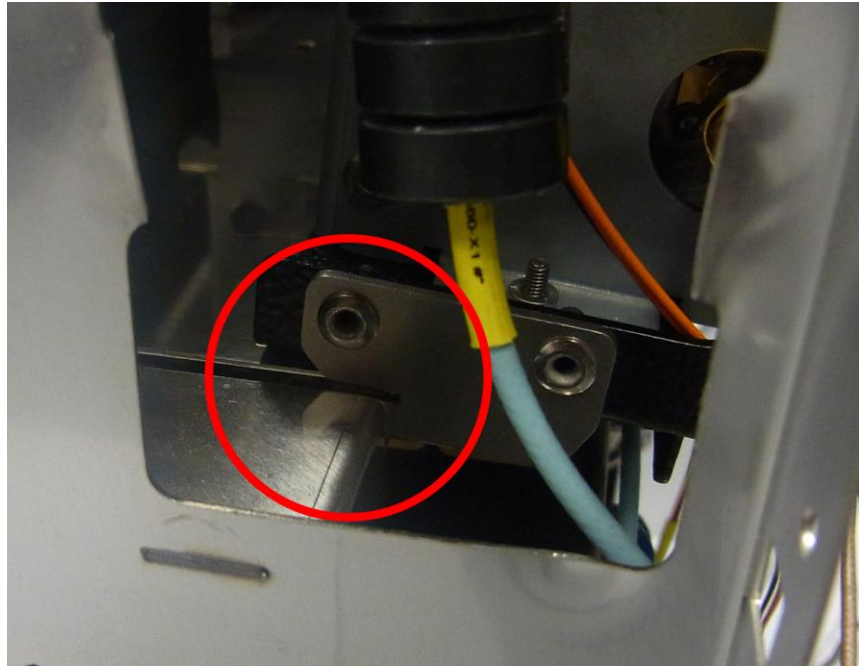


8. Unscrew the screws fastening the step attenuator at the right side of the instrument marked with B.
9. Carefully remove the microwave converter frontend unit from the instrument chassis by pulling it towards the bottom of the instrument.

4.3.10.3 Installing the microwave converter frontend unit A160

1. Carefully insert the microwave converter frontend unit in the instrument chassis.

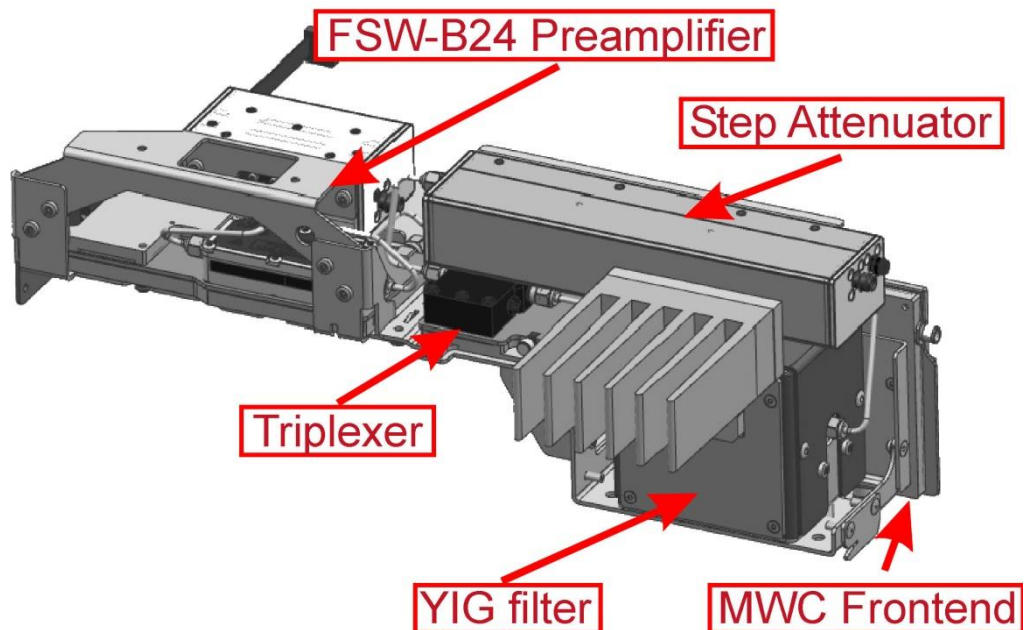
NOTICE: the hooks on both sides of the microwave converter frontend unit must match the trenches in the instrument chassis.



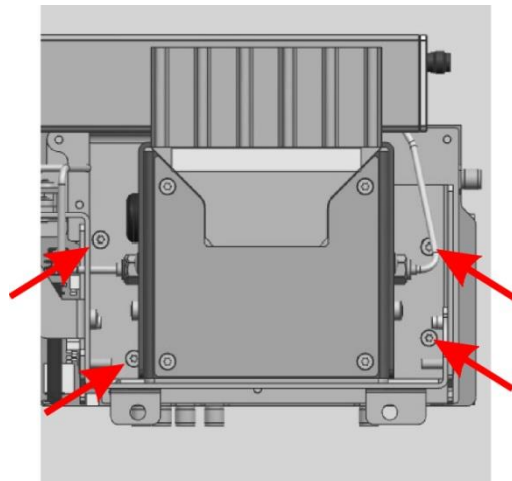
2. Fasten the microwave converter frontend unit by installing the screws previously removed
3. Reconnect all RF cables previously removed.
4. Reconnect the flat ribbon cables at the microwave converter base board.
5. Reconnect the cable of the step attenuator at the motherboard.
6. Mount the lower cover (refer to chapter [4.2.5](#)).
7. Mount the right cover (refer to [4.2.5](#)).
8. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
9. Perform a frequency response correction as described in chapter [4.2.6.2](#).
10. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

4.3.10.4 Replacing the Microwave Converter Frontend A161

The microwave converter frontend is part of the microwave converter frontend unit. For replacing the frontend board first uninstall the microwave converter frontend unit as described in chapter [4.3.10.2](#). The picture below shows a R&S®FSW 50 microwave converter frontend unit with installed option R&S®FSW-B24.

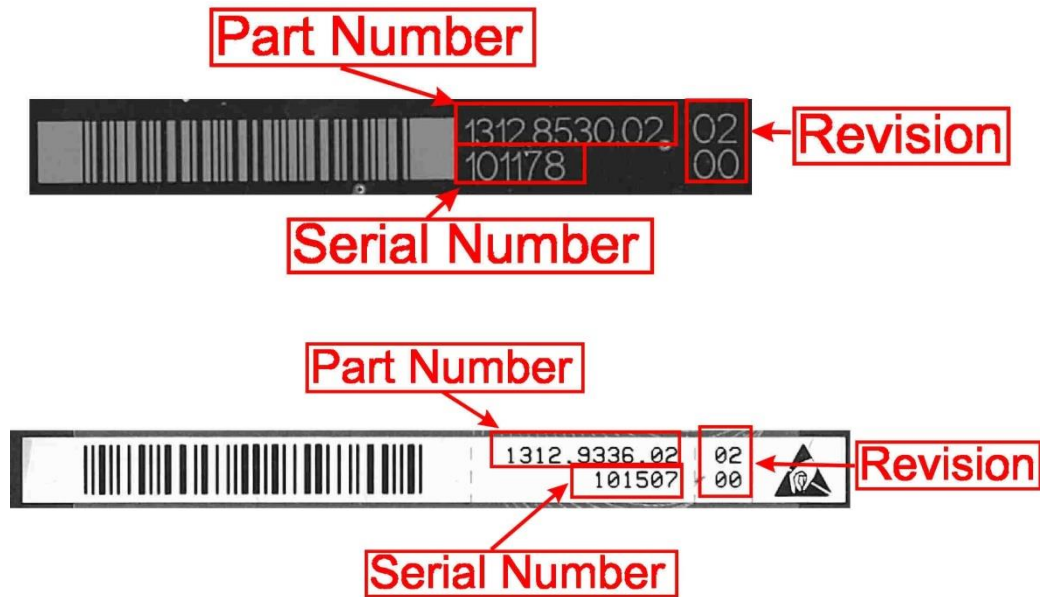


1. Unmount the microwave converter frontend unit as described in chapter 4.3.10.2
2. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
3. Unscrew the four screws fastening the microwave converter frontend to the frontend unit holder.



4. Replace the microwave converter frontend by a new one and fasten the four screws previously removed.
5. Write down the serial number, the part number and the revision of the new board.

Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the Eeprom!)



- 6.
7. Replug the YIG filter control cable to the new microwave converter frontend.
8. Reconnect the RF cables at connector X161 and X162 and the YIG filter
Tip: The connector to plug in is written on the yellow tube on the cable.
9. Reinstall the microwave converter frontend unit to the instrument as described in chapter 4.3.10.3.
10. Mount the right side cover (refer to chapter 4.2.5).
11. Mount the upper and lower cover (refer to 4.2.5).
12. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
13. Update the EPROM data of the microwave converter frontend.

- a) Enter the service password
 [SETUP : Service : Service Function : Password = 30473035]
- b) Enter the service function
 3.7.7.1.FRONTEND.xxxx.xxxx.xx.yyyyyy.zz.zz
 in the service dialog
 [SETUP : MORE : SERVICE : SERVICE FUNCTION]

where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 11!

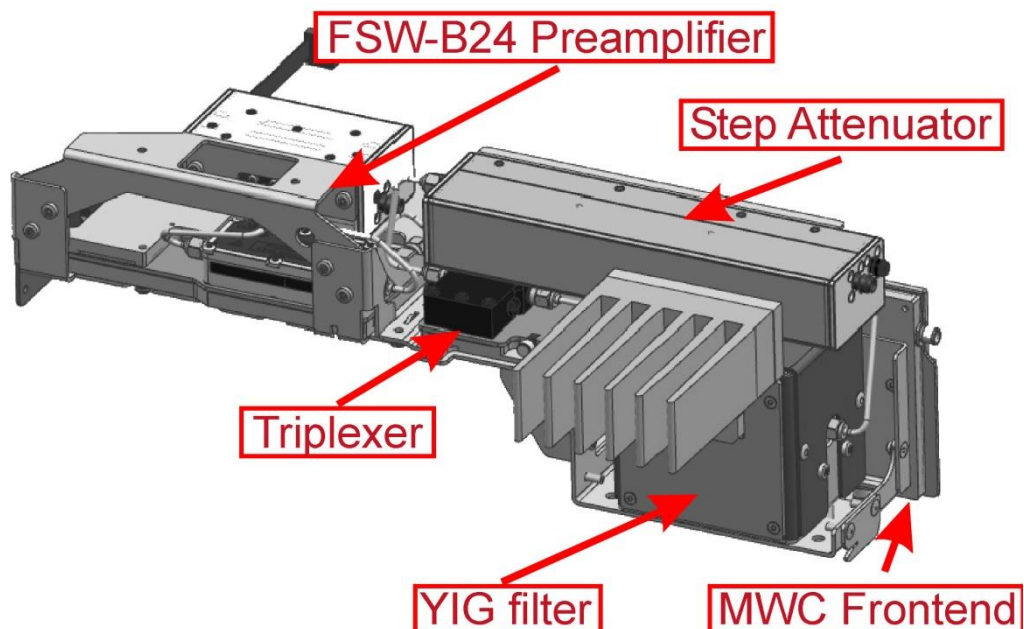
NOTICE**Risk of losing important information**

This service function must be carried out after the first boot of the firmware after replacing the hardware! Otherwise the EEPROM data, necessary to run the instrument properly, is lost!

14. Enter the service function
[3.7.7.0.FRONTEND]
and verify the displayed data with the data of the new installed hardware.
15. Reset the service password
[SETUP : MORE : SERVICE : SERVICE FUNCTION]
[Reset Password]
16. Perform a frequency response correction as described in chapter [4.2.6.2](#).
17. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

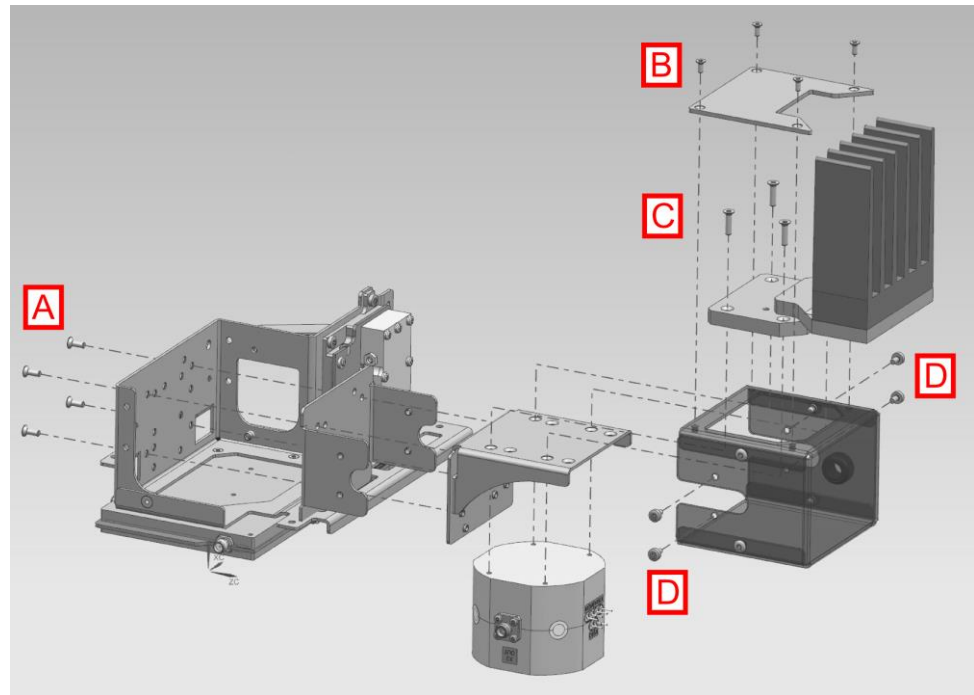
4.3.10.5 Replacing the YIG Filter A162

The YIG filter is mounted on the microwave converter frontend unit. To replace it the whole microwave converter frontend unit has to be removed from the instrument.



1. Unmount the microwave converter frontend unit as described in chapter [4.3.10.2](#)
2. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.

3. Unplug the YIG filter control cable.
4. Uninstall the two RF cable on the YIG filter.
5. Uninstall the YIG filter with its shielding cap and heat sink by unscrewing the four screws marked with A in the picture below.
6. Uninstall the covering plate by unscrewing the four screws marked with B in the picture below.
7. Uninstall the heat sink on the YIG filter by removing the four screws marked with C in the picture below.



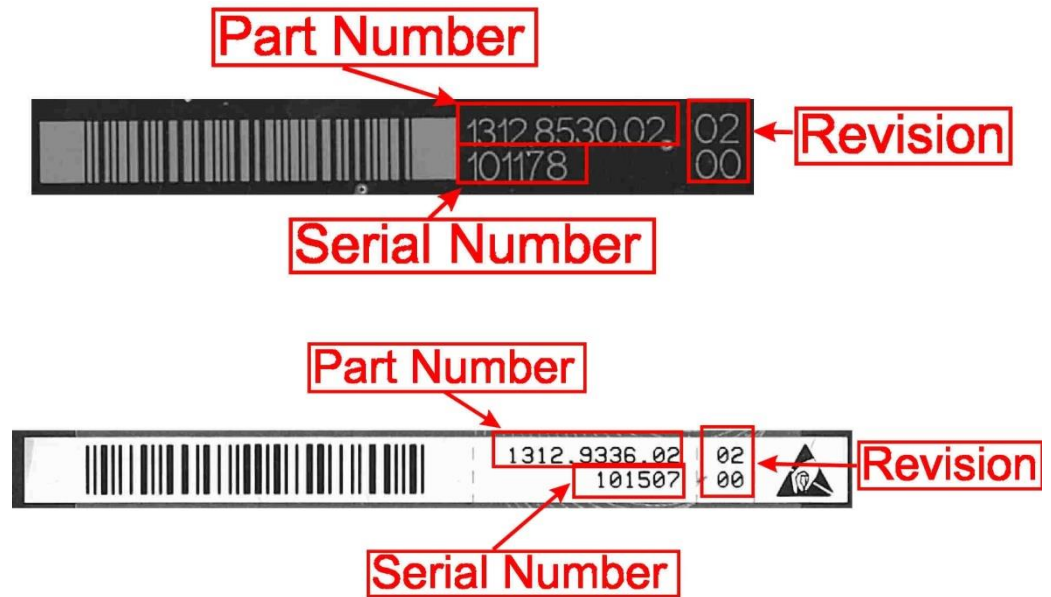
8. Uninstall the shielding cap with the YIG filter by unscrewing the four screws marked with D in the picture above.

NOTICE: the YIG filter is hold by the screws removed with the heat sink! So be careful when uninstalling the shielding cap.

NOTICE: Do not damage the YIG filter control cable when uninstalling the shielding cap!

9. Replace the YIG filter by a new one.
10. Write down the serial number, the part number and the revision of the new filter.

Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the Eeprom!)



11. Mount the YIG filter with its shielding cap and heat sink in inverted order of disassembling it. Use the screws formerly removed. Replace the thermal conductive pad if it was installed formerly before reinstalling the heat sink.
12. Reinstall the YIG filter to the microwave converter frontend unit.
13. Replug the YIG filter control cable to the microwave converter frontend.
14. Reconnect the RF cables at connector X161 and X162 and the YIG filter

Tip: The connector to plug in is written on the yellow tube on the cable.

15. Reinstall the microwave converter frontend unit to the instrument as described in chapter [4.3.10.3](#)
16. Mount the right side cover (refer to chapter [4.2.5](#)).
17. Mount the upper and lower cover (refer to [4.2.5](#)).
18. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.

19. Update the EPROM Data of the YIG filter

a) Enter the service password
[SETUP : Service : Service Function : Password = 30473035]

b) Enter the service function
3.7.7.1.YIG_UNIT.xxxx.xxxx.xx.yyyyyy.zz.zz

in the service dialog

[SETUP : MORE : SERVICE : SERVICE FUNCTION]

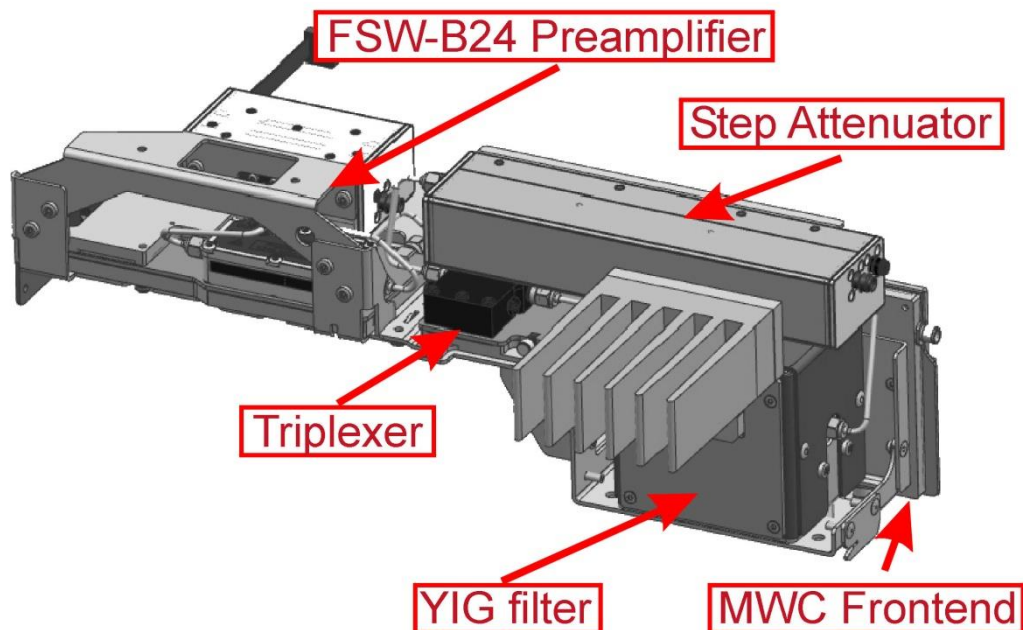
where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 9.

Note: This service function will be available with the firmware version 1.40 and higher.

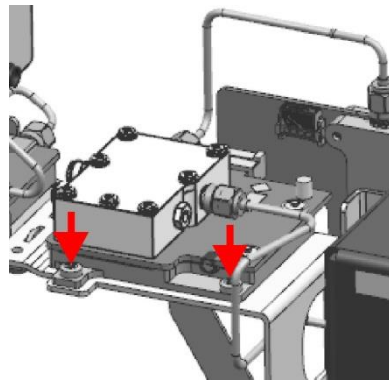
20. Enter the service function
[3.7.7.0.YIG_UNIT]
and verify the displayed data with the data of the new installed hardware.
21. Reset the service password
[SETUP : MORE : SERVICE : SERVICE FUNCTION]
[Reset Password]
22. Perform a frequency response correction as described in chapter 4.2.6.2.
23. Perform the Basic Instrument Checks according to chapter 4.2.6.1.

4.3.10.6 Replacing the Triplexer A340

The triplexer is located on the microwave converter frontend unit.

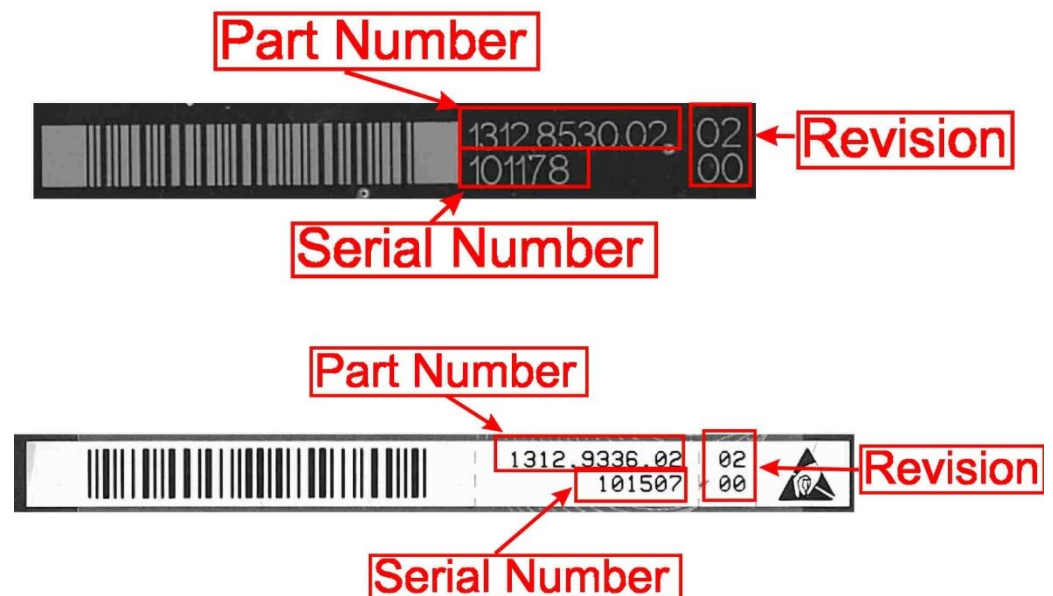


1. Unmount the microwave converter frontend unit as described in chapter 4.3.10.2.
2. Unconnected the RF cables to the step attenuator.
3. Unmount the step attenuator from the microwave converter frontend unit.
4. Uninstall the three RF cables to the triplexer.
5. Unscrew the two screws fastening the triplexer.



6. Carefully unplug the triplexer from the microwave converter frontend.
7. Replace the triplexer by a new one.
8. Replug the triplexer to the microwave converter frontend.
9. Fasten the triplexer by the screws previously removed.
10. Write down the serial number, the part number and the revision of the new triplexer.

Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the Eeprom!)



11. Reinstall the three RF cables.

Tip: The connector to plug in is written on the yellow tube on the cable.

12. Reinstall the step attenuator to the microwave converter frontend unit
13. Reinstall the cables to the step attenuator

14. Reinstall the microwave converter frontend unit to the instrument as describe in chapter [4.3.10.3](#)
15. Mount the right side cover (refer to chapter [4.2.5](#)).
16. Mount the upper and lower cover (refer to [4.2.5](#)).
17. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
18. Update the EPROM Data of the triplexer
 - a) Enter the service password
[SETUP : Service : Service Function : Password = 30473035]
 - b) Enter the service function
3.7.7.1.TRIPLEXER.xxxx.xxxx.xx.yyyyyy.zz.zz
in the service dialog
[SETUP : MORE : SERVICE : SERVICE FUNCTION]
where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 8.

Note: This service function will be available with the firmware version 1.70 and higher.
19. Enter the service function
[3.7.7.0.TRIPLEXER]
and verify the displayed data with the data of the new installed hardware.
20. Reset the service password
[SETUP : MORE : SERVICE : SERVICE FUNCTION]
[Reset Password]
21. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
22. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.11 Microwave Converter A700, A490, A480, A470, A450, A160, A161, A162, A170 (R&S®FSW 85)

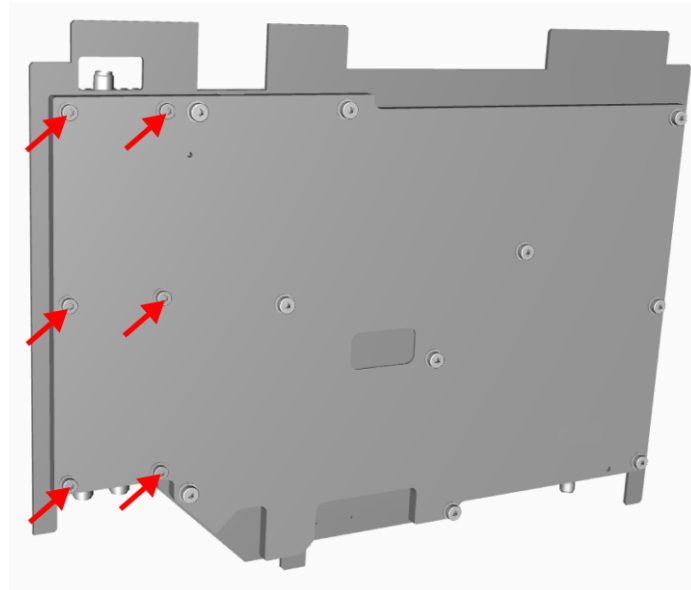
4.3.11.1 Base Board 85 A450

Replacing the Base Board 85 board:

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter [4.2.4.1](#)).
3. Unmount the inner lid 1 (refer to chapter [4.2.4.2](#)).
4. Disconnect flat ribbon cables to switch matrix controller unit, YIG filter2 module, converter 85 control unit.

Note: The connectors are locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

5. Disconnect all RF cables on the base board 85 side.
6. Carefully remove the base board 85 module from the instrument frame.
7. Remove RF cable on top of module.
8. Remove 6 screws fastening the LO module to the base board 85 board. The screws are marked with an arrow in the picture below.

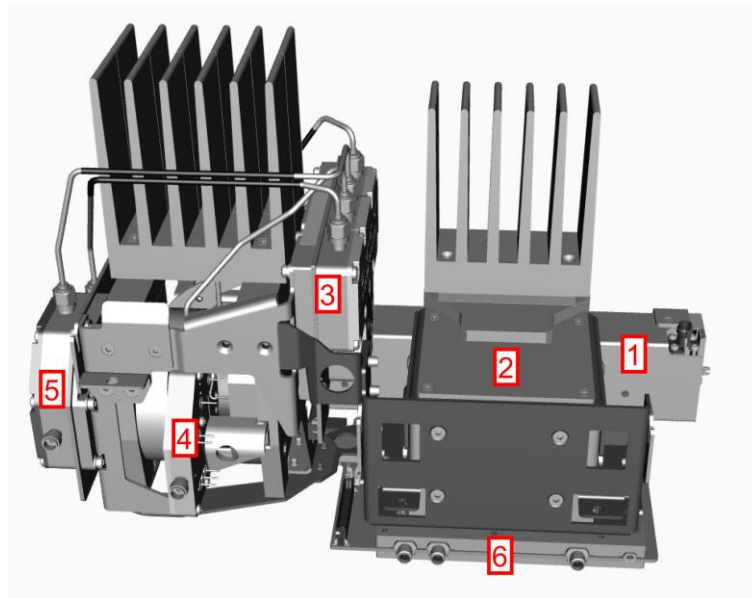


9. Remove the LO module from the board by pulling it out of the connectors on the board.
10. Reinstall the LO module to the new base board 85 board
11. Reinstall the 6 screws formerly removed.
12. Reinstall the RF cable on the top of the module connecting the LO module with the base board 85 board.
13. Reinstall the base board 85 module to the instrument frame.
14. Reconnect the RF cables to the base board 85 module.
15. Reconnect the flat ribbon cables.
16. Mount the upper and lower cover (refer to chapter [4.2.5](#)).
17. Mount the inner lid (refer to chapter [4.2.5](#)).
18. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
19. Perform a frequency response correction as described in chapter [4.2.6.1](#).
20. Perform the Basic Instrument Checks according to chapter [4.2.6.2](#).

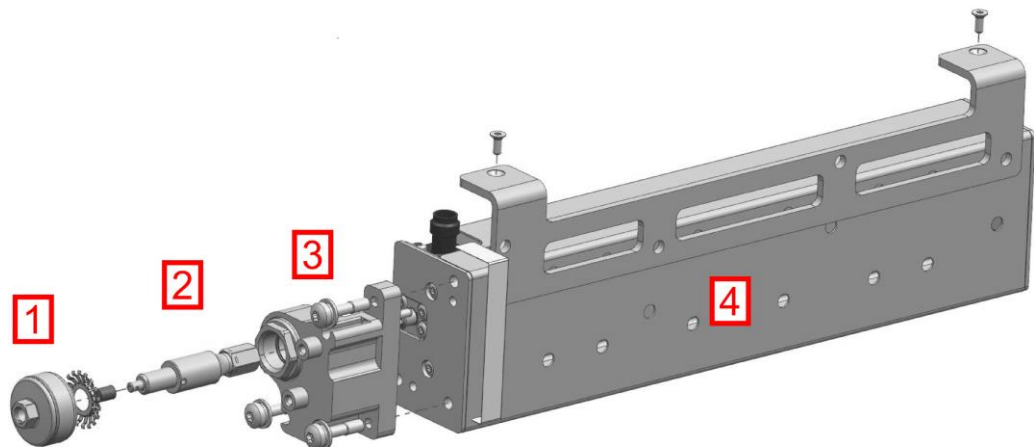
Replacing the LO Module:

Do the same steps as described in chapter [Replacing the Base Board 85 board](#): but replace the LO module by a new one instead of the board.

4.3.11.2 Microwave converter frontend unit A700 and A160



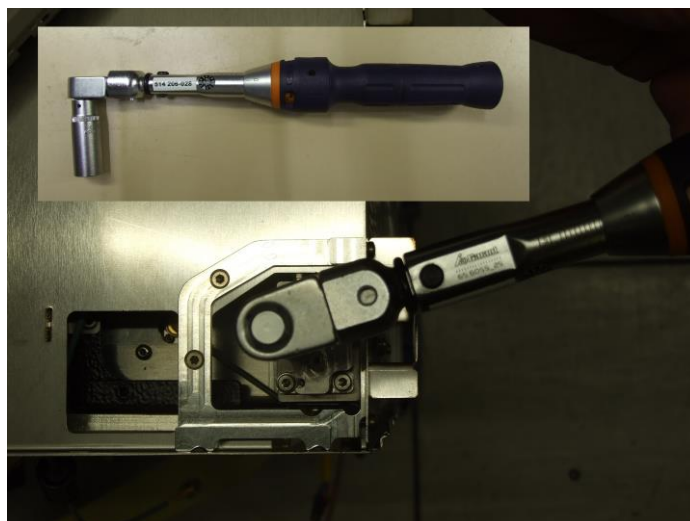
Position	Module
1	Step Attenuator A50
2	YIG filter 1
3	Switch Matrix controller unit
4	YIG filter 2 module
5	Converter 85 control module
6	Microwave converter frontend



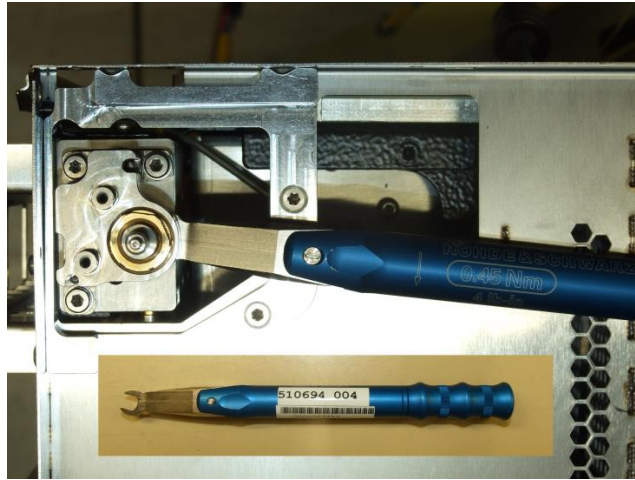
Position	Module
1	RF input adaptor
2	Victim adaptor
3	Victim adapter holder
4	Step Attenuator A50

Uninstalling the microwave converter frontend unit

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to chapter [4.2.4.1](#)).
3. Unmount the right side cover (refer to chapter [4.2.4.3](#)).
4. Unmount the frontpanel (refer to chapter [4.2.5](#)).
5. Loosen the bracket of the victim adaptor by use of mounting tool 2.



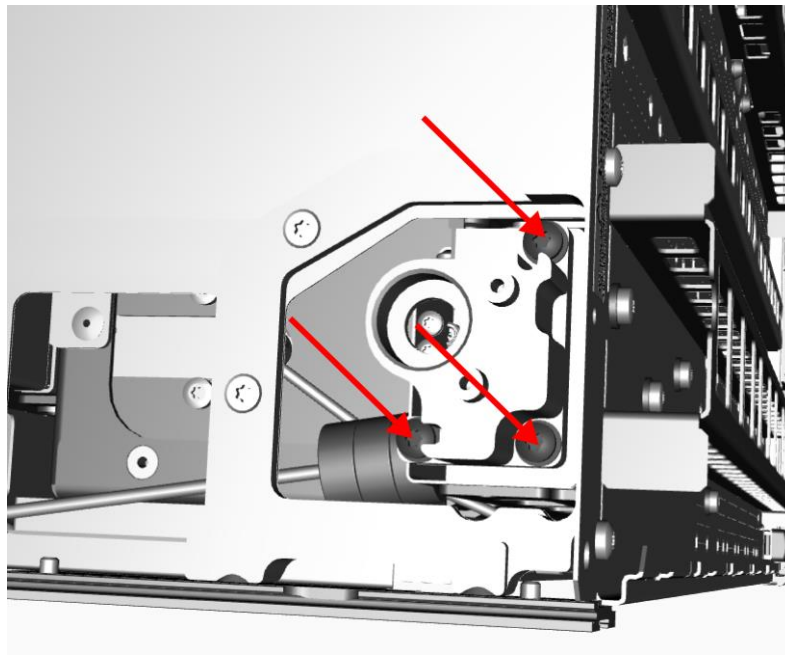
6. Loosen the 1mm connector at the step attenuator by use of the mounting tool 1.



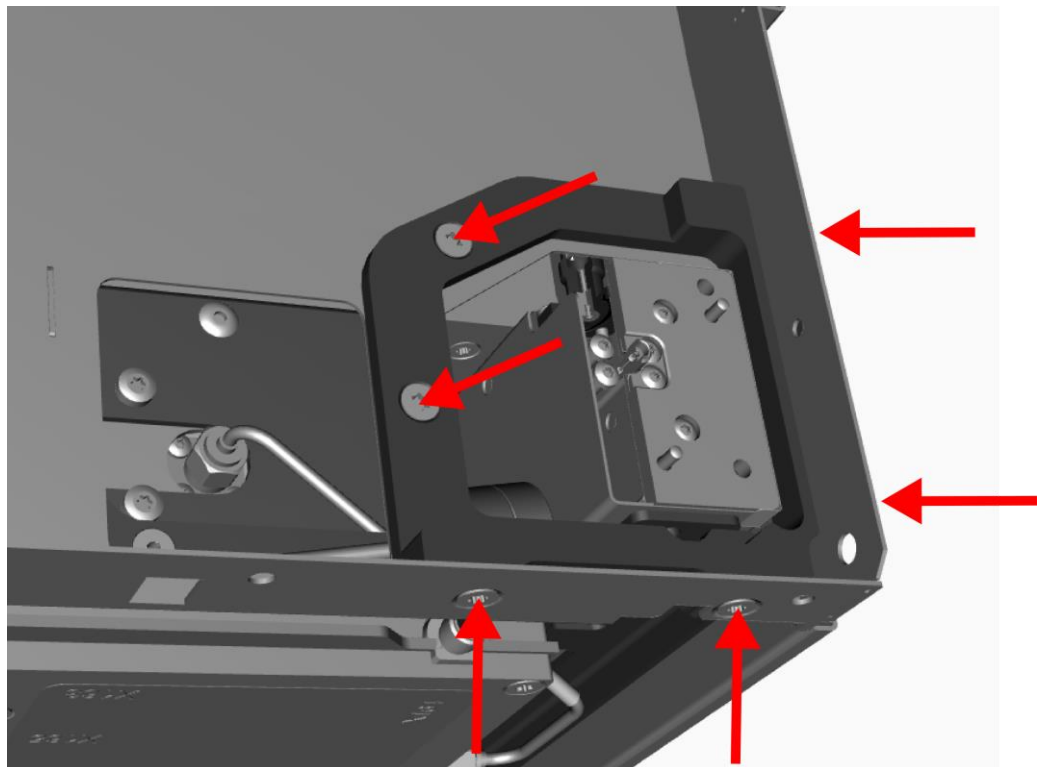
7. Carefully remove the victim adaptor.



8. Remove the three screws fastening the victim adapter holder to the attenuator and remove the victim adapter holder.



9. Remove the six screws fastening the front reinforcement part and remove the front reinforcement part.



10. Unplug the flat ribbon cables at the microwave converter frontend and base board 85 side.

Note: The connectors are locked. To unlock a connector press the two clamps on the small side of the connector at the same time and remove the connector.

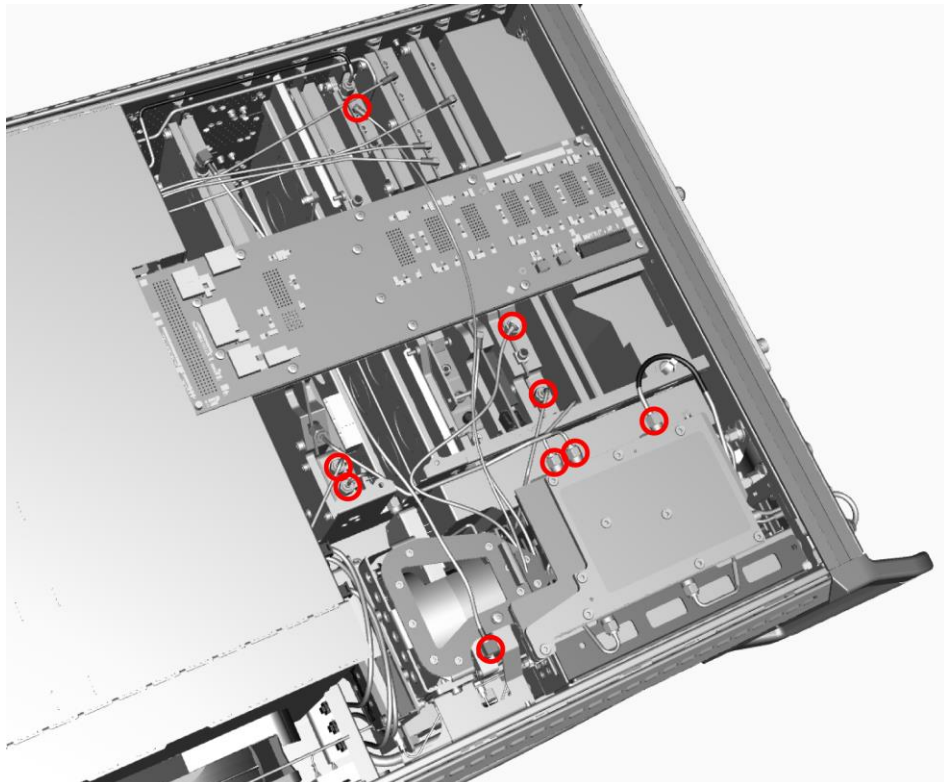
11. Unplug the flat ribbon cable of the step attenuator at the motherboard side.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

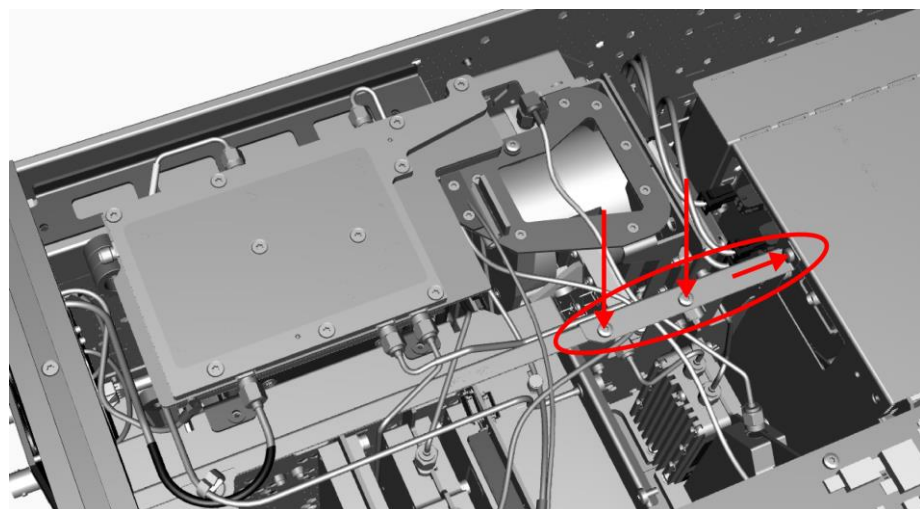
12. Unplug the three fan connectors at the motherboard side.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

13. Unplug all RF cables marked in the picture below.

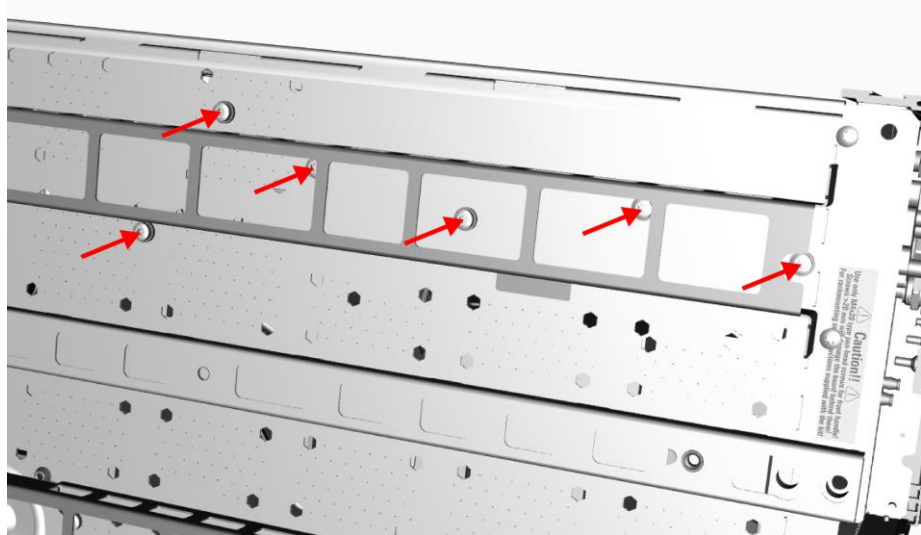


14. Remove the three screws marked with an arrow in the picture below, then remove the sheet metal part marked with a circle.

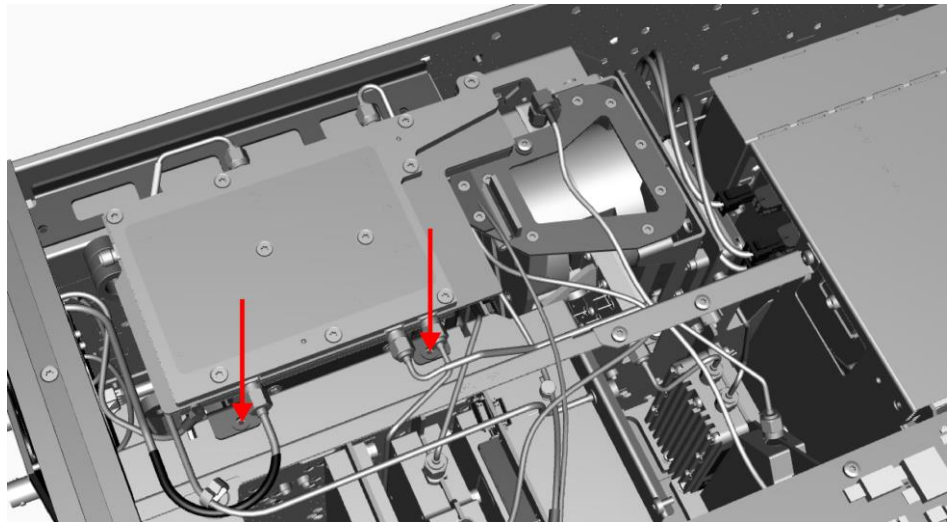


15. Remove the six screws at the right side fastening the attenuator and the microwave converter frontend unit to the instrument frame, marked with an arrow in the picture below.

Note: Do not lose the insulation washers!



16. Remove the two screws marked with an arrow in the picture below.

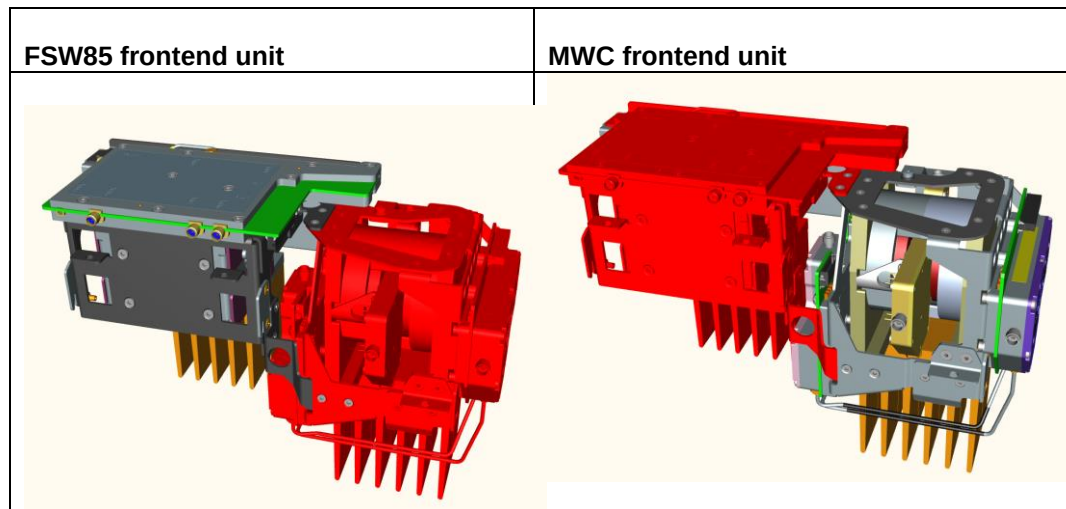


17. Remove the microwave converter frontend unit carefully from the instrument frame by pulling it towards the bottom of the instrument.

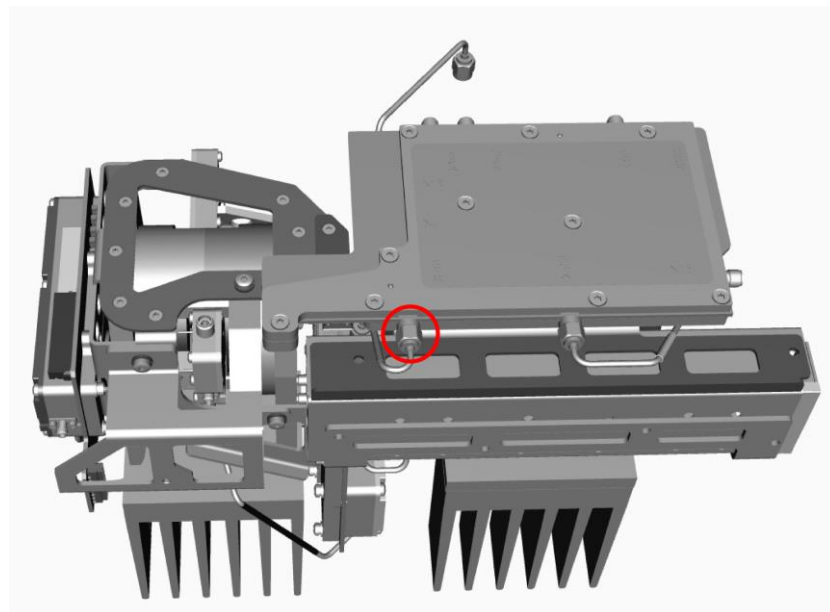
Note: Be careful some of the RF cables are still connected to the microwave converter frontend unit! Do not bend them!

Separating the R&S®FSW85 frontend unit A700 and the MWC frontend unit A160:

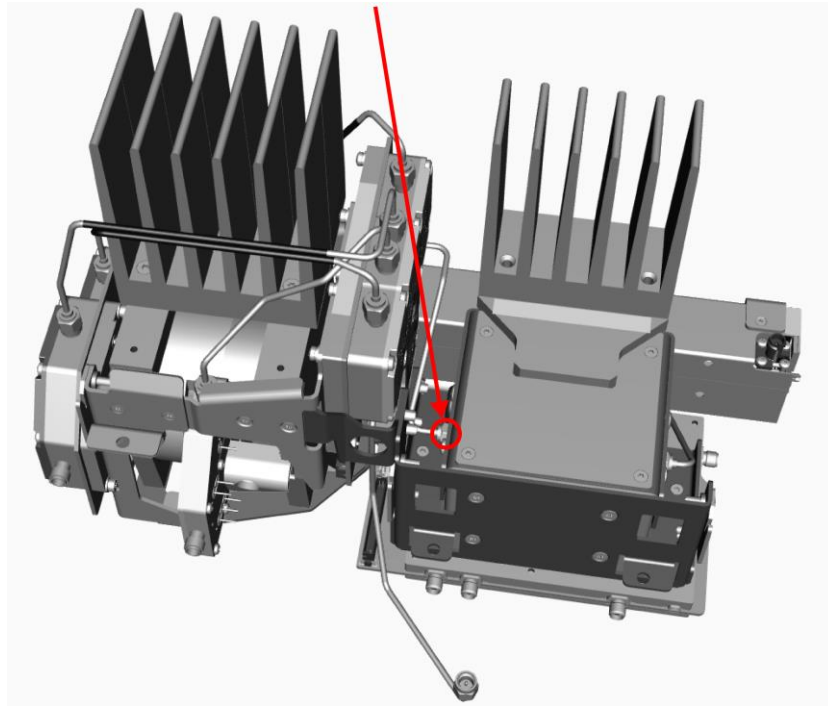
To reach each part on the microwave converter frontend unit the part must be dissolved in the two parts shown below:



1. Switch off the instrument and disconnect the power plug.
2. Remove the microwave converter frontend unit from the instrument frame and separate the two converter units as described in chapter [4.3.11, Uninstalling the microwave converter frontend unit](#)
3. Remove the attenuator from the microwave converter frontend unit as described in chapter [Attenuator A40](#)
4. Disconnect the RF cable to the microwave converter frontend at the microwave converter frontend as marked in the picture below

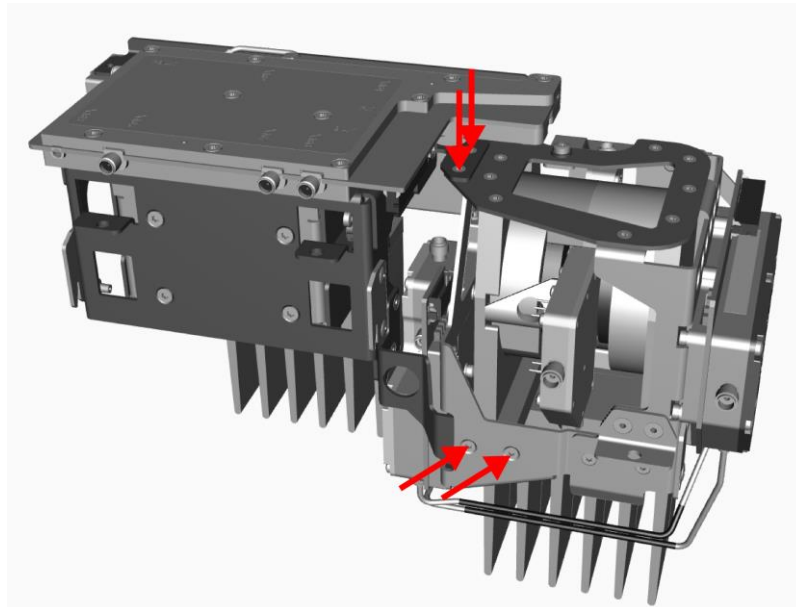


5. Disconnect the RF cable to the YIG filter at the YIG filter as marked in the picture below.



6. Remove the four screws fastening the FSW85 frontend unit to the MWC frontend unit marked in the picture below.

NOTICE! The parts are very heavy! Be careful not to damage any RF cable! Perhaps you have to use a kind of holder for the two parts.

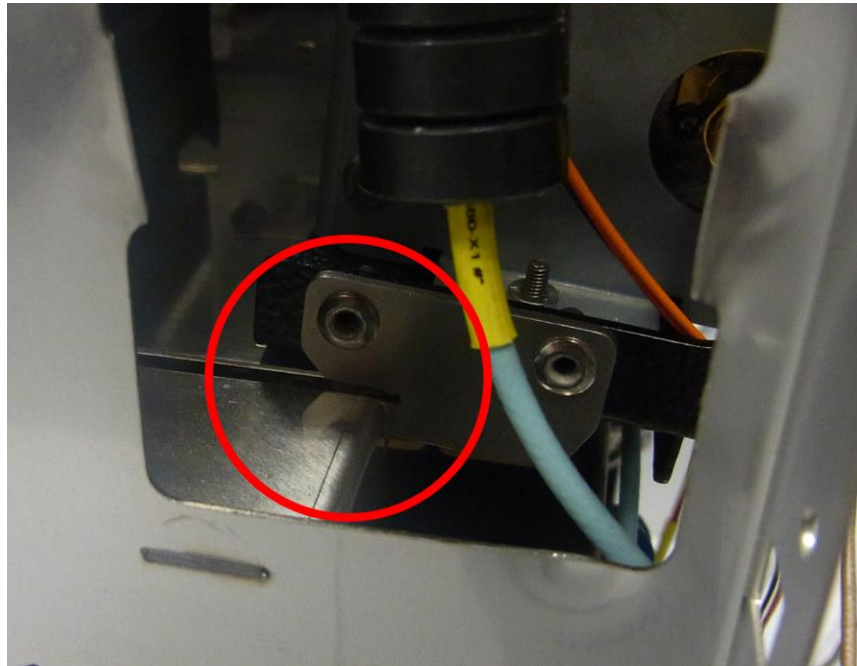


7. Remove the MWC frontend unit from the FSW85 frontend unit.

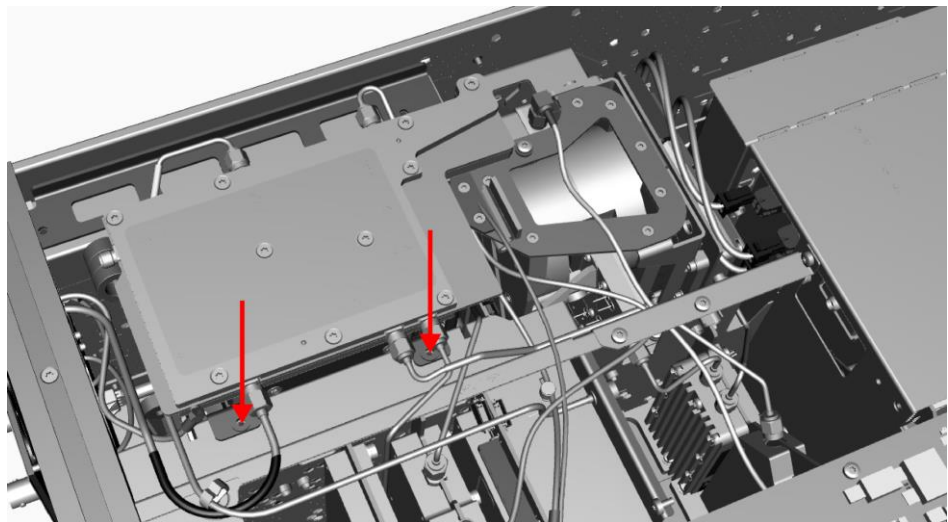
Installing the microwave converter frontend unit

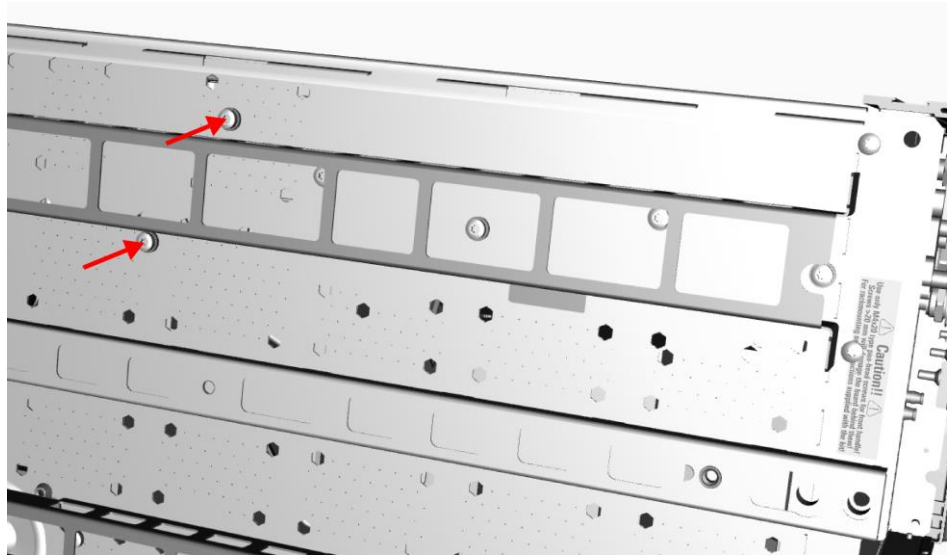
1. Carefully insert the microwave converter frontend unit in the instrument chassis.

NOTICE: the hooks on both sides of the microwave converter frontend unit must match the trenches in the instrument chassis.



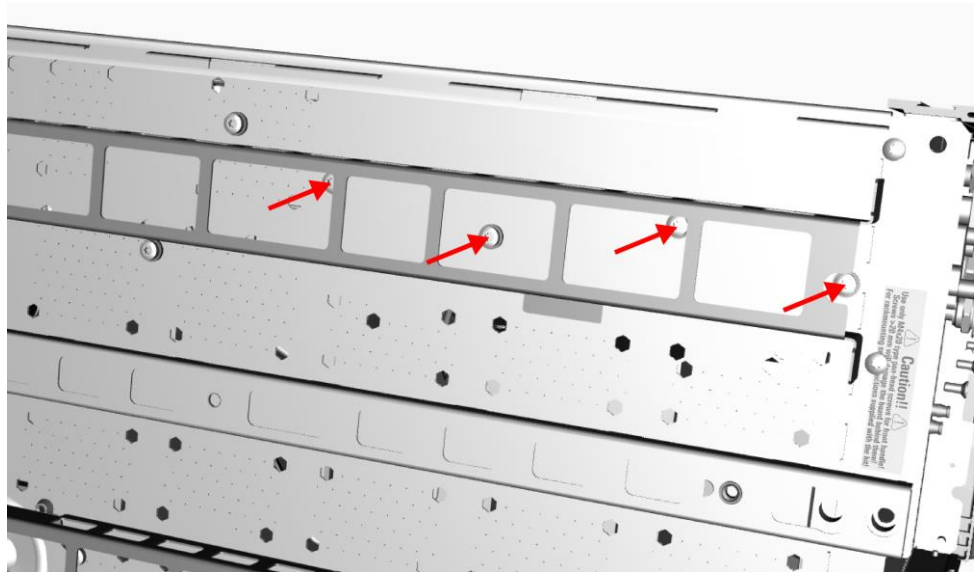
2. Fasten the microwave converter frontend unit by installing the screws marked with an arrow in the picture below.





Note: Do not forget to install the insulation washers!!

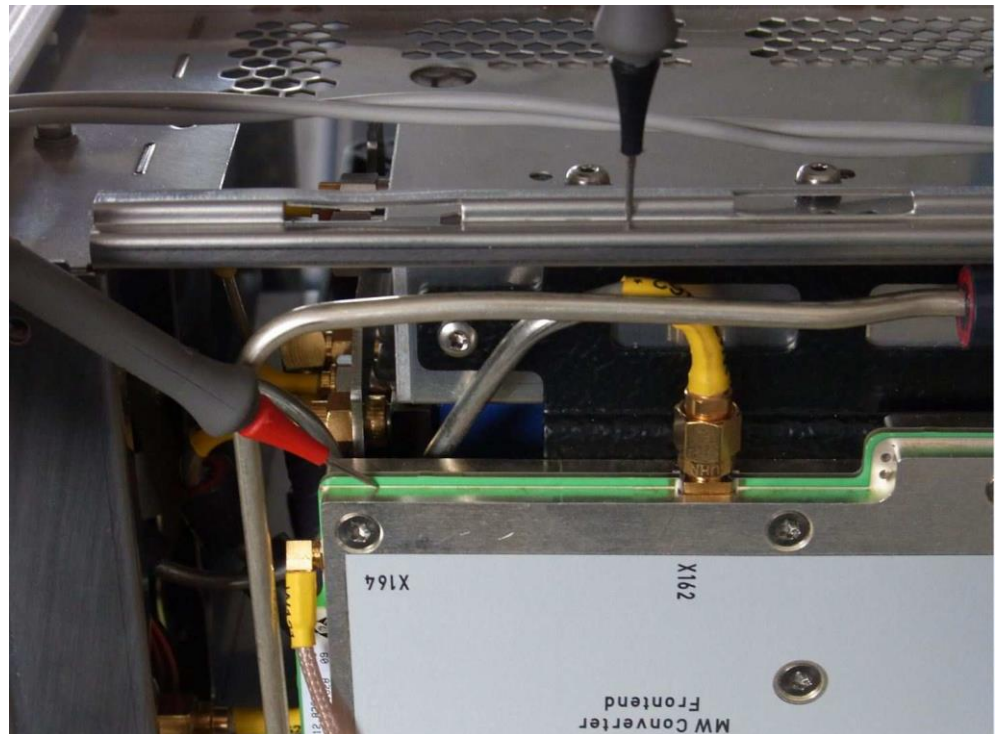
3. Install the screws fastening the attenuator (marked with an arrow in picture below) but do not fasten it!



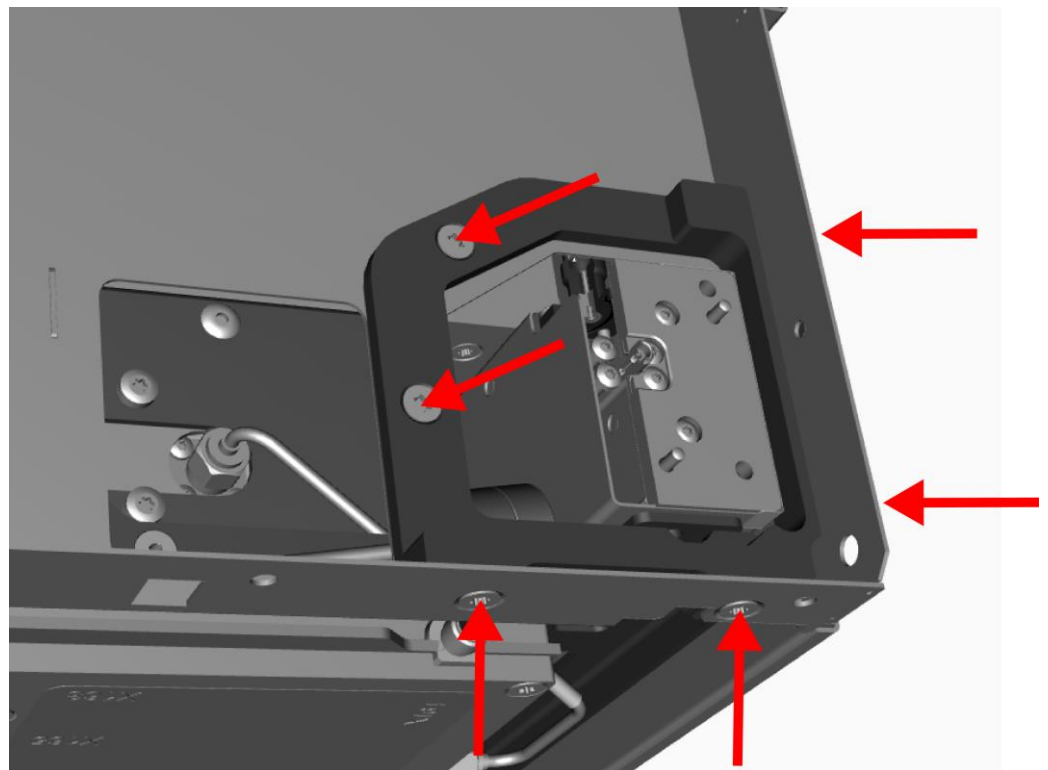
Note: Do not forget to install the insulation washers!!

4. Check the DC resistance to ground. Use a multimeter in setting resistance to check the DC resistance from the microwave converter frontend unit to the instrument frame as shown in the picture below. Minimum resistance to ground is 10kOhm!

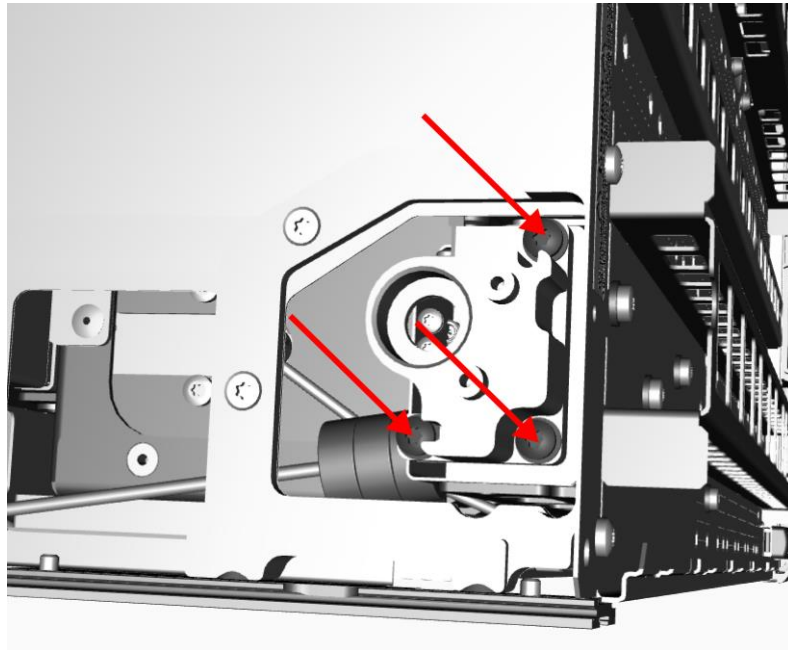
Note: Be sure no RF cable contacts the rest of the instrument when measuring the resistance!



5. Reconnect all RF cables previously removed.
6. Reconnect all flat ribbon cables.
7. Reinstall the front reinforcement part and fasten it with the 6 screws formerly removed..



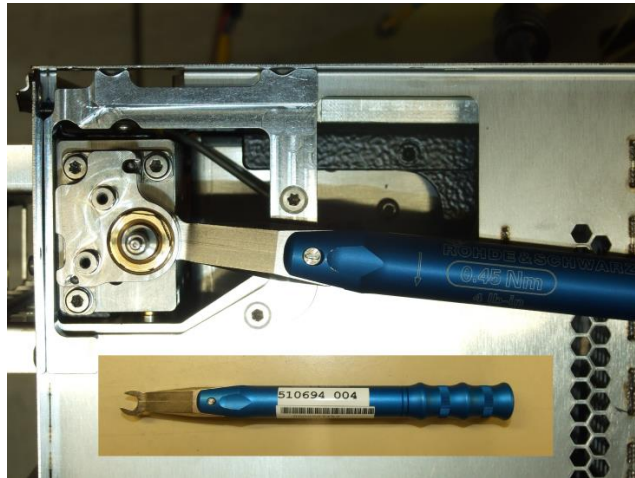
8. Reinstall the victim adapter holder and fasten it to the attenuator by installing the 3 screws formerly removed.



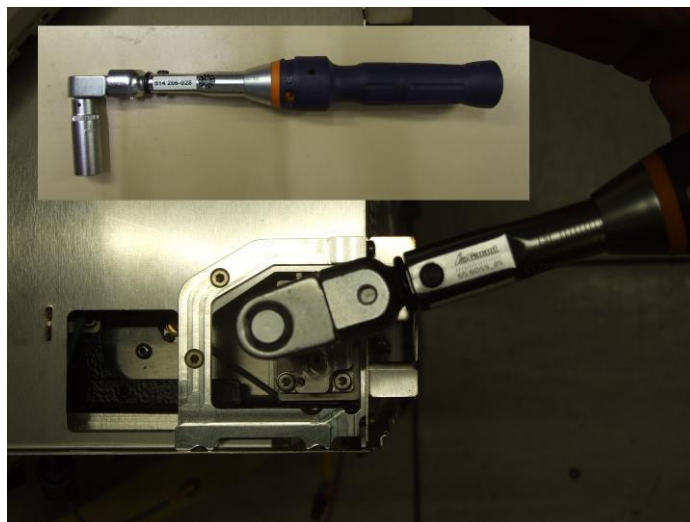
9. Carefully insert the victim adaptor in its holder.



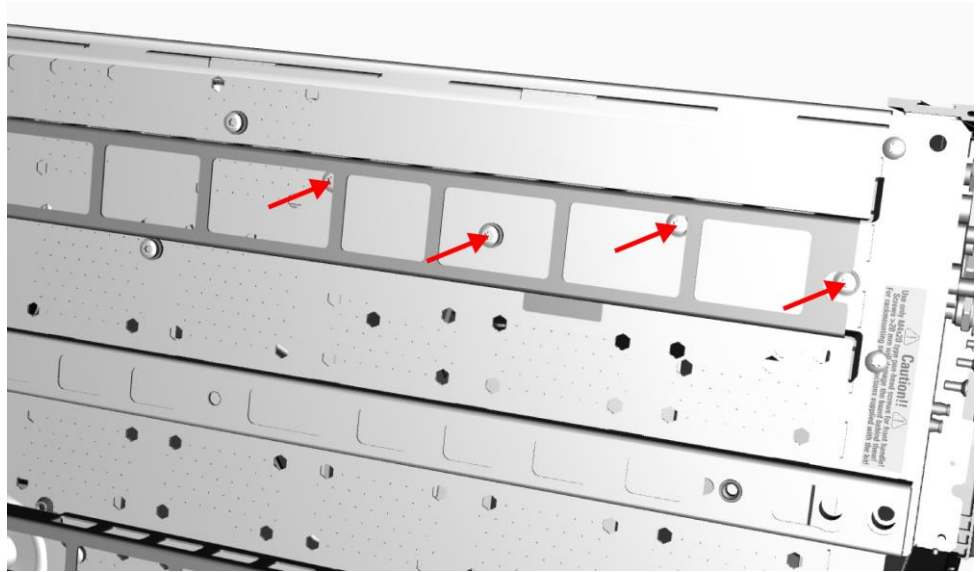
10. Carefully tighten the 1mm connector at the step attenuator by use of the mounting tool 1 with **0.45Nm**.



11. Carefully tighten the bracket of the victim adaptor by use of mounting tool 2 with **5Nm**.

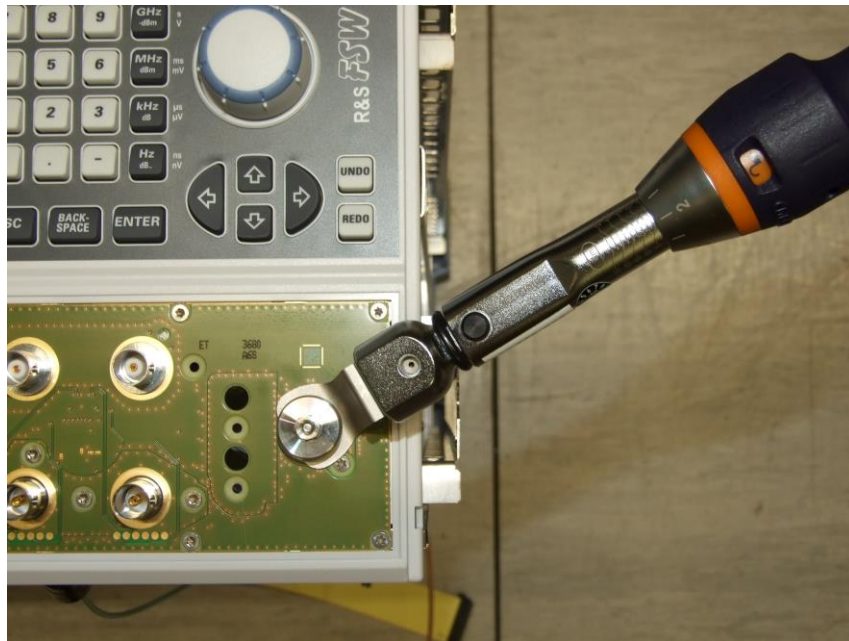


12. Reinstall the frontpanel (refer to chapter [4.2.5](#))
13. Tighten the screws marked with an arrow in the picture below fastening the attenuator.



14. Remove the security cap over the victim adaptor and reinstall the ball bearing mounted head and tighten it by use of the mounting tool 3 with **3Nm**.

NOTICE: Do not damage the inner conductor of the RF input connector.

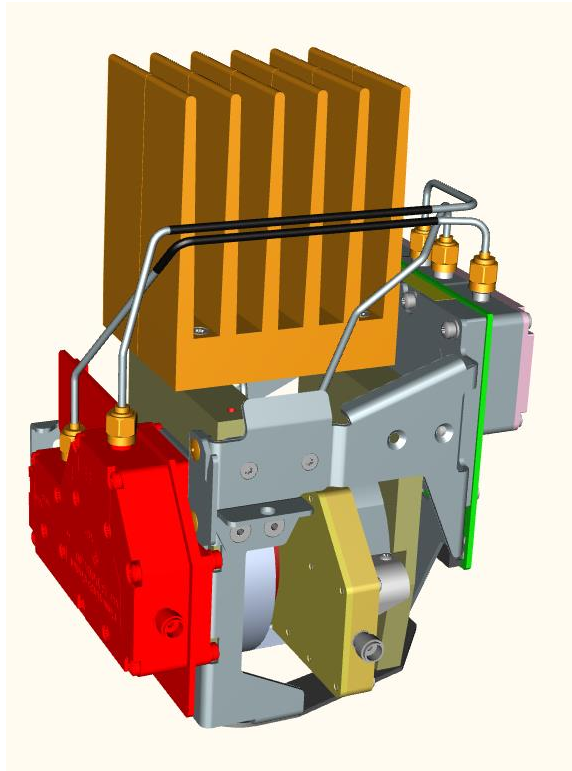


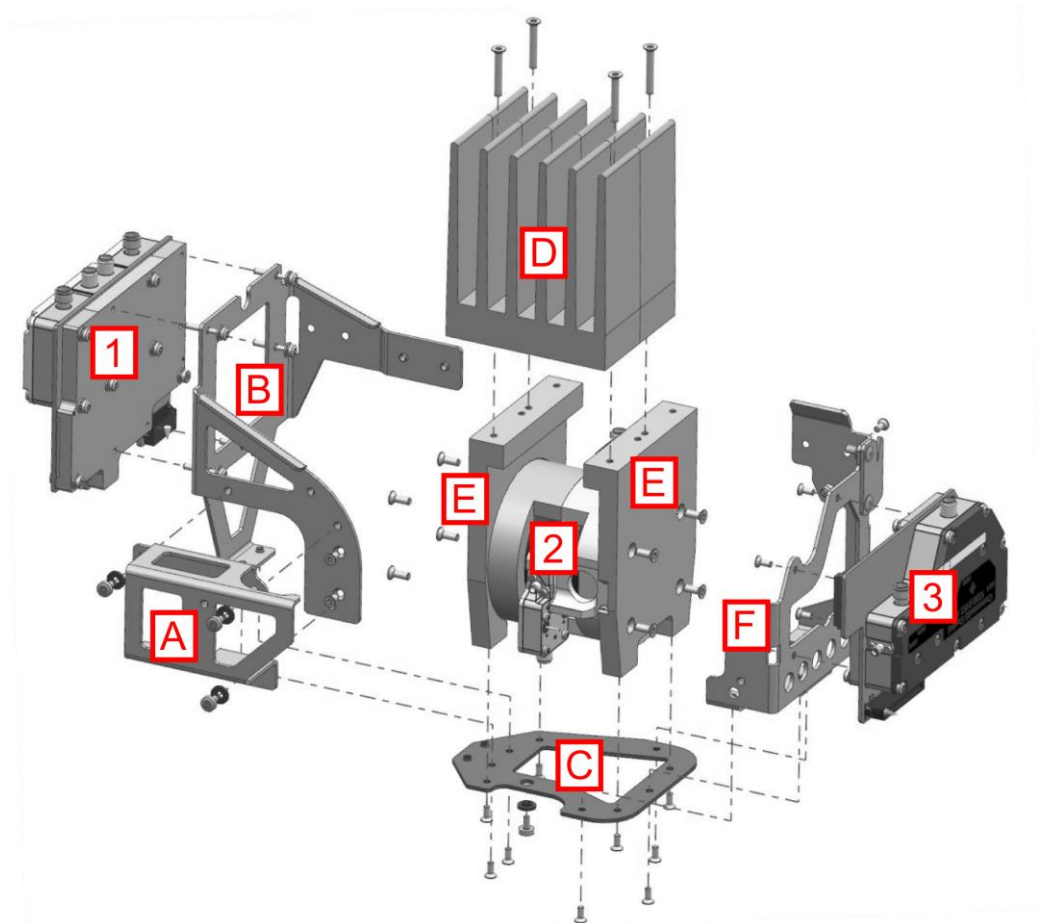
15. Install a new label on the connector carrier board.
- Note:** Be sure to mount the label properly. It can only be installed once!
16. Reinstall the right side cover (refer to chapter [4.2.4.3](#)).
17. Reinstall the lower cover (refer to chapter [4.2.4.1](#)).
18. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
19. Perform a frequency response correction as described in chapter [4.2.6.2](#).

20. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

Replacing the converter 85 control unit A470

The converter 85 control unit is mounted on the FSW85 frontend unit.





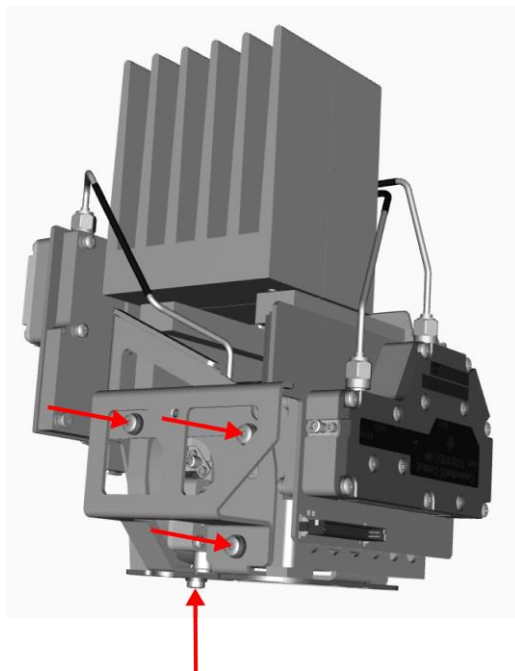
Position	Module
1	Switch Matrix controller unit
2	YIG filter 2 module
3	Converter 85 control module
A	Side holding plate
B	Holding plate 1
C	Bottom plate
D	Heat sink
E	Cool plate
F	Holding plate 2

1. Switch off the instrument and disconnect the power plug.
2. Remove the microwave converter frontend unit from the instrument frame as described in chapter [4.3.11, Uninstalling the microwave converter frontend unit](#)

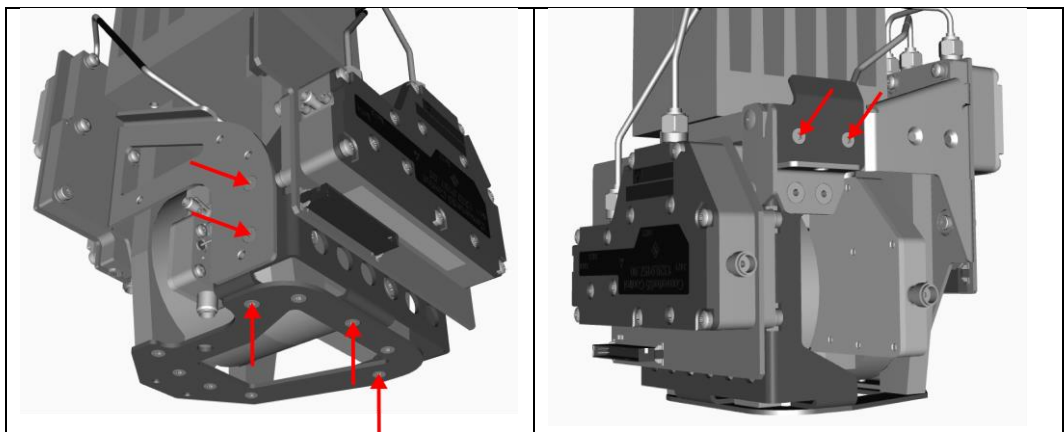
3. Separate the two converter units as described in chapter [4.3.11, Separating the R&S®FSW85 frontend unit A700 and the MWC frontend unit A160](#):
4. Locate the converter 85 control unit. It is highlighted in red in the picture above.
5. Disconnect the two RF cables at the converter 85 control unit side
6. Disconnect the flat ribbon cable at the converter 85 control unit.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

7. Disconnect the YIG filter 2 control cable at the converter 85 control unit.
8. Unmount side holding plate by unscrewing the 4 screws fastening it to the FSW 85 frontend unit, marked by arrows in the picture below



9. Unmount holding plate 2 and converter 85 control unit by unscrewing the screws fastening it to the FSW 85 frontend unit. Screws are marked with arrows in the pictures below.



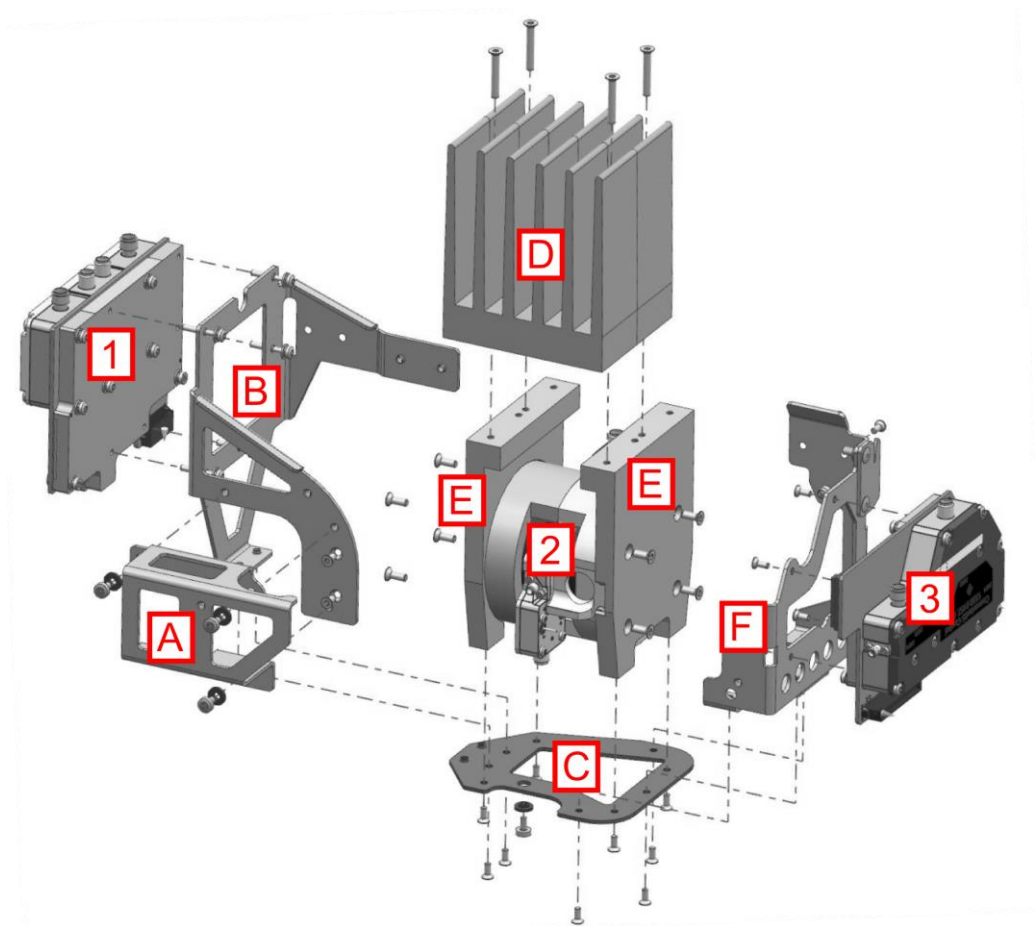
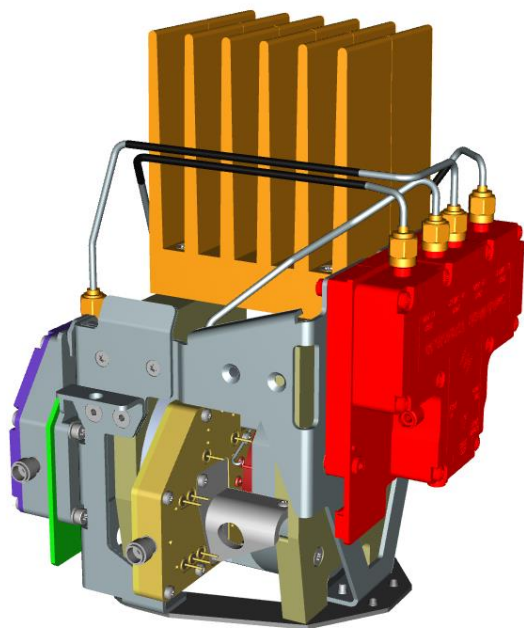
10. Unmount the converter 85 control unit by unscrewing the 4 screws fastening it to the holding plate 2.
11. Replace the converter 85 control unit by a new one and mount it to the holding plate 2 by use of the 4 screws formerly removed.
12. Mount the holding plate 2 with the converter 85 control unit to the FSW 85 frontend unit by use of the 7 screws formerly removed.
13. Reinstall the side holding plate to the FSW 85 frontend unit by use of the 4 screws formerly removed.

Note: Do not forget to install the 4 insulation washers!

14. Reconnect the RF cables to the converter 85 control unit.
15. Reconnect the flat ribbon cable to the converter 85 control unit.
16. Reconnect the YIG filter 2 control cable to the converter 85 control unit.
17. Mount the FSW 85 frontend unit to the MWC frontend unit.
18. Reinstall the microwave converter frontend unit to the instrument frame as described in [4.3.11 Installing the microwave converter frontend unit](#)
19. Mount the upper and lower cover (refer to chapter [4.2.5](#)).
20. Mount the inner lid (refer to chapter [4.2.5](#)).
21. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
22. Perform a frequency response correction as described in chapter [4.2.6.1](#).
23. Perform the Basic Instrument Checks according to chapter [4.2.6.2](#).

Replacing the switch matrix controller unit A480

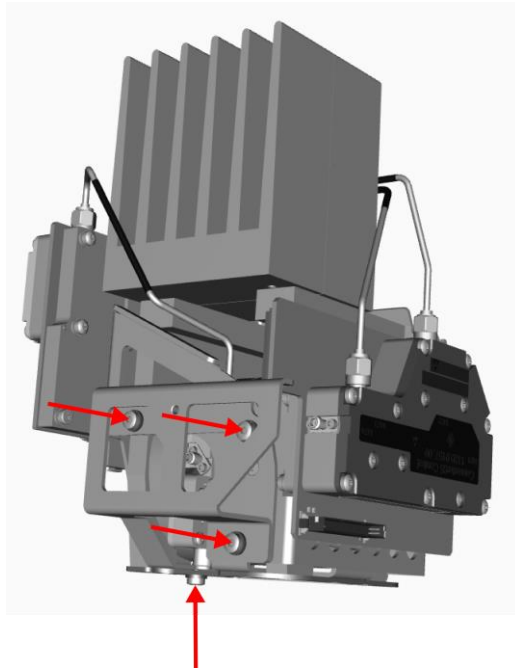
The switch matrix controller unit is mounted on the FSW85 frontend unit.



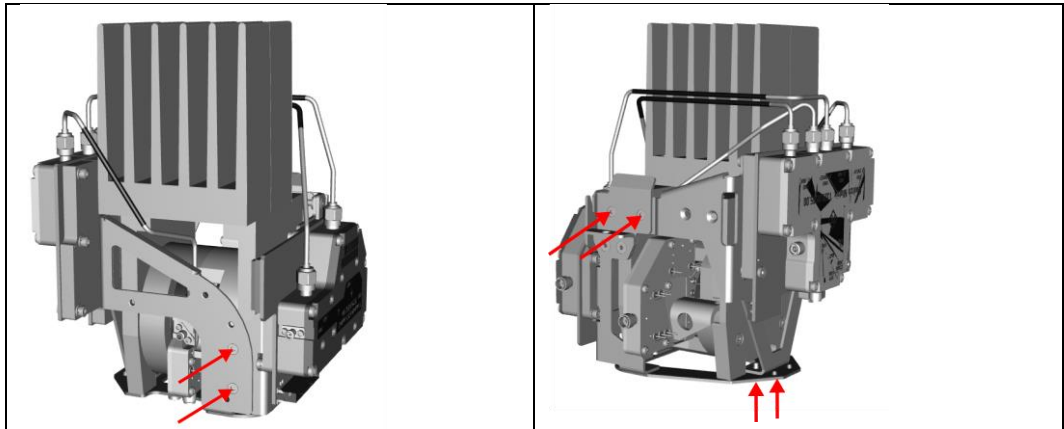
Position	Module
----------	--------

Position	Module
1	Switch Matrix controller unit
2	YIG filter 2 module
3	Converter 85 control module
A	Side holding plate
B	Holding plate 1
C	Bottom plate
D	Heat sink
E	Cool plate
F	Holding plate 2

1. Switch off the instrument and disconnect the power plug.
2. Remove the microwave converter frontend unit from the instrument frame as described in chapter [4.3.11, Uninstalling the microwave converter frontend unit](#)
3. Separate the two converter units as described in chapter [4.3.11, Separating the R&S®FSW85 frontend unit A700 and the MWC frontend unit A160](#):
4. Locate the switch matrix control unit. It is highlighted in red in the picture above.
5. Disconnect the four RF cables at the switch matrix control unit side
6. Disconnect the flat ribbon cable at the switch matrix control unit.
Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
7. Unmount side holding plate by unscrewing the 4 screws fastening it to the FSW 85 frontend unit, marked by arrows in the picture below



8. Unmount holding plate 1 and switch matrix control unit by unscrewing the screws fastening it to the FSW 85 frontend unit. Screws are marked with arrows in the pictures below.

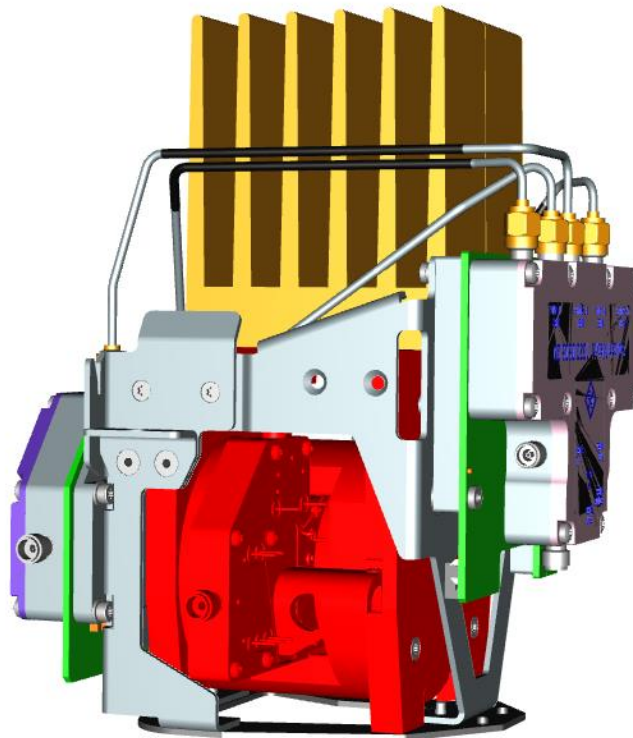


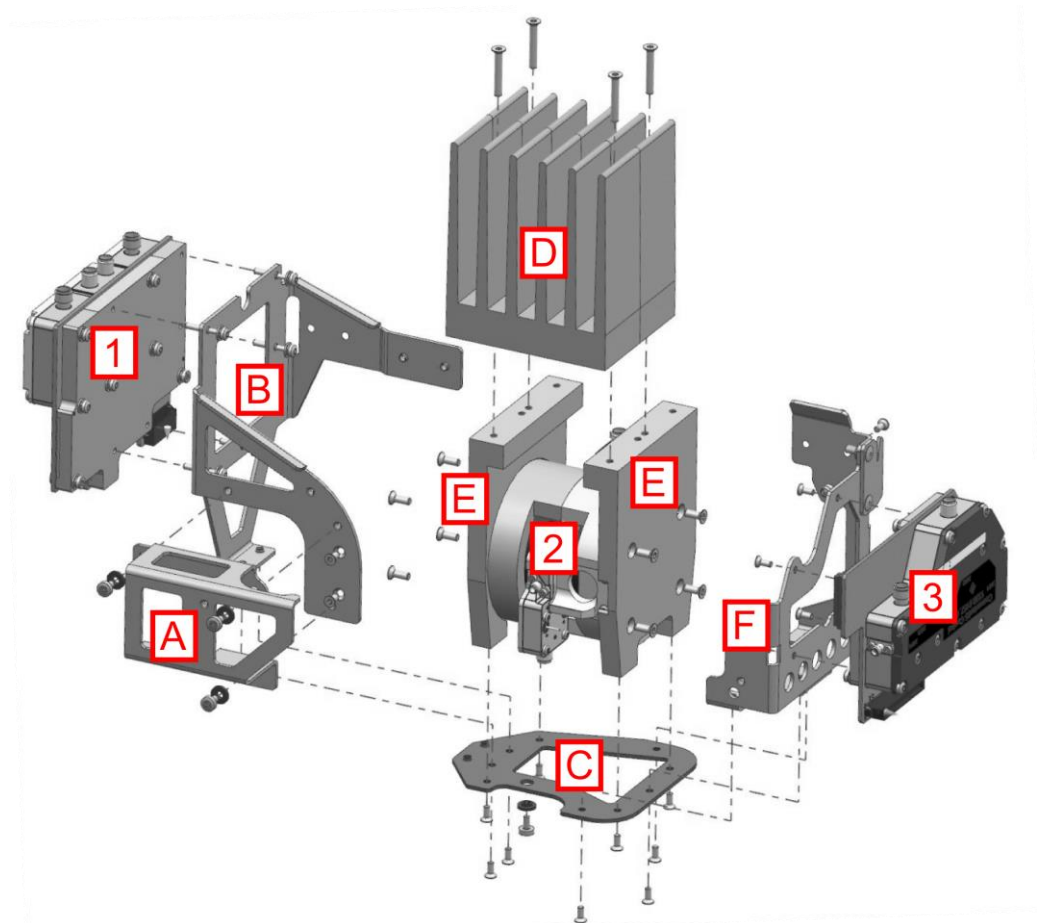
9. Unmount the switch matrix control unit by unscrewing the 5 screws fastening it to the holding plate 2.
 10. Replace the switch matrix control unit by a new one and mount it to the holding plate 1 by use of the 5 screws formerly removed.
 11. Mount the holding plate 1 with the switch matrix control unit to the FSW 85 frontend unit by use of the 6 screws formerly removed.
 12. Reinstall the side holding plate to the FSW 85 frontend unit by use of the 4 screws formerly removed.
- Note:** Do not forget to install the 4 insulation washers!
13. Reconnect the RF cables to the switch matrix control unit.
 14. Reconnect the flat ribbon cable to the switch matrix control unit.

15. Mount the FSW 85 frontend unit to the MWC frontend unit.
16. Reinstall the microwave converter frontend unit to the instrument frame as described in [4.3.11 Installing the microwave converter frontend unit](#)
17. Mount the upper and lower cover (refer to chapter [4.2.5](#)).
18. Mount the inner lid (refer to chapter [4.2.5](#)).
19. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
20. Perform a frequency response correction as described in chapter [4.2.6.1](#).
21. Perform the Basic Instrument Checks according to chapter [4.2.6.2](#).

Replacing the YIG filter 2 module A490

The YIG filter 2 module is mounted on the FSW85 frontend unit.

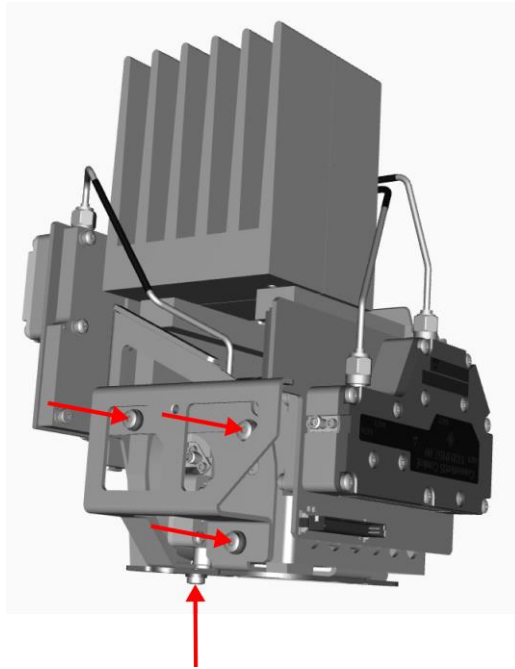




Position	Module
1	Switch Matrix controller unit
2	YIG filter 2 module
3	Converter 85 control module
A	Side holding plate
B	Holding plate 1
C	Bottom plate
D	Heat sink
E	Cool plate
F	Holding plate 2

1. Switch off the instrument and disconnect the power plug.
2. Remove the microwave converter frontend unit from the instrument frame as described in chapter [4.3.11, Uninstalling the microwave converter frontend unit](#)

3. Separate the two converter units as described in chapter [4.3.11, Separating the R&S®FSW85 frontend unit A700 and the MWC frontend unit A160](#):
4. Locate the YIG filter 2 module. It is highlighted in red in the picture above.
5. Unmount side holding plate by unscrewing the 4 screws fastening it to the FSW 85 frontend unit, marked by arrows in the picture below

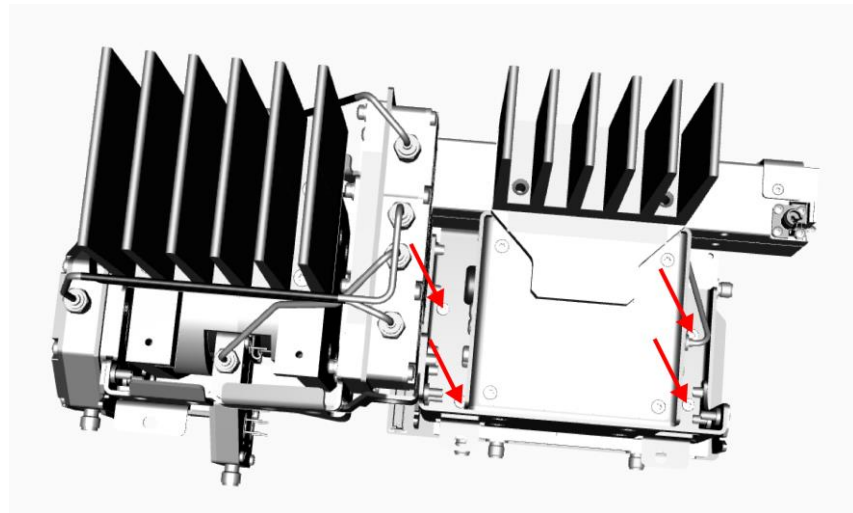


6. Unmount the converter 85 control unit as described in chapter [4.3.11 Replacing the converter 85 control unit](#)
7. Unmount the switch matrix control unit as described in chapter [4.3.11 Replacing the switch matrix controller unit](#).
8. Uninstall the bottom plate by uninstalling the 4 screws fastening it to the YIG filter 2 module.
9. Uninstall the 2 heatsinks by uninstalling the 2 screws fastening each to the YIG filter 2 module.
10. Uninstall the 2 cooling plates by uninstalling the 4 screws fastening each to the YIG filter 2 module.
11. Replace the YIG filter 2 module by a new one.
12. Reinstall the cooling plates to the YIG filter 2 module by use of the 4 screws formerly removed.
13. Reinstall the two heatsinks by use of the 2 screws formerly removed.
14. Reinstall the bottom plate by use of the 4 screws formerly removed.
15. Reinstall the switch matrix control unit as described in chapter [4.3.11 Replacing the switch matrix controller unit](#).

16. Reinstall the converter 85 control unit as described in chapter [4.3.11 Replacing the converter 85 control unit](#)
17. Reinstall the side holding plate to the FSW 85 frontend unit by use of the 4 screws formerly removed.
Note: Do not forget to install the 4 insulation washers!
18. Mount the FSW 85 frontend unit to the MWC frontend unit.
19. Reinstall the microwave converter frontend unit to the instrument frame as described in [4.3.11 Installing the microwave converter frontend unit](#)
20. Mount the upper and lower cover (refer to chapter [4.2.5](#)).
21. Mount the inner lid (refer to chapter [4.2.5](#)).
22. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
23. Perform a frequency response correction as described in chapter [4.2.6.1](#).
24. Perform the Basic Instrument Checks according to chapter [4.2.6.2](#).

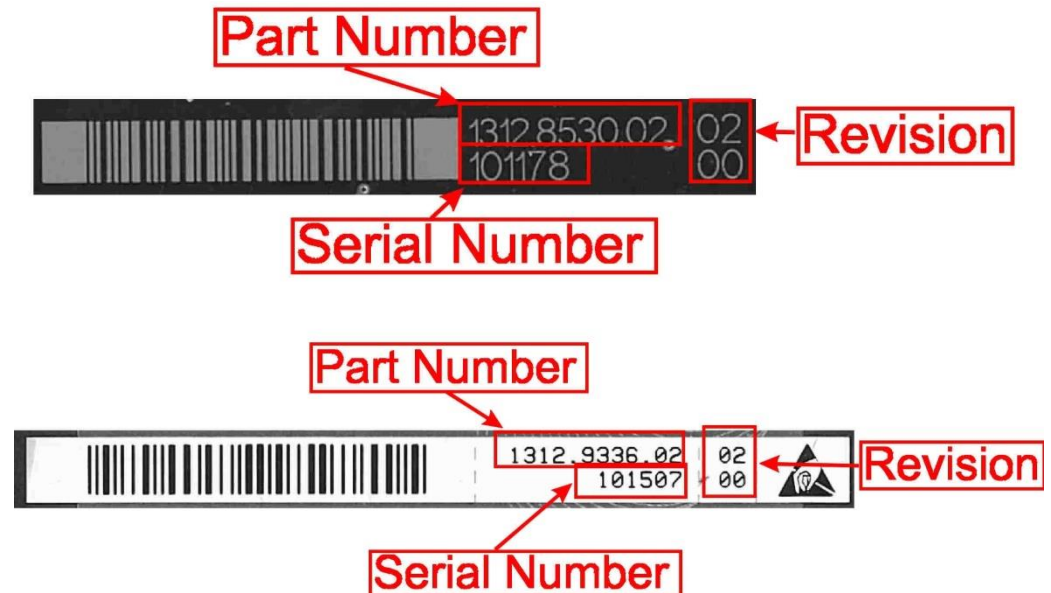
Replacing the microwave converter frontend A161

1. Switch off the instrument and disconnect the power plug.
2. Remove the microwave converter frontend unit from the instrument frame as described in chapter [4.3.11, Uninstalling the microwave converter frontend unit](#)
3. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
4. Unscrew the four screws fastening the microwave converter frontend to the frontend unit holder.



5. Replace the microwave converter frontend by a new one and fasten the four screws previously removed.
6. Write down the serial number, the part number and the revision of the new board.

Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the Eeprom!)



7. Replug the YIG filter control cable to the new microwave converter frontend.
8. Reconnect the RF cables at connector X161 and X162 and the YIG filter
9. Reinstall the microwave converter frontend unit to the instrument as described in chapter 4.3.11, [Installing the microwave converter frontend unit](#)
10. Mount the right side cover (refer to chapter 4.2.5).
11. Mount the front unit (refer to chapter 4.2.5).
12. Mount the upper and lower cover (refer to 4.2.5).
13. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
14. Update the EPROM data of the microwave converter frontend.

a) Enter the service password
[SETUP : Service : Service Function : Password = 30473035]

b) Enter the service function
3.7.7.1.FRONTEND.xxxx.xxxx.xx.yyyyyy.zz.zz
in the service dialog

[SETUP : MORE : SERVICE : SERVICE FUNCTION]

where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 11!

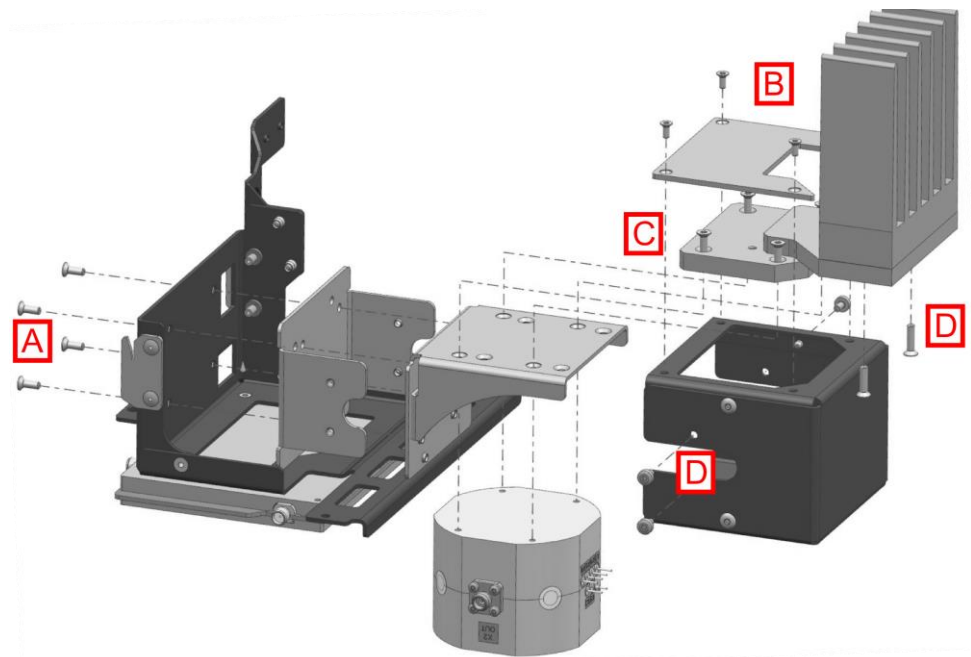
NOTICE**Risk of losing important information**

This service function must be carried out after the first boot of the firmware after replacing the hardware! Otherwise the EEPROM data, necessary to run the instrument properly, is lost!

15. Enter the service function
[3.7.7.0.FRONTEND]
and verify the displayed data with the data of the new installed hardware.
16. Reset the service password
[SETUP : MORE : SERVICE : SERVICE FUNCTION]
[Reset Password]
17. Perform a frequency response correction as described in chapter [4.2.6.2](#).
18. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

Replacing the YIG filter A162

1. Switch off the instrument and disconnect the power plug.
2. Remove the microwave converter frontend unit from the instrument frame as described in chapter [4.3.11](#), [Uninstalling the microwave converter frontend unit](#)
3. Separate the FSW85 frontend unit and the MWC frontend unit as described in chapter [4.3.11](#) [Separating the R&S®FSW85 frontend unit A700 and the MWC frontend unit A160](#):
4. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
5. Unplug the YIG filter control cable.
6. Uninstall the two RF cable on the YIG filter.
7. Uninstall the YIG filter with its shielding cap and heat sink by unscrewing the four screws marked with A in the picture below.
8. Uninstall the covering plate by unscrewing the four screws marked with B in the picture below.
9. Uninstall the heat sink on the YIG filter by removing the four screws marked with C in the picture below.



10. Uninstall the shielding cap with the YIG filter by unscrewing the four screws marked with D in the picture above.

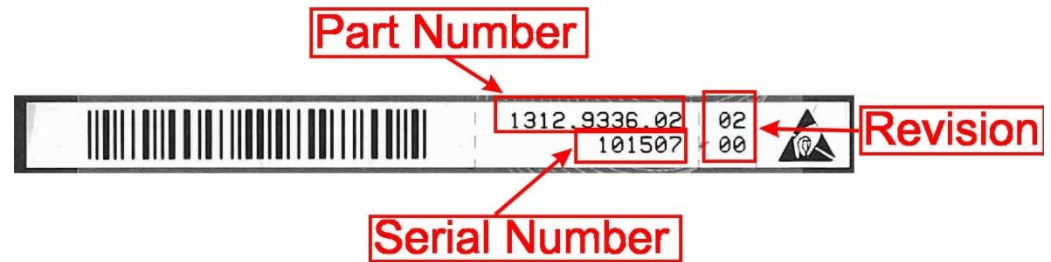
NOTICE: the YIG filter is hold by the screws removed with the heat sink! So be careful when uninstalling the shielding cap.

NOTICE: Do not damage the YIG filter control cable when uninstalling the shielding cap!

11. Replace the YIG filter by a new one.
12. Write down the serial number, the part number and the revision of the new filter.

Tip: You find this data on the barcode label on the printed circuit board. There are two different barcode labels: (the numbers shown in the picture are only for illustration. Do not use them for updating the Eeprom!)





13. Mount the YIG filter with its shielding cap and heat sink in inverted order of disassembling it. Use the screws formerly removed. Replace the thermal conductive pad if it was installed formerly before reinstalling the heat sink.
14. Reinstall the YIG filter to the microwave converter frontend unit.
15. Replug the YIG filter control cable to the microwave converter frontend.
16. Reconnect the RF cables at connector X161 and X162 and the YIG filter
Tip: The connector to plug in is written on the yellow tube on the cable.
17. Reinstall the microwave converter frontend unit to the instrument as described in chapter 4.3.11, [Installing the microwave converter frontend unit](#)
18. Mount the right side cover (refer to chapter 4.2.5).
19. Mount the upper and lower cover (refer to 4.2.5).
20. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
21. Update the EPROM Data of the YIG filter
 - a) Enter the service password
 [SETUP : Service : Service Function : Password = 30473035]
 - b) Enter the service function
 3.7.7.1.YIG_UNIT.xxxx.xxxx.xx.yyyyyy.zz.zz
 in the service dialog
 [SETUP : MORE : SERVICE : SERVICE FUNCTION]
 where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 9.
Note: This service function will be available with the firmware version 1.40 and higher.
22. Enter the service function
 [3.7.7.0.YIG_UNIT]
 and verify the displayed data with the data of the new installed hardware.
23. Reset the service password
 [SETUP : MORE : SERVICE : SERVICE FUNCTION]
 [Reset Password]

24. Perform a frequency response correction as described in chapter [4.2.6.2](#).
25. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

4.3.11.3 Replacing the Microwave converter base board A170

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter [4.2.4.1](#)).
3. Unmount the inner lid 1 (refer to chapter [4.2.4.2](#)).
4. Unplug the flat ribbon cable to the microwave converter frontend at the microwave converter base board side.
Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.
5. Unplug the RF cables from the microwave converter base board.
6. Set the dip switches on the new board according to the label on the board.
7. Carefully replace the microwave converter base board by a new one.
8. Reconnect the flat ribbon cables.

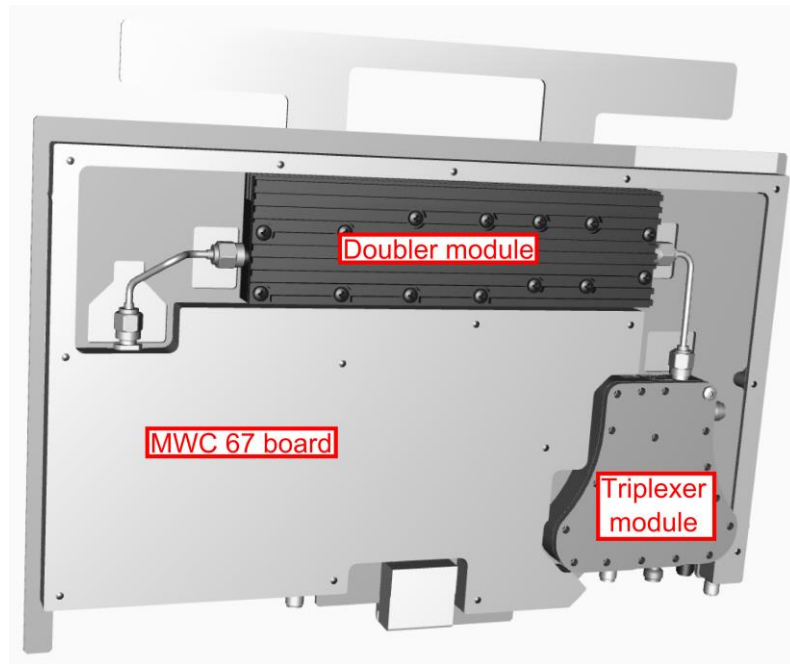
NOTICE

Risk of damaging connector contacts

Make sure you plug in the flat ribbon cable connectors in a right angle. Otherwise, the contacts inside the connector may be damaged.

9. Reconnect the RF cables.
Tip: The connector to plug in is written on the yellow tube on the cable.
10. Mount the upper and lower cover (refer to chapter [4.2.5](#)).
11. Mount the inner lid (refer to chapter [4.2.5](#)).
12. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
13. Perform a frequency response correction as described in chapter [4.2.6.1](#).
14. Perform the Basic Instrument Checks according to chapter [4.2.6.2](#).

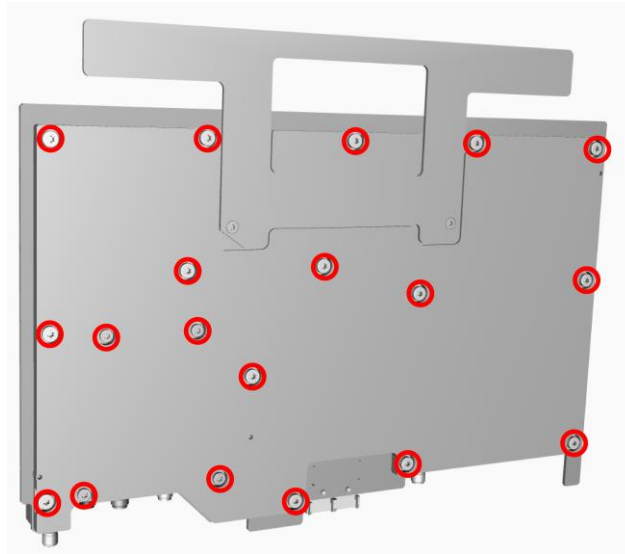
4.3.12 Microwave Converter 67 A150 (R&S®FSW 67)



4.3.12.1 Replacing the microwave converter 67 board:

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter [4.2.4.1](#)).
3. Unmount the inner lid 1 (refer to chapter [4.2.4.2](#)).
4. Disconnect all RF cables to the microwave converter 67 board at the microwave converter 67 board.
5. Carefully remove the microwave converter 67 board from the instrument.
6. Remove the RF cable connecting the microwave converter 67 board and the doubler module.
7. Remove the RF cable connecting the doubler module and the triplexer module.
8. Unscrew the 19 screws, marked with a circle in the picture below, fastening the bottom part of the shielding lid.

Note: the screws stick to the lid! Do not remove them from the bottom part of the lid!



9. Carefully remove the bottom shielding lid.

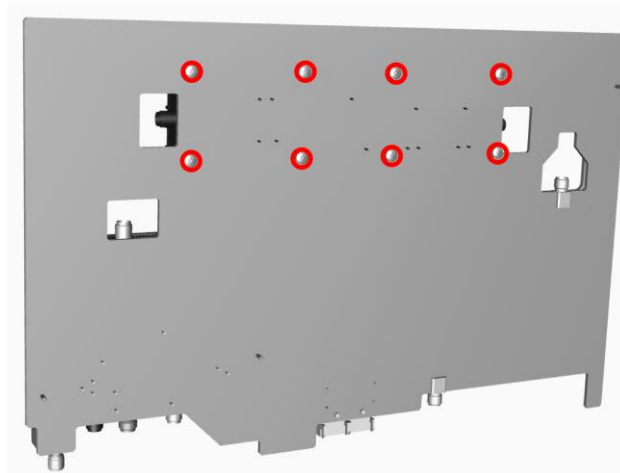
NOTICE! Do not damage the parts on the board! The triplexer module is now not fastened anymore!

10. Remove the triplexer module from the microwave converter 67 board by unplugging it from the board connectors.

Note: The triplexer module is reused with the new microwave converter 67 board!

11. Remove the 8 screws marked with an circle in the picture below, fastening the doubler module to the microwave converter 67 board.

Note: The doubler module is reused with the new microwave convert 67 board!



12. Replace the microwave converter 67 board by a new one.
13. Replug the formerly removed doubler module and triplexer module to the new microwave converter 67 board.
14. Remount the 8 screws fastening the double module formerly removed.
15. Remount the bottom shielding lid and fasten the 19 screws.

Note: Be sure you have fastened ALL 19 screws!

16. Reconnect the two RF cables on the module formerly removed.

Tip: The connector to plug in is written on the yellow tube on the cable.

17. Insert the microwave converter 67 board into the instrument frame.

18. Reconnect the RF cables.

Tip: The connector to plug in is written on the yellow tube on the cable.

19. Mount the inner lid 1 (refer to chapter 4.2.5).

20. Mount the upper and lower cover (refer to 4.2.5).

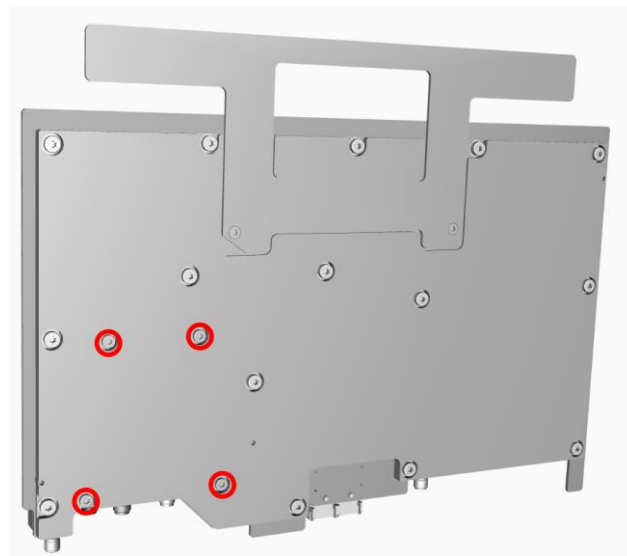
21. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.

22. Perform the Basic Instrument Checks according to chapter 4.2.6.1.

23. Perform a frequency response correction as described in chapter 4.2.6.2.

4.3.12.2 Replacing the triplexer

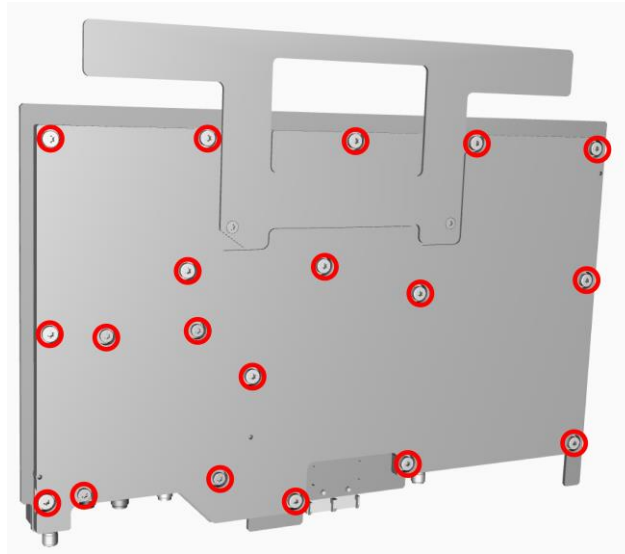
1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter 4.2.4.1).
3. Unmount the inner lid 1 (refer to chapter 4.2.4.2).
4. Disconnect all RF cables to the microwave converter 67 board at the microwave converter 67 board.
5. Carefully remove the microwave converter 67 board from the instrument.
6. Remove the RF cable connecting the doubler module and the triplexer module.
7. Unscrew the 4 screws, marked with a circle in the picture below, fastening the triplexer module to the microwave converter 67 board.



8. Remove the triplexer module from the microwave converter 67 board by unplugging it from the board connectors.
9. Replace the triplexer module by a new one.
10. Replug the new triplexer module to the microwave converter 67 board.
11. Remount the 4 screws fastening the triplexer module formerly removed.
12. Reconnect the RF cable on the module formerly removed.
Tip: The connector to plug in is written on the yellow tube on the cable.
13. Insert the microwave converter 67 board into the instrument frame.
14. Reconnect the RF cables.
Tip: The connector to plug in is written on the yellow tube on the cable.
15. Mount the inner lid 1 (refer to chapter [4.2.5](#)).
16. Mount the upper and lower cover (refer to [4.2.5](#)).
17. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
18. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
19. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.12.3 Replacing the doubler

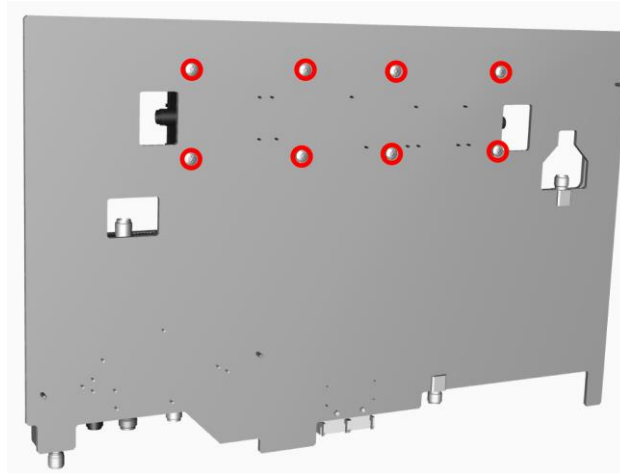
1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter [4.2.4.1](#)).
3. Unmount the inner lid 1 (refer to chapter [4.2.4.2](#)).
4. Disconnect all RF cables to the microwave converter 67 board at the microwave converter 67 board.
5. Carefully remove the microwave converter 67 board from the instrument.
6. Remove the RF cable connecting the microwave converter 67 board and the doubler module.
7. Remove the RF cable connecting the doubler module and the triplexer module.
8. Unscrew the 19 screws, marked with a circle in the picture below, fastening the bottom part of the shielding lid.
9. **Note:** the screws stick to the lid! Do not remove them from the bottom part of the lid!



10. Carefully remove the bottom shielding lid.

NOTICE! Do not damage the parts on the board! The triplexer module is now not fastened anymore!

11. Remove the 8 screws marked with an circle in the picture below, fastening the doubler module to the microwave converter 67 board.



12. Replace the doubler module by a new one.
13. Replug the new doubler module to the microwave converter 67 board.
14. Remount the 8 screws fastening the double module formerly removed.
15. Remount the bottom shielding lid and fasten the 19 screws.

Note: Be sure you have fastened ALL 19 screws!

16. Reconnect the two RF cables on the module formerly removed.

Tip: The connector to plug in is written on the yellow tube on the cable.

17. Insert the microwave converter 67 board into the instrument frame.

18. Reconnect the RF cables.
Tip: The connector to plug in is written on the yellow tube on the cable.
19. Mount the inner lid 1 (refer to chapter 4.2.5).
20. Mount the upper and lower cover (refer to 4.2.5).
21. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
22. Perform the Basic Instrument Checks according to chapter 4.2.6.1.
23. Perform a frequency response correction as described in chapter 4.2.6.2.

4.3.13 Parts Mounted on the Instrument Chassis

4.3.13.1 Replacing the Speaker B1

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper cover (refer to chapter 4.2.4.1).
3. Unmount the inner lid 2 (refer to chapter 4.2.4.2).
4. Unplug the speaker cable at the digital motherboard side.
5. Remove the speaker with its holder by turning the frontend unit clockwise for about 10 degrees.
6. Remove the speaker from its holder.
7. Install the new speaker in the holder previously unmounted.
8. Install the speaker with its holder to the instrument.
9. Plug in the speaker cable.
10. Mount the inner lid (refer to chapter 4.2.5).
11. Mount the upper cover (refer to 4.2.5).
12. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
13. Perform the Basic Instrument Checks according to chapter 4.2.6.1.
14. Perform the following steps to do a functional test of the speaker:
 - [**PRESET**]
 - [**FREQ** : CENTER : **64 MHz**]
 - [**SPAN** : ZERO SPAN]
 - [**BW** : RBW MANUAL : **10 Hz**]
 - [**AMPT** : REF LEVEL : **-10 dBm**]
 - [**AMPT** : RF ATTEN MANUAL : **0 dB**]
 - [**MKR FCTN** : SELECT MARKER FUNCTION : MARKER DEMODULATION]

- [MKR FCTN : MODULATION : FM]

Set volume to maximum (Note: when pressing the volume control knob the volume is set to mute!).

With this setup some noise should be audible at the speaker.

4.3.13.2 Replacing the Fans

FSW 8/13/26/43/50/67



1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter [4.2.4.1](#))
3. Unmount the inner lid 2 (refer to chapter [4.2.4.2](#)).
4. Unplug the fan to be replaced.

Note: The connector is locked! To unlock it press the lever down and disconnect carefully the cable!

5. Remove the fan from its holder.

Tip: you can pull at the lever on the rubber holder while pushing out the fan.

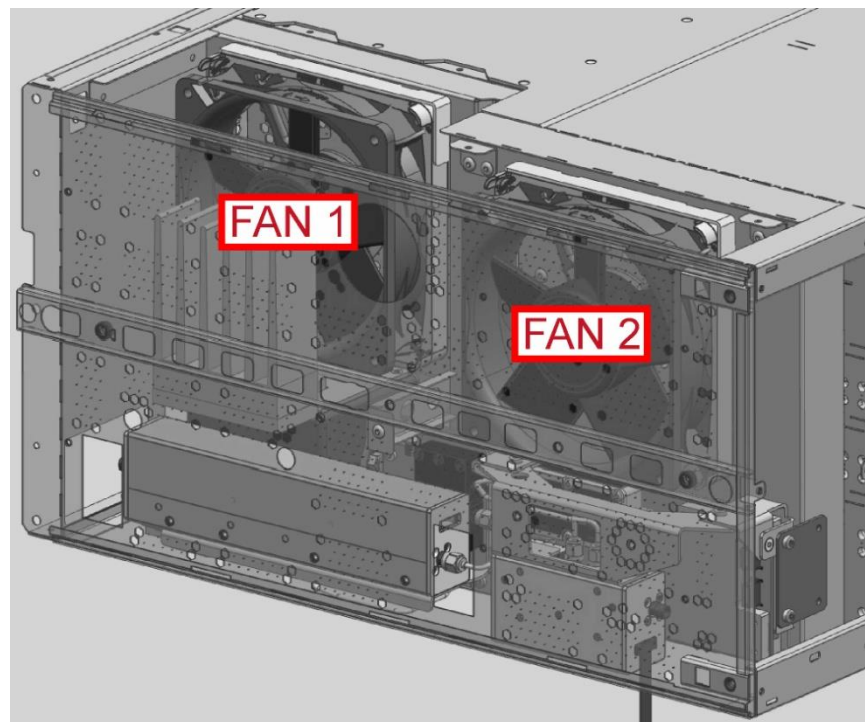
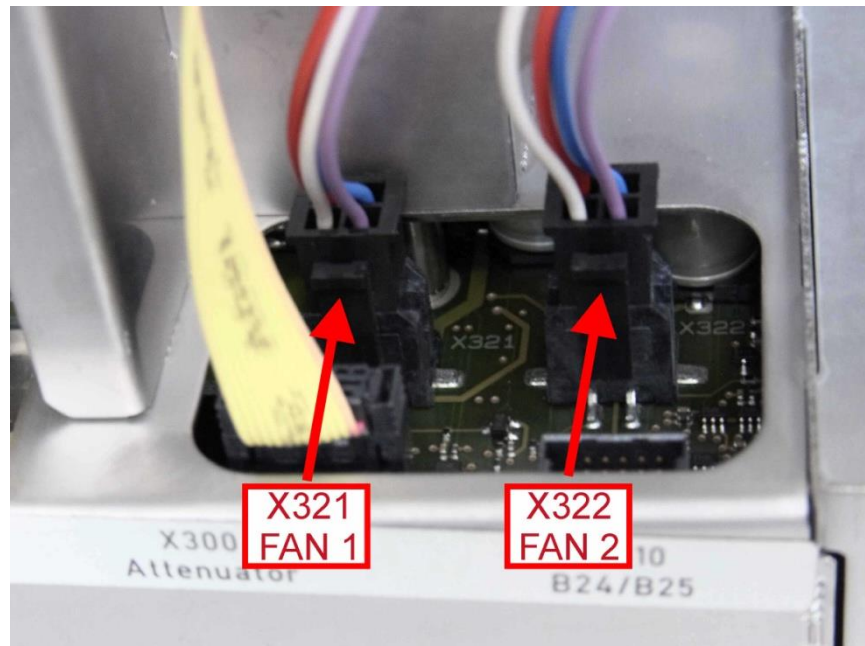
6. Install the new fan. Insert the lower corner of the fan in the holder, then press the other two corners in the holder. The fourth corner can be inserted in the holder by pulling the lever at that corner.

Note: be sure to install the fan in the right orientation: the airflow (given by an arrow on the fan) must go into the instrument!

7. Plug in the fan cables in the corresponding plug. Refer to picture below.

NOTICE! Be sure to plug in the fans in the correct connector on the motherboard otherwise the instrument can be damaged! If the fan which remains in the

instrument is connected to the wrong connector correct its position according to the picture below.



8. Mount the inner lid 2 (refer to chapter [4.2.5](#)).
9. Mount the upper and lower cover (refer to [4.2.5](#)).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Check if the fans are running.

Note: The fans start several seconds after powering up the instrument! This is no malfunction of the fans or the instrument!

12. Open the file C:\r_slinstrument\EEPROM\motherboard\config.ini in the text editor.

Check the entry

[FAN]

REAR FAN = x

if the entry x is "1" then change it to "2" save the file using FILE > SAVE and transfer the file to the EEPROM of the motherboard:

[**SETUP** : Service : Service Function : Password = 30473035]

[**SETUP** : Service : Service Function : Enter Service Function: 2.3.6.1]

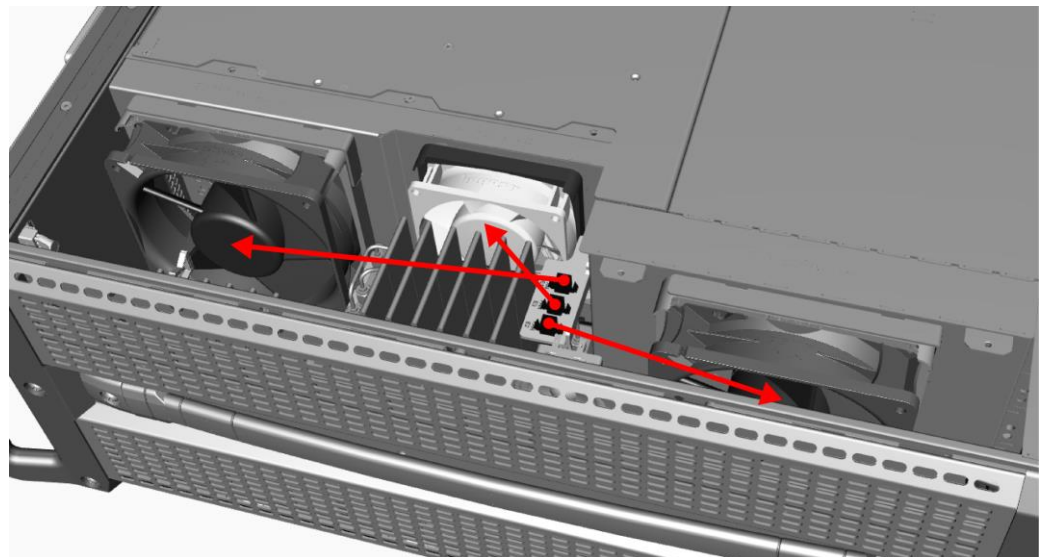
NOTICE! Be sure you have plugged in both fans in the correct connector on the motherboard! Otherwise the instrument can be damaged!

13. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
14. Perform a frequency response correction as described in chapter [4.2.6.2](#).

FSW 85

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper cover (refer to chapter [4.2.4.1](#))
3. Unmount the inner lid 2 (refer to chapter [4.2.4.2](#)).
4. Unplug the fan to be replaced.

Note: The connector is locked! To unlock it press the lever down and disconnect carefully the cable!



5. Remove the fan from its holder.

Tip: you can pull at the lever on the rubber holder while pushing out the fan.

6. Install the new fan. Insert the lower corner of the fan in the holder, then press the other two corners in the holder. The fourth corner can be inserted in the holder by pulling the lever at that corner.

Note: be sure to install the fan in the right orientation: the airflow (given by an arrow on the fan) must go into the instrument!

7. Plug in the fan cables in the corresponding plug. Refer to picture above.

NOTICE! Be sure to plug in the fans in the correct connector on the motherboard otherwise the instrument can be damaged! If the fan which remains in the instrument is connected to the wrong connector correct its position according to the picture below.

8. Mount the inner lid 2 (refer to chapter 4.2.5).
9. Mount the upper and lower cover (refer to 4.2.5).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Check if the fans are running.

Note: The fans start several seconds after powering up the instrument! This is no malfunction of the fans or the instrument!

12. Open the file C:\r_slinstrument\eeeprom\motherboard\config.ini in the text editor.

Check the entry

[FAN]

REAR FAN = x

if the entry x is "1" then change it to "2" save the file using FILE > SAVE and transfer the file to the eeprom of the motherboard:

[**SETUP** : Service : Service Function : Password = 30473035]

[**SETUP** : Service : Service Function : Enter Service Function: 2.3.6.1]

NOTICE! Be sure you have plugged in both fans in the correct connector on the motherboard! Otherwise the instrument can be damaged!

13. Perform the Basic Instrument Checks according to chapter 4.2.6.1.
14. Perform a frequency response correction as described in chapter 4.2.6.2.

4.3.14 Replacing the OCXO A250 (R&S®FSW-B4)

1. Switch off the instrument and disconnect the power plug.
2. Unscrew four screws fastening the OCXO.
3. Carefully remove the OCXO.
4. Insert the new OCXO carefully and mount it with the four screws previously removed.

5. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
6. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
7. Adjust the reference frequency according to chapter [3.2](#) or perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.15 Replacing the Synthesizer Board A140

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter [4.2.4.1](#)).
3. Unmount the inner lid1 (refer to chapter [4.2.4.2](#)).
4. Unplug all RF cables at the synthesizer board.
Note: there are one or more cables routed on the upper side of the instrument!
5. Remove the synthesizer board carefully.
6. Install the new synthesizer board.
7. Reconnect all RF cables at the synthesizer board (for detailed cable routing refer to chapter [4.2.2](#)).
Tip: The connector to plug in is written on the yellow tube on the cable.
8. Mount the inner lid1 (refer to chapter [4.2.5](#)).
9. Mount the upper and lower cover (refer to chapter [4.2.5](#)).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
12. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.16 Replacing the Reference Board A120

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to chapter [4.2.4.1](#))
3. Unscrew the eight screws fastening the reference board.

Without R&S®FSW-B4 installed:

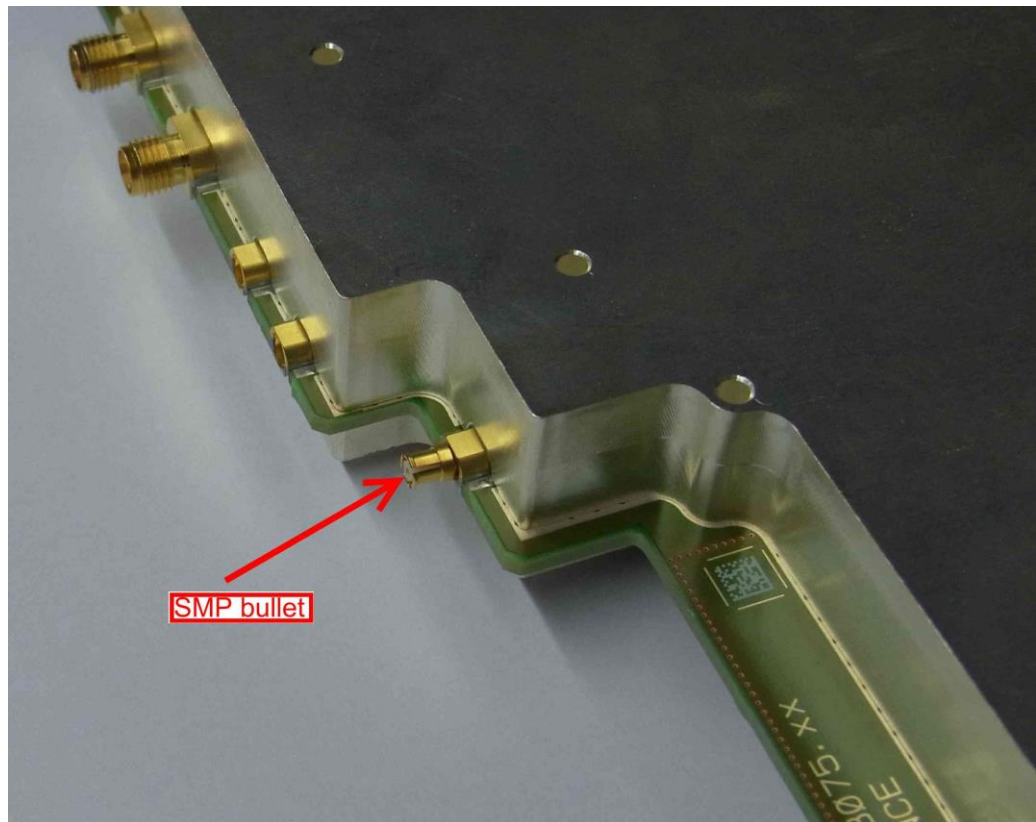
- ▶ Unscrew the four screws fastening the metal sheet covering the R&S®FSW-B4 slot and remove the cover.

With R&S®FSW-B4 installed:

- ▶ Uninstall the R&S®FSW-B4 according to chapter [4.2.5](#).
4. **Unplug** all RF cables inside the instrument from the reference board.
 5. Remove the reference board from the instrument.

6. Install the new reference board.

Note: Do not forget to install the SMP bullet!



7. Reconnect all RF cables at the reference board (for detailed cable routing refer to chapter 4.2.2).

Tip: The connector to plug in is written on the yellow tube on the cable.

Without R&S®FSW-B4 installed:

- ▶ Remount the slot cover by fastening the four screws previously removed.

With R&S®FSW-B4 installed:

- ▶ Reinstall the R&S®FSW-B4 according to chapter 4.2.5.
8. Fasten the reference board by installing the eight screws previously removed.
 9. Mount the lower cover (refer to chapter 4.2.5).
 10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
 11. Perform the Basic Instrument Checks according to chapter 4.2.6.1.
 12. Perform a frequency response correction as described in chapter 4.2.6.2.

Note: If the firmware shows a "DCM unlock" Error (refer to 4.4.3.2) when starting the instrument check the SMP bullet for proper installation!

4.3.17 Preamplifier

4.3.17.1 Preamplifier in R&S®FSW8/13/26, Option R&S®FSW-B24

The installation of the preamplifier option R&S®FSW-B24 depends on the model and on the presence of the option R&S®FSW-B25.

The option R&S®FSW-B24 includes two individual replaceable parts: the relays unit and the preamplifier board denoted by "MW preamp". The two parts are mounted together as the preamplifier frontend unit.

Depending on the fault of the preamplifier, either the preamplifier board or the relays unit must be replaced.

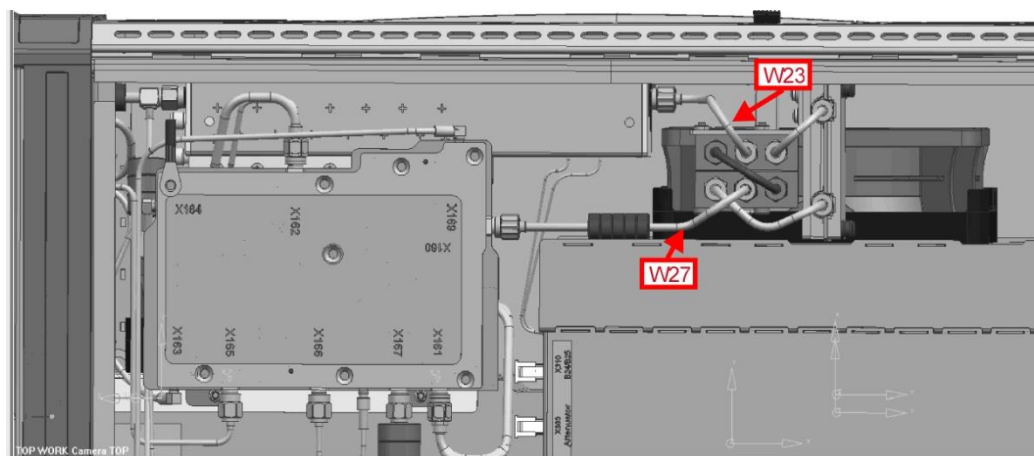


Figure 4-20: Cabling of an R&S®FSW13 equipped with R&S®FSW-B24

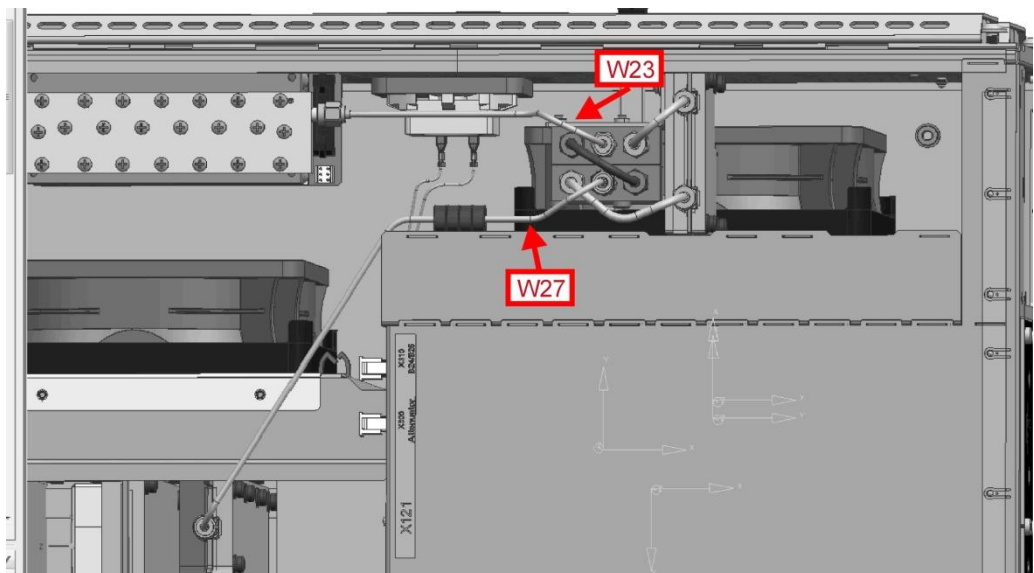


Figure 4-21: Cabling of an R&S®FSW8 equipped with R&S®FSW-B24

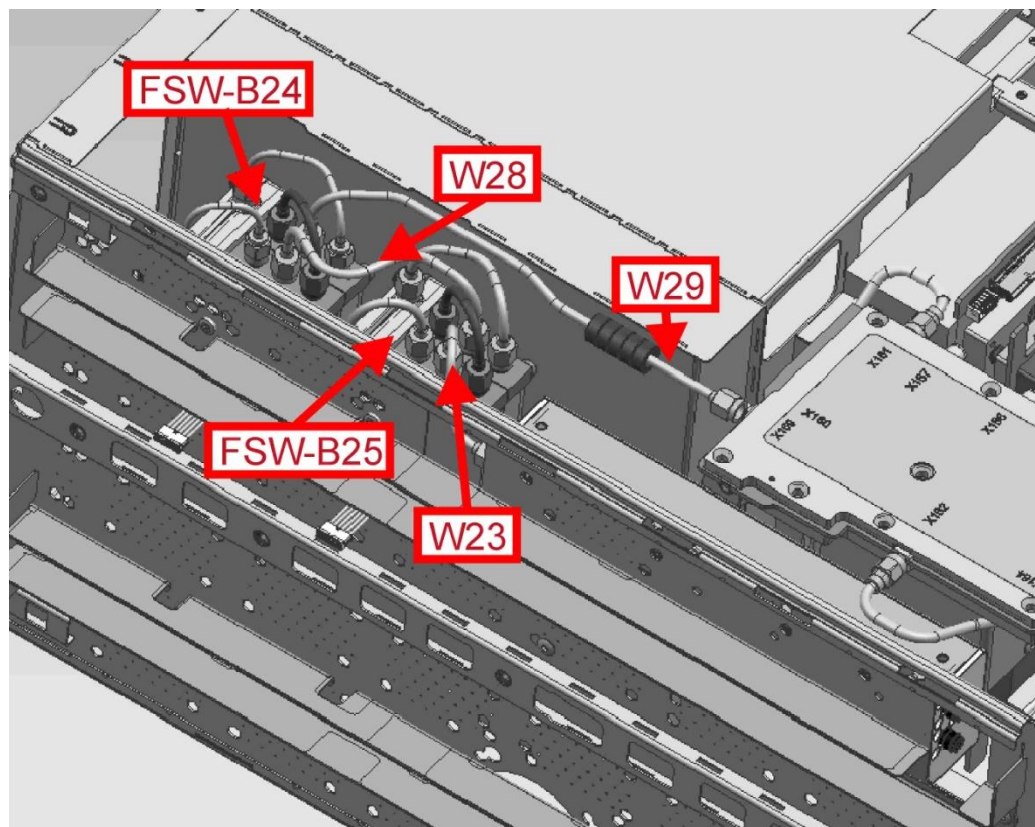


Figure 4-22: Cabling of an R&S®FSW13 equipped with R&S®FSW-B24 and B25

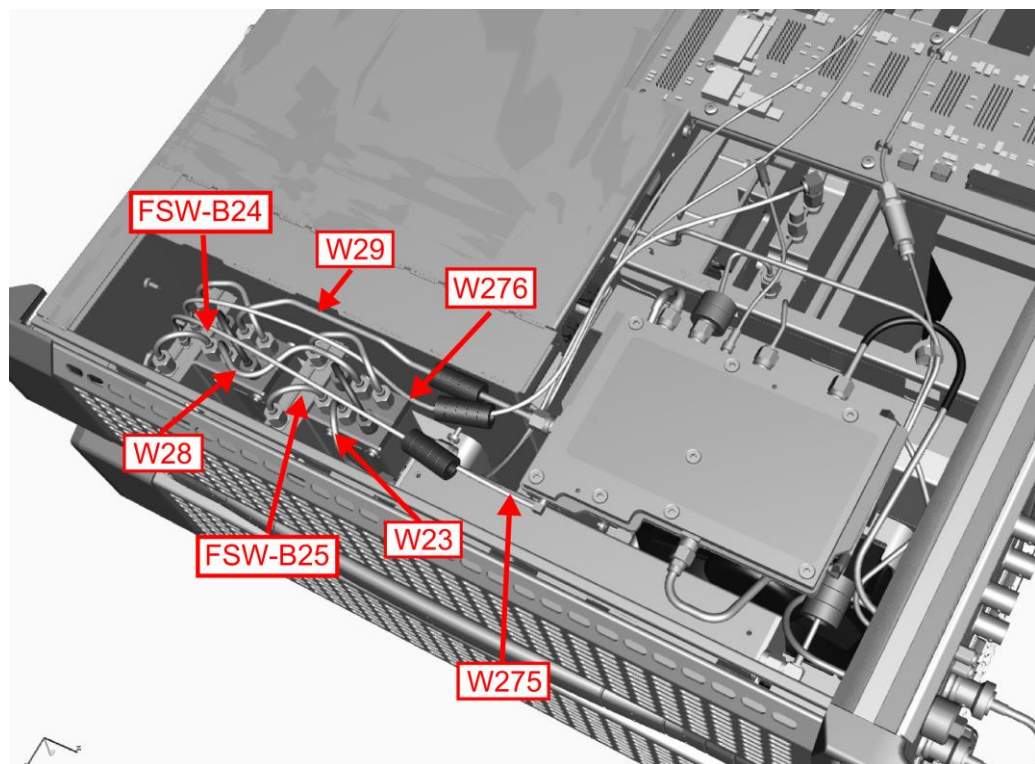


Figure 4-23: Cabling of an R&S®FSW26 equipped with R&S®FSW-B24 and B25

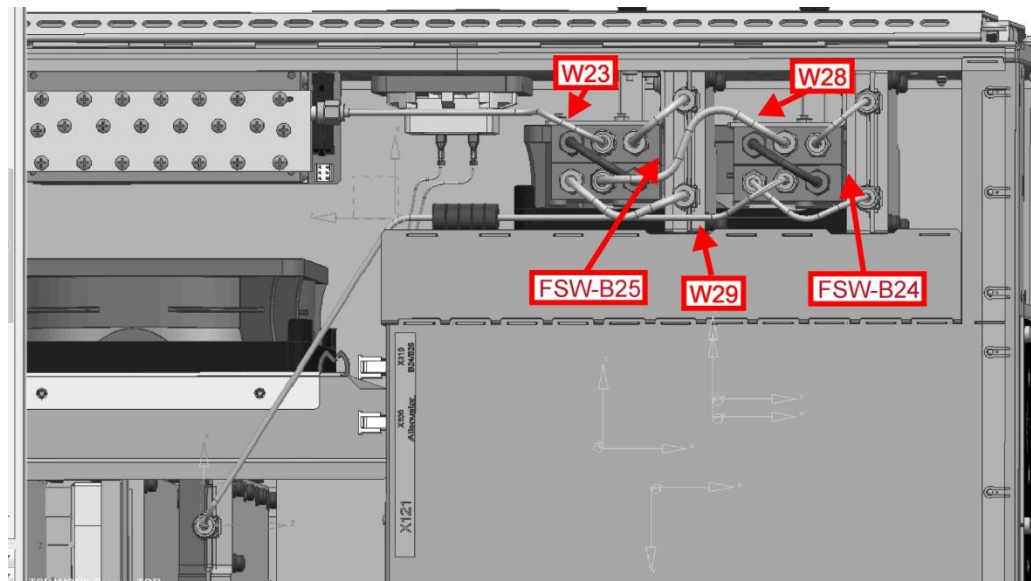


Figure 4-24: Cabling of an R&S®FSW8 equipped with R&S®FSW-B24 and B25

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to chapter 4.2.4.1).
3. Unmount the right side cover (refer to chapter 4.2.4.3).

R&S®FSW8 without installed option R&S®FSW-B25:

- Unplug the RF cables W23 at the step attenuator and W27 at the frontend

R&S®FSW8 with installed option R&S®FSW-B25:

- Unplug the RF cables W29 at the frontend and W28 at the electronic attenuator (R&S®FSW-B25).

R&S®FSW13/26 without installed option R&S®FSW-B25:

- Unplug the RF cables W23 at the step attenuator and W27 at the microwave converter frontend

R&S®FSW13/26 with installed option R&S®FSW-B25:

- Unplug the RF cables W28 at the electronic attenuator (R&S®FSW-B25) and W29 at the microwave converter frontend

R&S®FSW26 with installed option R&S®FSW-B24 VAR 27 (RF preamplifier board 1313.4609.02):

- Unplug the RF cables W275 and W276 at the preamplifier board.
4. Unscrew the two screws fastening the preamplifier.
 5. Remove the preamplifier frontend unit from the instrument.

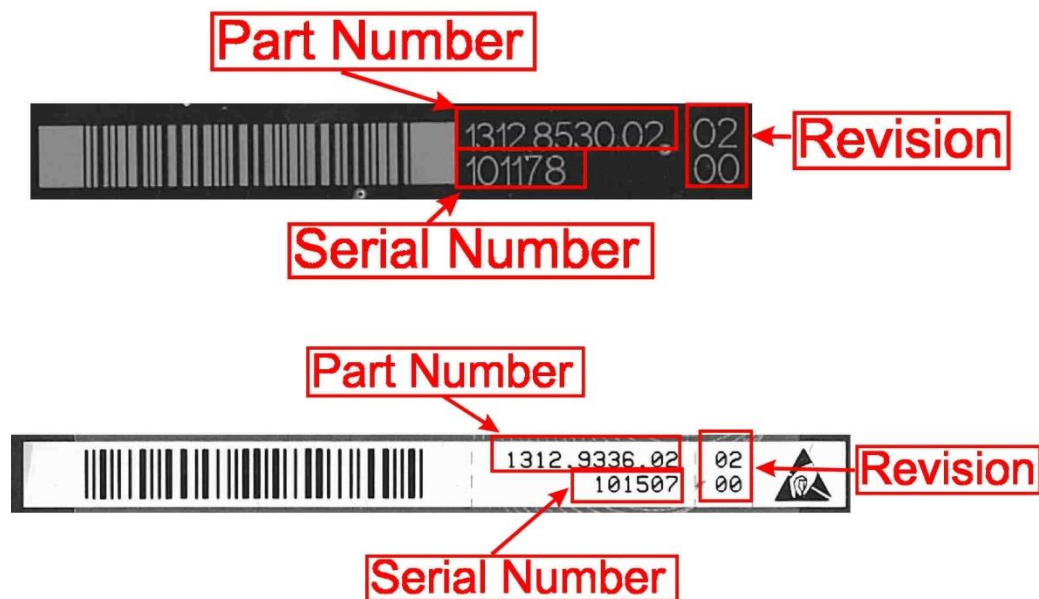
Note: The flat ribbon cable is still connected. Be careful not to damage the cable or the board!

6. Unplug the flat ribbon cable at the preamplifier board.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

7. Replace either the preamp board referred by "MW preamp" or the relays unit by a new one and reassemble the preamplifier frontend unit.
8. Write down the serial number, the part number and the revision of the new part.

Tip: You find this information on the barcode label on the printed circuit board. There are two different barcode labels: (The numbers shown in the picture are only for illustration. Do not use them for updating the Eeprom!)



9. Connect the flat ribbon cable to the preamplifier board.
10. Install the preamplifier frontend unit to the instrument and fasten it with the two screws previously removed.

Note: Do not over tighten the screws!

11. Reconnect all RF cables at the preamplifier board.

Tip: The connector to plug in is written on the yellow tube on the cable.

Note: If you are replacing a preamplifier board 1312.9113.02 by 1313.4609.02 install the two additional cables W275 and W276. Otherwise the instrument will not be able to measure signals below 30MHz!

12. Mount the right side cover (refer to chapter 4.2.5).
13. Mount the lower cover (refer to 4.2.5).
14. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
15. Update the EPROM Data of the preamplifier unit
 - a) When the preamplifier board "MW preamp" has been changed:

Enter the service password

[SETUP : Service : Service Function : Password = 30473035]

Enter the service function

3.16.7.1.PREAMP.xxxx.xxxx.xx.yyyyyy.zz.zz

in the service dialog

[SETUP : MORE : SERVICE : SERVICE FUNCTION]

where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 8.

NOTICE

Risk of losing important information

This service function must be carried out after the first boot of the firmware after replacing the hardware! Otherwise the EEPROM data, necessary to run the instrument properly, is lost!

Enter the service function

[3.16.7.0.PREAMP]

and verify the displayed data with the data of the new installed hardware.

b) When the relays unit has been changed:

Enter the service password

[SETUP : Service : Service Function : Password = 30473035]

Enter the service function

3.16.7.1.RELAIS_UNIT.xxxx.xxxx.xx.yyyyyy.zz.zz

in the service dialog

[SETUP : MORE : SERVICE : SERVICE FUNCTION]

where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 8.

Note: This service function will be available with the firmware version 1.40 and higher.

Enter the service function

[3.16.7.0.RELAIS_UNIT]

and verify the displayed data with the data of the new installed hardware.

16. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

17. Perform a frequency response correction as described in chapter [4.2.6.2](#)

4.3.17.2 Preamplifier in R&S®FSW43/50/67, Option R&S®FSW-B24

The preamplifier in for the R&S®FSW43/50 can only be replaced as a whole unit.

1. Unmount the microwave converter frontend unit as described in chapter 4.3.9.2 for R&S®FSW43 and chapter 4.3.10 for R&S®FSW50/67.
2. Disconnect all RF cables from the R&S®FSW-B24 frontend unit.
3. Unscrew the two screws fastening the R&S®FSW-B24 frontend unit to the microwave converter frontend unit.

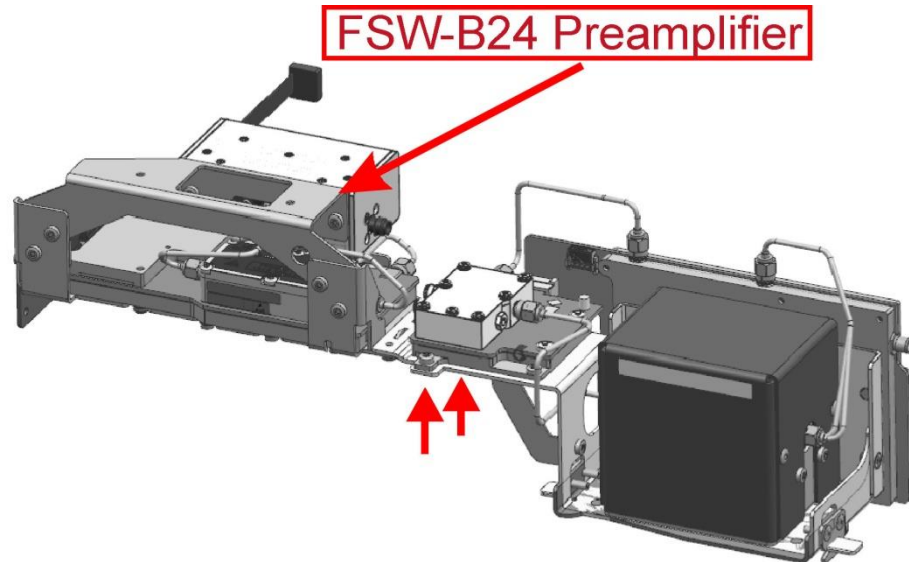


Figure 4-25: Microwave converter frontend for R&S®FSW43

4. Replace the R&S®FSW-B24 frontend unit by a new one
5. Reinstall the two screws previously removed.
6. Reconnect all RF cables previously removed.
7. Reinstall the microwave converter frontend unit to the instrument as describe in chapter 4.3.9.3 for R&S®FSW43 and chapter 4.3.10.3 for R&S®FSW50/67.
8. Mount the right side cover (refer to chapter 4.2.5).
9. Mount the upper and lower cover (refer to 4.2.5).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Perform the Basic Instrument Checks according to chapter 4.2.6.1.
12. Perform a frequency response correction as described in chapter 4.2.6.2.

4.3.18 Replacing the Electronic Attenuator in R&S®FSW8/13/26 (option R&S®FSW-B25)

The installation of the preamplifier option R&S®FSW-B25 depends on the model and on the presence of the option R&S®FSW-B24.

The option R&S®FSW-B25 includes two individual replaceable parts: the relays unit A272 and the electronic attenuator board A281. The two parts are mounted together as the electronic attenuator frontend unit.

Depending on the fault of the electronic attenuator, either the electronic attenuator board or the relays unit must be replaced.

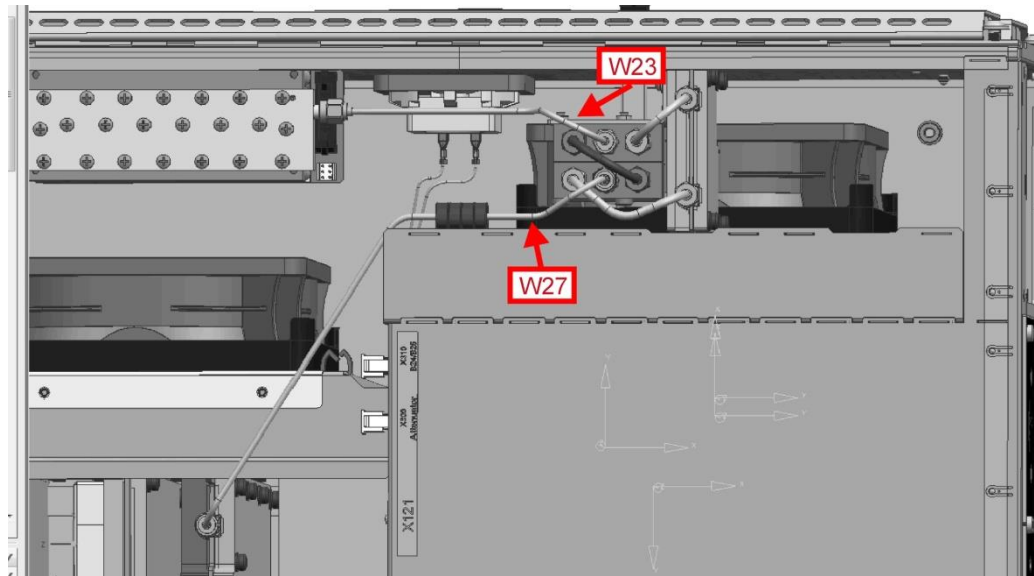


Figure 4-26: Cabling of an R&S®FSW8 equipped with R&S®FSW-B25

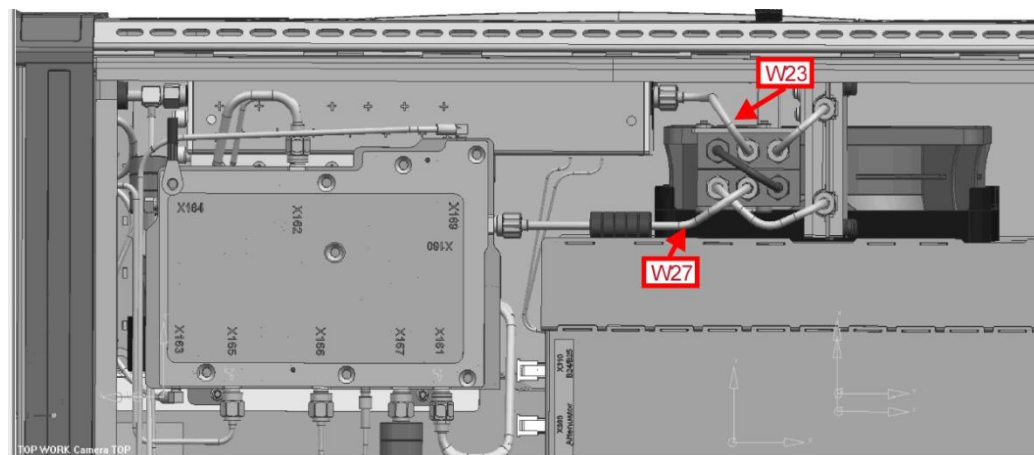


Figure 4-27: Cabling of an R&S®FSW13/26 equipped with R&S®FSW-B25

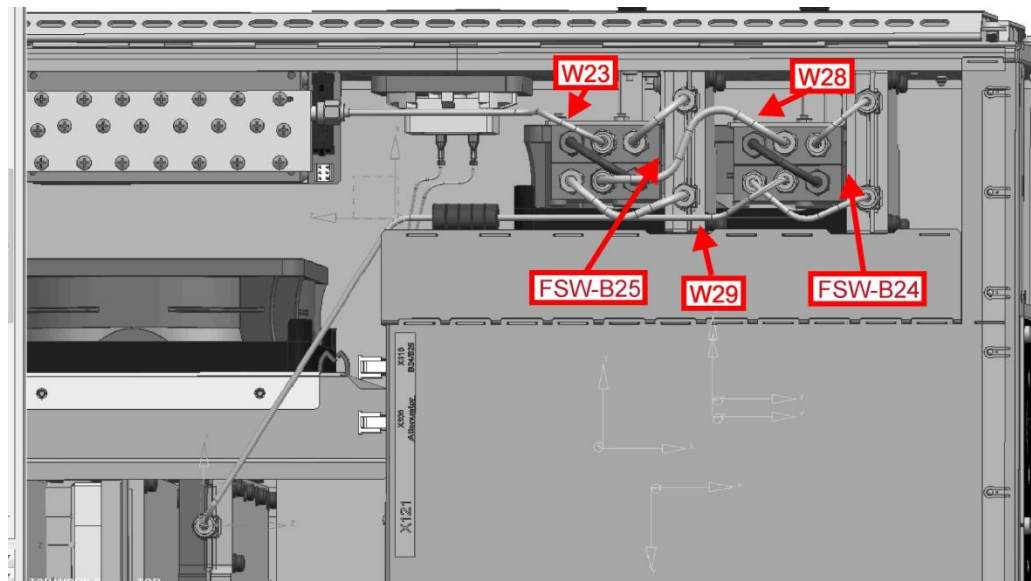


Figure 4-28: Cabling of an R&S®FSW8 equipped with R&S®FSW-B24 and B25

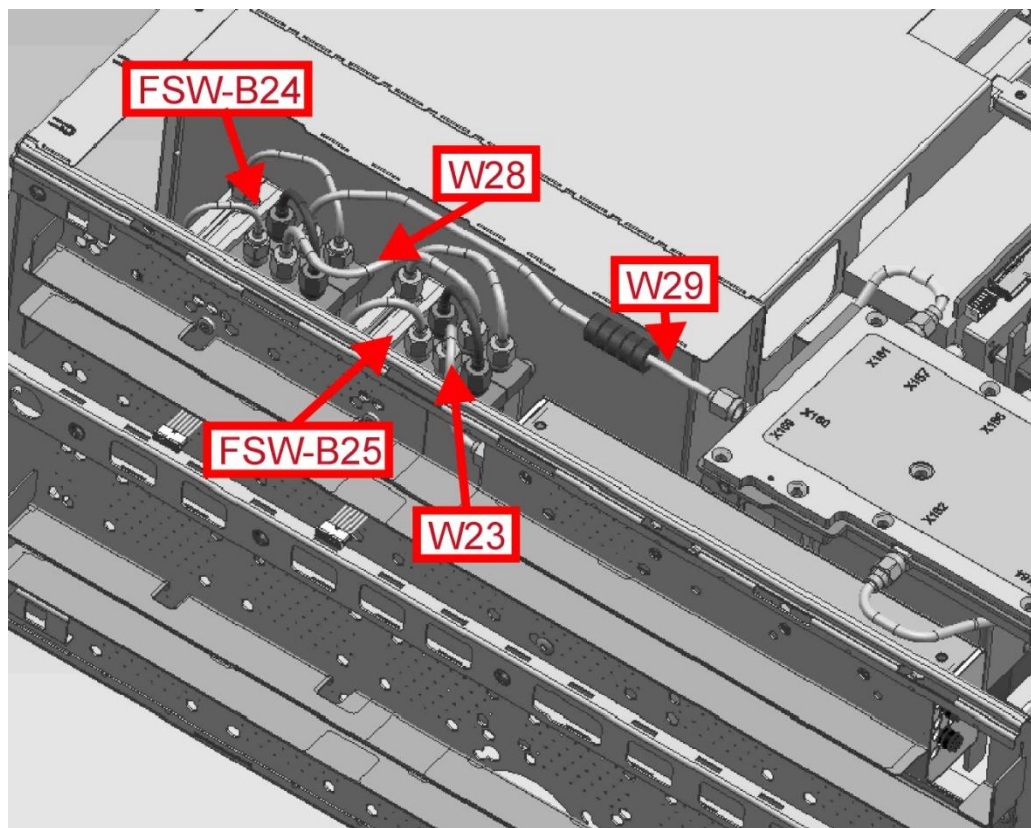


Figure 4-29: Cabling of an R&S®FSW13/26 equipped with R&S®FSW-B24 and B25

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to chapter [4.2.4.1](#)).
3. Unmount the right side cover (refer to chapter [4.2.4.3](#)).

4. Locate the electronic attenuator frontend unit. It is installed in the place shown in the pictures above depending whether R&S®FSW-B24 is installed or not.

R&S®FSW8 without installed option R&S®FSW-B24:

- ▶ Unplug the RF cables W23 at the step attenuator and W27 at the frontend.

R&S®FSW8 with installed option R&S®FSW-B24:

- ▶ Unplug the RF cables W28 at the preamplifier frontend unit (R&S®FSW-B24) and W23 at the step attenuator.

R&S®FSW13/26 without installed option R&S®FSW-B24:

- ▶ Unplug the RF cables W23 at the step attenuator and W27 at the microwave converter frontend.

R&S®FSW13/26 with installed option R&S®FSW-B24:

- ▶ Unplug the RF cables W28 at the preamplifier frontend unit and W23 at the step attenuator.

5. Unscrew the two screws fastening the electronic attenuator frontend unit.
6. Remove the electronic attenuator frontend unit from the instrument.

Note: The flat ribbon cable is still connected. Be careful not to damage the cable or the board!

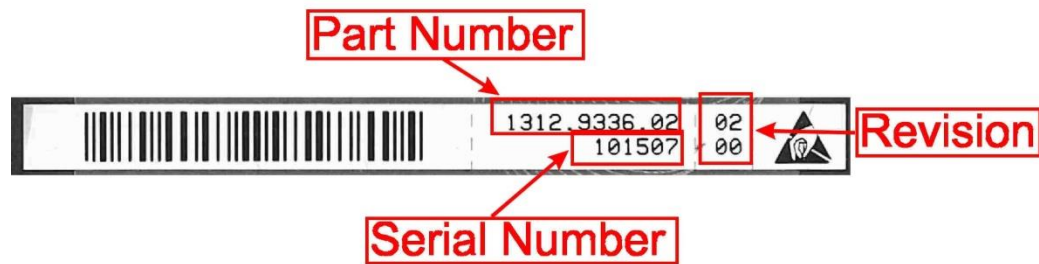
7. Unplug the flat ribbon cable at the electronic attenuator board.

Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

8. Replace either the relays unit or the electronic attenuator board by a new one and reassemble the electronic attenuator frontend unit.
9. Write down the serial number, the part number and the revision of the new part.

Tip: You find this information on the barcode label on the printed circuit board. There are two different barcode labels: (The numbers shown in the picture are only for illustration. Do not use them for updating the Eeprom!)





10. Connect the flat ribbon cable to the electronic attenuator board.
11. Install the electronic attenuator frontend unit to the instrument and fasten it with the two screws previously removed.
Note: Do not over tighten the screws!
12. Reinstall all RF cables previously removed (for detailed cable routing refer to chapter 4.2.2).
Tip: The connector to plug in is written on the yellow tube on the cable.
13. Mount the right side cover (refer to chapter 4.2.5).
14. Mount the lower cover (refer to 4.2.5).
15. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
16. Update the EPROM Data of the preamplifier unit
 - a) When the electronic attenuator board has been changed:
Enter the service password
[SETUP : Service : Service Function : Password = 30473035]

Enter the service function
3.21.7.1.ELATT.xxxx.xxxx.xx.yyyyyy.zz.zz
in the service dialog
[SETUP : MORE : SERVICE : SERVICE FUNCTION]

where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 9.

NOTICE

Risk of losing important information

This service function must be carried out after the first boot of the firmware after replacing the hardware! Otherwise the EEPROM data, necessary to run the instrument properly, is lost!

Enter the service function

[3.21.7.0.ELATT]

and verify the displayed data with the data of the new installed hardware.

b) When the relays unit has been changed:

Enter the service password

[SETUP : Service : Service Function : Password = 30473035]

Enter the service function

3.21.7.1.RELAIS_UNIT.xxxx.xxxx.xx.yyyyyy.zz.zz

in the service dialog

[SETUP : MORE : SERVICE : SERVICE FUNCTION]

where: xxxx.xxxx.xx is the part number, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 9.

Note: This service function will be available with the firmware version 1.40 and higher.

Enter the service function

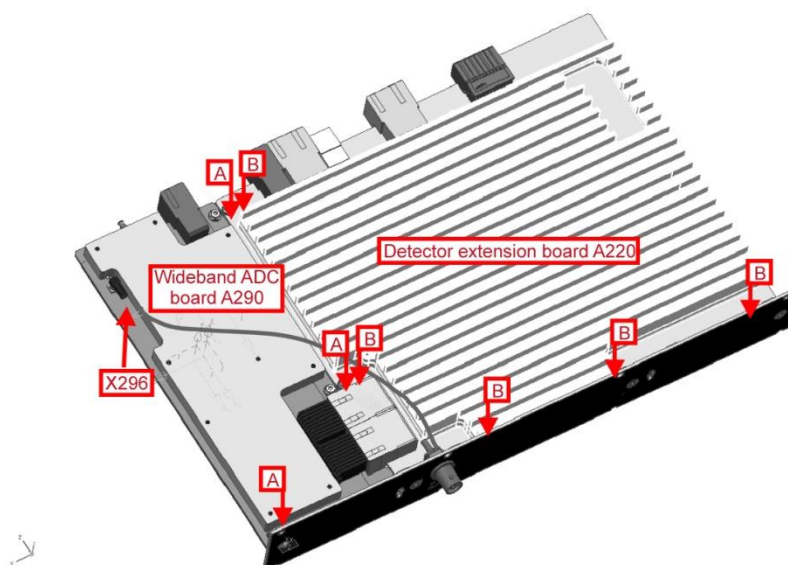
[3.21.7.0.RELAIS_UNIT]

and verify the displayed data with the data of the new installed hardware.

17. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
18. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.19 Replacing the Bandwidth Extension (option R&S®FSW-B160, R&S®FSW-B160R and R&S®FSW-B320)

The option R&S®FSW-B160, R&S®FSW-B160R or R&S®FSW-B320 consists of two boards: The wideband ADC board A290 and the detector extension board A220. The boards can be replaced independently.



1. Switch off the instrument and disconnect the power plug.
2. Unscrew the eight screws on the back cover of the instrument.
3. The wideband ADC board is bundled with the detector extension board. The two boards can only be removed as a pair. To remove the detector extension board and the wideband ADC board using the BW2010 tool.

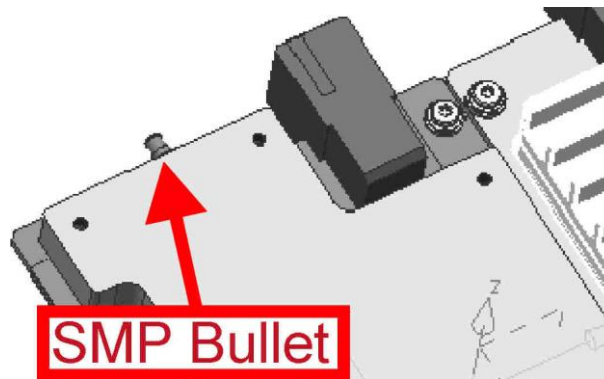
Tip: The board sticks very strongly to the motherboard. It can be removed more easily by gently moving the board to the left and to the right while pulling it out of the frame of the instrument.

Replacing the wideband ADC board A290

- a) Unscrew the three screws, marked with A in the picture above, fastening the wideband ADC board.
- b) Unplug the RF cable at connector X296 and the SMP bullet.
- c) Unplug the wideband ADC board from the detector extension board.
- d) Replug the new wideband ADC board to the detector extension board.
- e) Reinstall the three screws previously removed.
- f) Replug the RF cable and reinstall the SMP bullet previously removed.

Replacing detector extension board A220

- a) Unscrew the six screws, marked with B in the picture above, fastening the detector extension board as shown in the picture above
 - b) Unplug the detector extension board from the wideband ADC board.
 - c) Replug the new detector extension board to the wideband ADC board.
 - d) Reinstall the six screws previously removed.
4. Be sure the SMP bullet is installed properly to the wideband ADC board



5. Reinstall the two modules in the instrument.

Note: Be sure to plug in the module properly. The back panel must seat solidly to the instrument frame.

6. Reinstall the eight screws previously removed.
7. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

For R&S®FSW-B320 only:

8. Perform a frequency response correction as described in chapter [4.2.6.2](#).

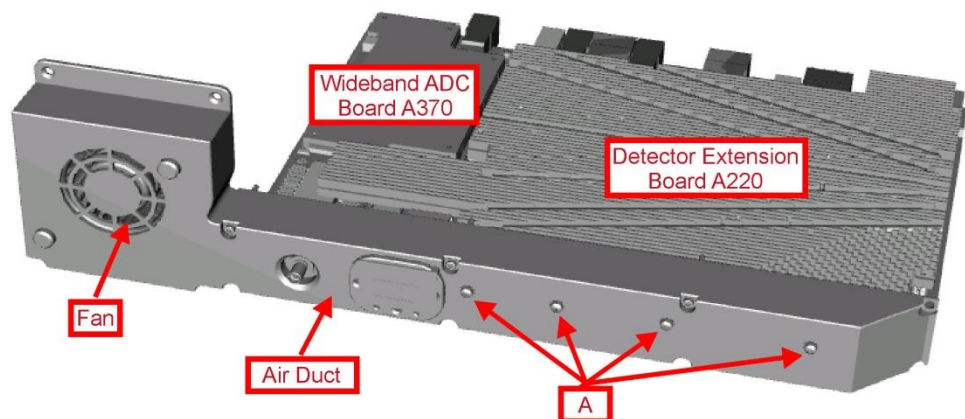
4.3.20 Bandwidth Extension (option R&S®FSW-B512)

The option R&S®FSW-B512 consists of two boards: The wideband ADC board A370 and the detector extension board A220. The boards can be replaced independently.

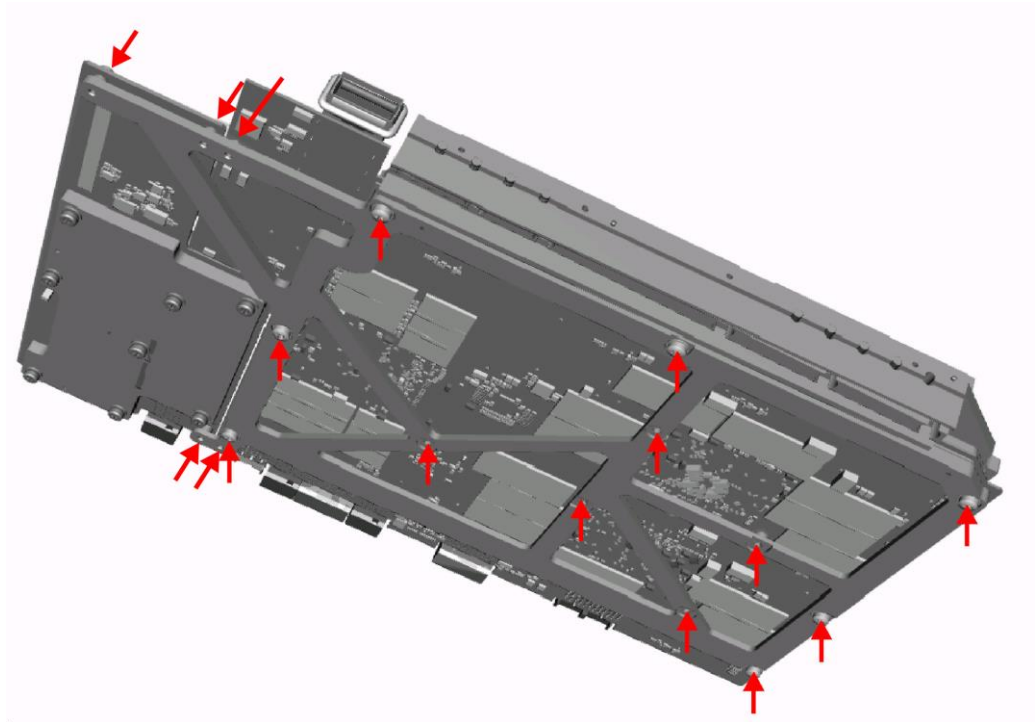
4.3.20.1 Replacing wideband ADC board A370 and detector extension board A220

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the eleven screws fastening the option R&S®FSW-B512 on the back cover of the instrument.
3. The wideband ADC board is bundled with the detector extension board. The two boards can only be removed as a pair. To remove the detector extension board and the wideband ADC board gently pull on the air duct of the R&S®FSW-B500 option.

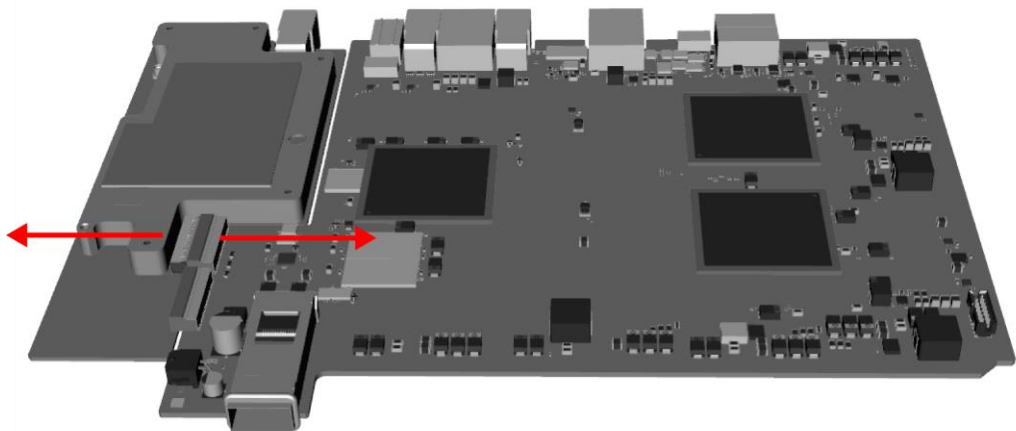
Tip: The board sticks very strongly to the motherboard. It can be removed more easily by gently moving the board to the left and to the right while pulling it out of the frame of the instrument.



4. Unplug the RF cable at connector X376 and the SMP bullet.
Note: The SMP bullet is reused for the new ADC board.
5. Unscrew the four screws, marked with A in the picture above, fastening the air duct to the detector extension board ADC board.
Note: The fan is still connected to the detector extension board. Be careful not to damage the cable!
6. Carefully remove the air duct from the detector extension board and unplug the fan cable. Be careful not to damage the insulation plate!
Note: The connector is locked! To unlock it press the lever down and disconnect carefully the cable!



7. Remove the screws marked with an arrow in the upper picture on the bottom side of the detector extension board.
8. Carefully remove the cooling plate from the detector extension board
NOTICE: Be careful not to damage the integrated circuits on the top side of the board. The cooling plate sticks to the package of the integrated circuits by the heat conductive film!
NOTICE: The two boards are only connected by the high speed connectors! Be careful not to damage the connector!
9. Separate the two boards by unplugging them by pulling them in the direction of the arrows in the picture below



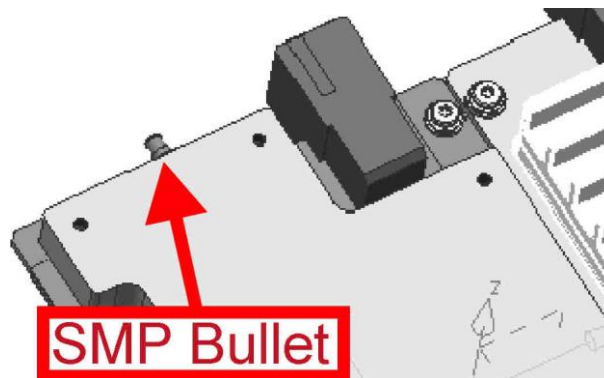
Replacing the wideband ADC board A370

- Replace the wideband ADC board by a new one.

Replacing detector extension board A220

- a) Replace the detector extension board by a new one.
 - b) Replace the grey heat conductive film on the wideband ADC board by a new one
10. Reconnect the two boards.
Note: Do not damage the connectors on the two boards!
 11. Reinstall the heat conductive film on the upper cooling plate formerly removed.
NOTICE: Be sure to install the heat conductive films on the correct positions! Be sure to install the cooling plate to the correct position! Before installing the cooling plate remove the protective foil on the grey heat conductive pad! The detector extension board may be destroyed if the heat conductive film is installed incorrectly!
 12. Reinstall the frame on the bottom side of the detector extension board.
 13. Reinstall the screws formerly removed on the bottom side of the detector extension board.
 14. Reinstall the fan unit to the boards.
 15. Reconnect the fan controller cable.
 16. Reconnect the RF cable at connector X376.
 17. Reinstall the SMP bullet formerly removed.

Note: Be sure the SMP bullet is installed properly to the wideband ADC board!



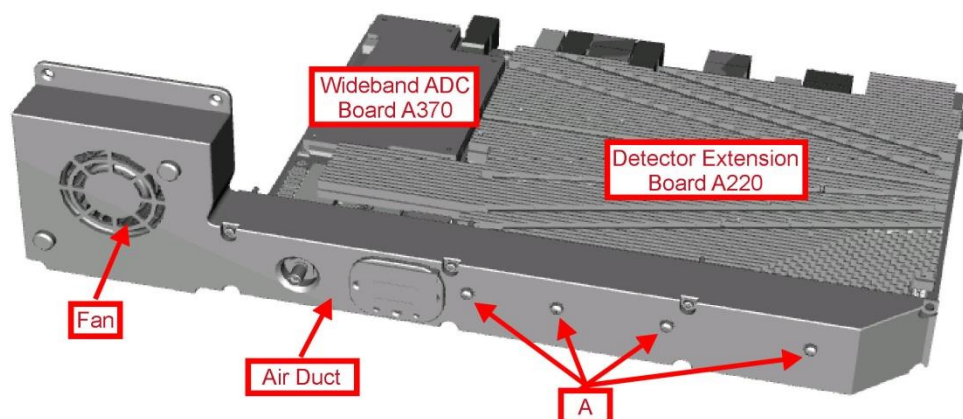
18. Reinstall the air duct with the four screws formerly removed.
Note: Be sure to install the insulation sheet between air duct and detector extension board as well as the insulation washers underneath the screws.
19. Reinstall the boards to the instrument.
20. Reinstall the eleven screws formerly removed.
21. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

22. Perform a frequency response correction as described in chapter 4.2.6.2.

4.3.20.2 Replacing fan of bandwidth extension

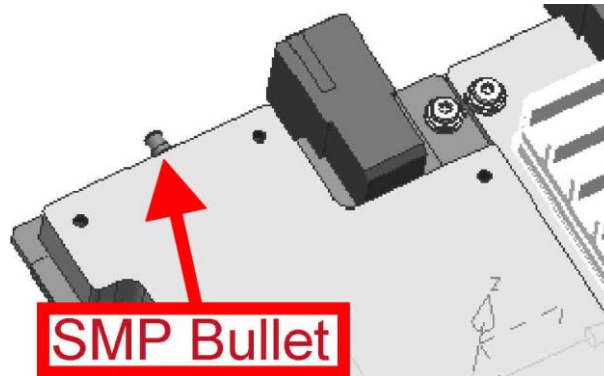
1. Switch off the instrument and disconnect the power plug.
2. Unscrew the eleven screws fastening the option R&S®FSW-B512 on the back cover of the instrument.
3. The wideband ADC board is bundled with the detector extension board. The two boards can only be removed as a pair. To remove the detector extension board and the wideband ADC board gently pull on the air duct of the R&S®FSW-B512 option.

Tip: The board sticks very strongly to the motherboard. It can be removed more easily by gently moving the board to the left and to the right while pulling it out of the frame of the instrument.



4. Unplug the RF cable at connector X376 and the SMP bullet.
Note: The SMP bullet is reused for the new ADC board.
5. Unscrew the four screws, marked with A in the picture above, fastening the air duct to the detector extension board ADC board.
Note: The fan is still connected to the detector extension board. Be careful not to damage the cable!
6. Carefully remove the air duct from the detector extension board and unplug the fan cable. Be careful not to damage the insulation plate!
Note: The connector is locked! To unlock it press the lever down and disconnect carefully the cable!
7. Unscrew the two screws fastening the fan to the air duct.
8. Replace the fan by a new one and fasten it with the two screws formerly removed.
9. Reconnect the RF cable at connector X376 and the SMP bullet.

Note: Be sure the SMP bullet is installed properly to the wideband ADC board



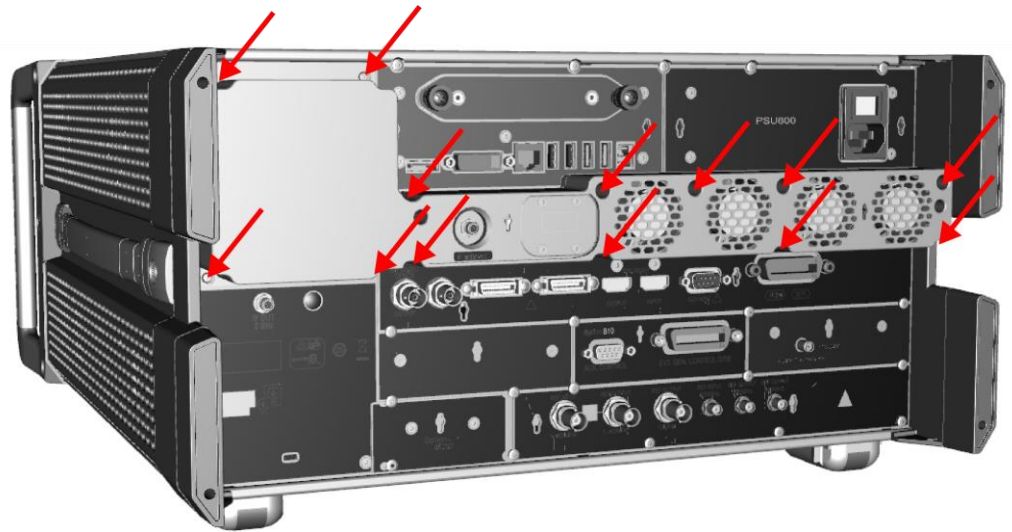
10. Reconnect the fan cable.
11. Reinstall the air duct with the four screws formerly removed.
Note: Be sure to install the insulation sheet between air duct and detector extension board as well as the insulation washers underneath the screws.
12. Reinstall the boards to the instrument.
13. Reinstall the eleven screws formerly removed.
14. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
15. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.21 Bandwidth Extension (option R&S®FSW-B512R)

The option R&S®FSW-B512R consists of two boards: The wideband ADC board A370 and the detector extension board A220. The boards can be replaced independently.

4.3.21.1 Replacing wideband ADC board A370 and detector extension board A220

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the 13 screws fastening the option on the back cover of the instrument marked with an arrow in the picture below.



3. The wideband ADC board is bundled with the detector extension board. The two boards can only be removed as a pair. To remove the detector extension board and the wideband ADC board gently pull on the air duct of the option.

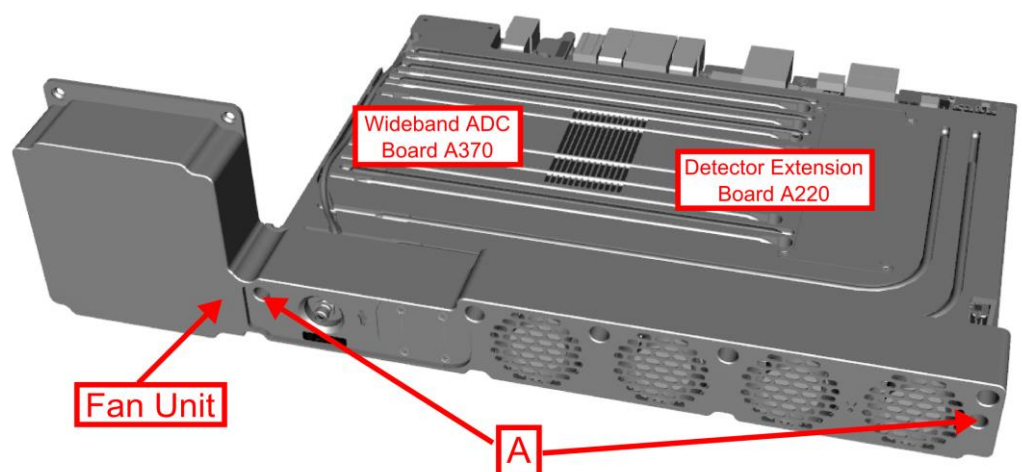
Tip: The board sticks very strongly to the motherboard. It can be removed more easily by gently moving the board to the left and to the right while pulling it out of the frame of the instrument. You can use a BW2000 removal tool.

4. Unplug the RF cable at connector X376 and the SMP bullet.

Note: The SMP bullet is reused for the new ADC board.

5. Unscrew the two screws, marked with A in the picture above, fastening the fan unit to the detector extension board ADC board.

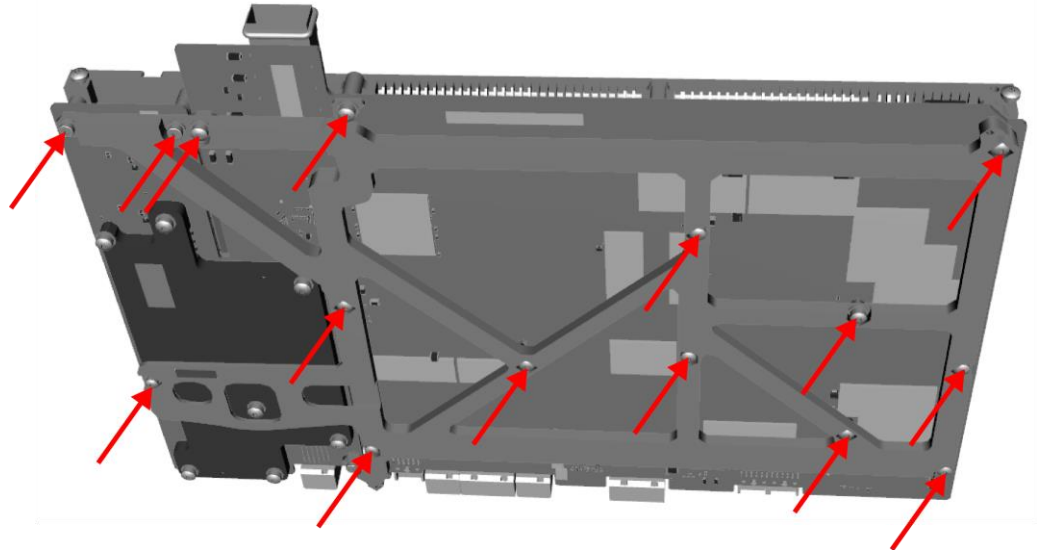
Note: The fan unit is still connected to the detector extension board. Be careful not to damage the cable!



6. Carefully remove the fan unit from the detector extension board and unplug the fan controller cable.

Note: The connector is locked! To unlock it press the lever down and disconnect carefully the cable!

7. Remove the 15 screws marked with an arrow in the picture below on the bottom side of the detector extension board.

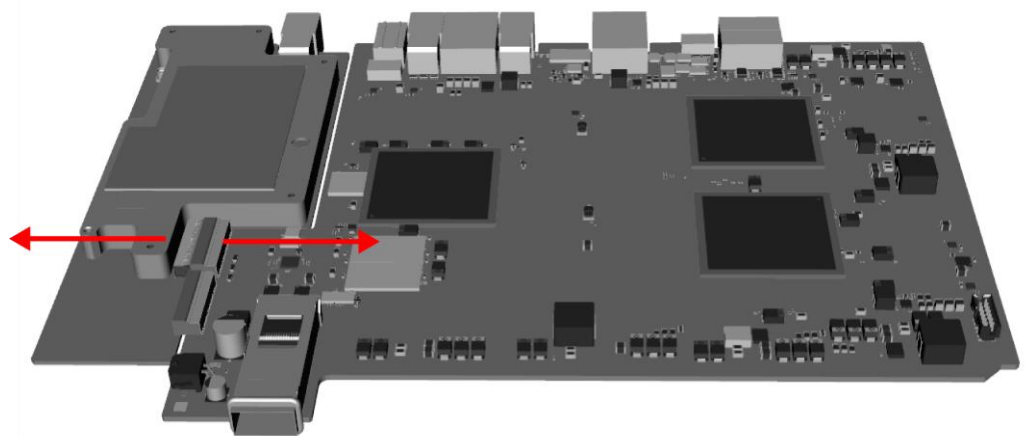


8. Carefully remove the upper cooling plate from the detector extension board

NOTICE: Be careful not to damage the integrated circuits on the top side of the board. The cooling plate sticks to the package of the integrated circuits by the heat conductive film!

NOTICE: The two boards are only connected by the high speed connectors! Be careful not to damage the connector!

9. Separate the two boards by unplugging them by pulling them in the direction of the arrows in the picture below



Replacing the wideband ADC board A370

- Replace the wideband ADC board by a new one.

Replacing detector extension board A220

- a) Replace the detector extension board by a new one.
 - b) Replace the grey heat conductive film on the wideband ADC board by a new one
10. Reconnect the two boards.

Note: Do not damage the connectors on the two boards!

11. Reinstall the heat conductive film on the upper cooling plate formerly removed.

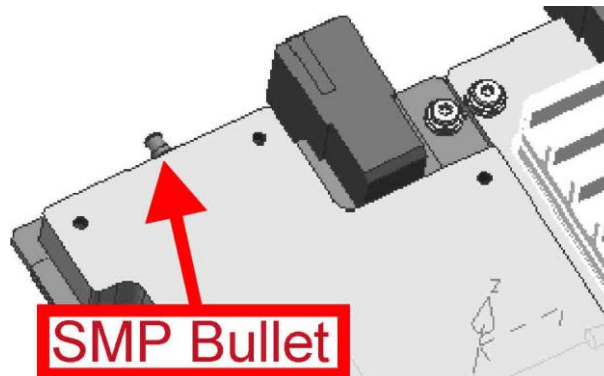
NOTICE: Be sure to install the heat conductive films on the correct positions! Be sure to install the cooling plate to the correct position! The detector extension board may be destroyed if the heat conductive film is installed incorrectly!

12. Reinstall the frame on the bottom side of the detector extension board.
13. Reinstall the 15 screws formerly removed on the bottom side of the detector extension board.
14. Reinstall the fan unit to the boards.

Note: Be sure to route the fan cables properly! Refer to instruction in chapter 6.3 "FAN UNIT 1331.4559.00".

15. Reconnect the fan controller cable.
16. Reconnect the RF cable at connector X376.
17. Reinstall the SMP bullet formerly removed. (for option FSW-B1200: install the 4 SMP bullets formerly removed!)

Note: Be sure the SMP bullet is installed properly to the wideband ADC board!

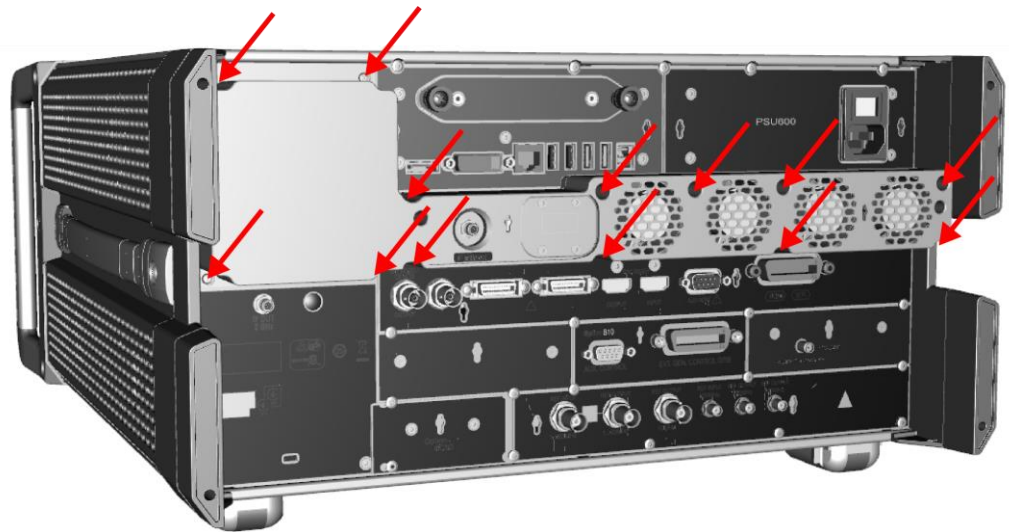


18. Reinstall the unit to the instrument.
19. Reinstall the 13 screws formerly removed.
20. Perform the Basic Instrument Checks according to chapter 4.2.6.1.
21. Perform a frequency response correction as described in chapter 4.2.6.2.

4.3.21.2 Replacing fan of bandwidth extension

1. Switch off the instrument and disconnect the power plug.

2. Unscrew the 13 screws fastening the option on the back cover of the instrument marked with an arrow in the picture below.



3. The wideband ADC board is bundled with the detector extension board. The two boards can only be removed as a pair. To remove the detector extension board and the wideband ADC board gently pull on the air duct of the option.

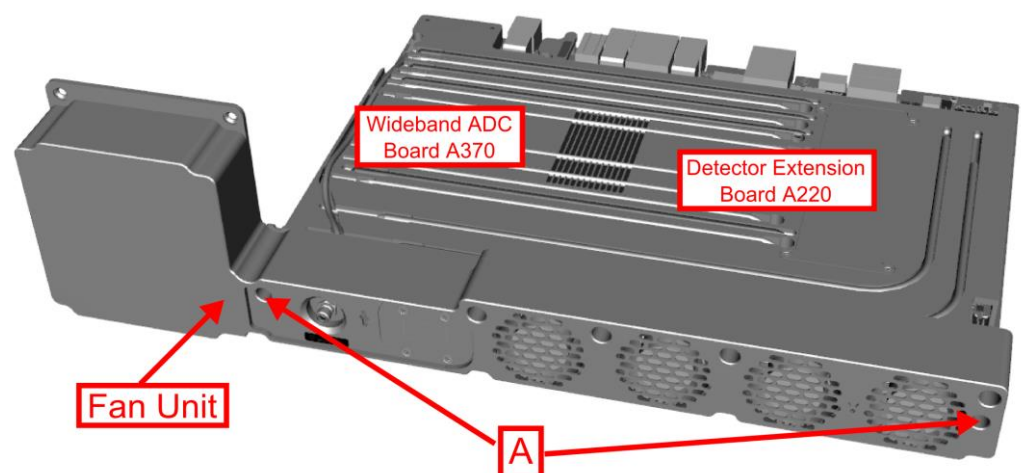
Tip: The board sticks very strongly to the motherboard. It can be removed more easily by gently moving the board to the left and to the right while pulling it out of the frame of the instrument. You can use a BW2000 removal tool.

4. Unplug the RF cable at connector X376 and the SMP bullet.

Note: The SMP bullet is reused for the new ADC board.

5. Unscrew the two screws, marked with A in the picture above, fastening the fan unit to the detector extension board ADC board.

Note: The fan unit is still connected to the detector extension board. Be careful not to damage the cable!



6. Carefully remove the fan unit from the detector extension board and unplug the fan cable.

Note: The connector is locked! To unlock it press the lever down and disconnect carefully the cable!

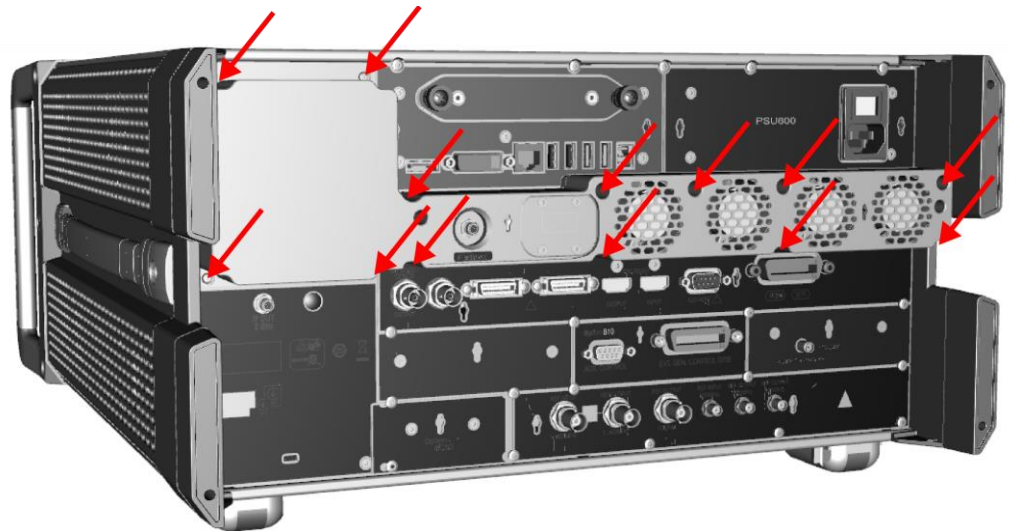
7. For disassembling and assembling the fan unit refer to the detailed description in chapter 6.3 "FAN UNIT 1331.4559.00". Replace the defective fan by a new one.
8. Reinstall the fan unit to the boards.

Note: Be sure to route the fan cables properly! Refer to instruction in chapter 6.3 "FAN UNIT 1331.4559.00".

9. Reconnect the fan controller cable.
10. Reconnect the RF cable at connector X376.
11. Reinstall the unit to the instrument.
12. Reinstall the 13 screws formerly removed.
13. Perform the Basic Instrument Checks according to chapter 4.2.6.1.
14. Perform a frequency response correction as described in chapter 4.2.6.2.

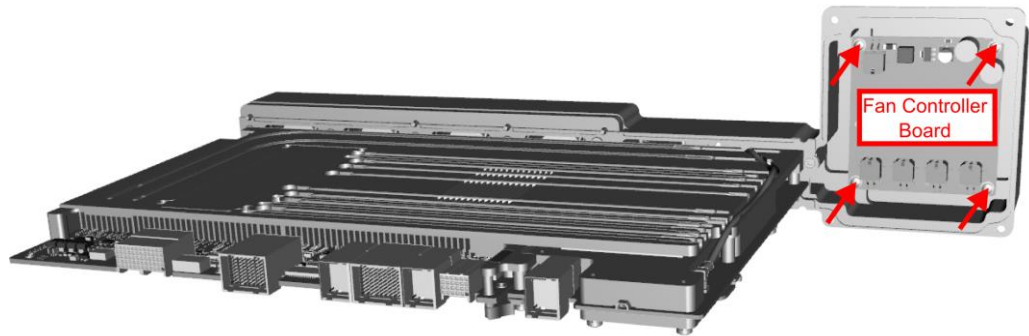
4.3.21.3 Replacing the fan controller board

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the 13 screws fastening the option on the back cover of the instrument marked with an arrow in the picture below.



3. The wideband ADC board is bundled with the detector extension board. The two boards can only be removed as a pair. To remove the detector extension board and the wideband ADC board gently pull on the air duct of the option.

Tip: The board sticks very strongly to the motherboard. It can be removed more easily by gently moving the board to the left and to the right while pulling it out of the frame of the instrument. You can use a BW2000 removal tool.



4. Uninstall the 4 screws marked with an arrow fastening the fan controller board.
5. Remove the board from its housing and unplug all 5 cables.
6. Replace the board by a new one.
7. Reconnect all 5 cables.
Note: Be sure to connect the correct connectors! The name is written on the connector!
8. Reinstall the fan controller board in its housing and reinstall the 4 screws formerly removed.
9. Reinstall the unit to the instrument.
10. Reinstall the 13 screws formerly removed.
11. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
12. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.22 Bandwidth Extension (option R&S®FSW-B1200)

The option R&S®FSW-B1200 consists of three boards: The wideband ADC board A370 and the detector extension board A220 and the wideband frontend board in the front part of the instrument. The boards can be replaced independently.

4.3.22.1 Replacing wideband ADC board A370 or detector extension board A220 or fan controller board

For replacing this two boards refer to chapter [4.3.21](#). The method of changing the boards is the same as it is with option FSW-B512R.

4.3.22.2 Replacing Wideband Converter Board A110

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to [4.2.4.1](#)).
3. Unmount the inner lid1 (refer to [4.2.4.2](#)).
4. Unplug all RF cables at the wideband converter board.

Note: There are three cables routed on the upper side of the instrument!

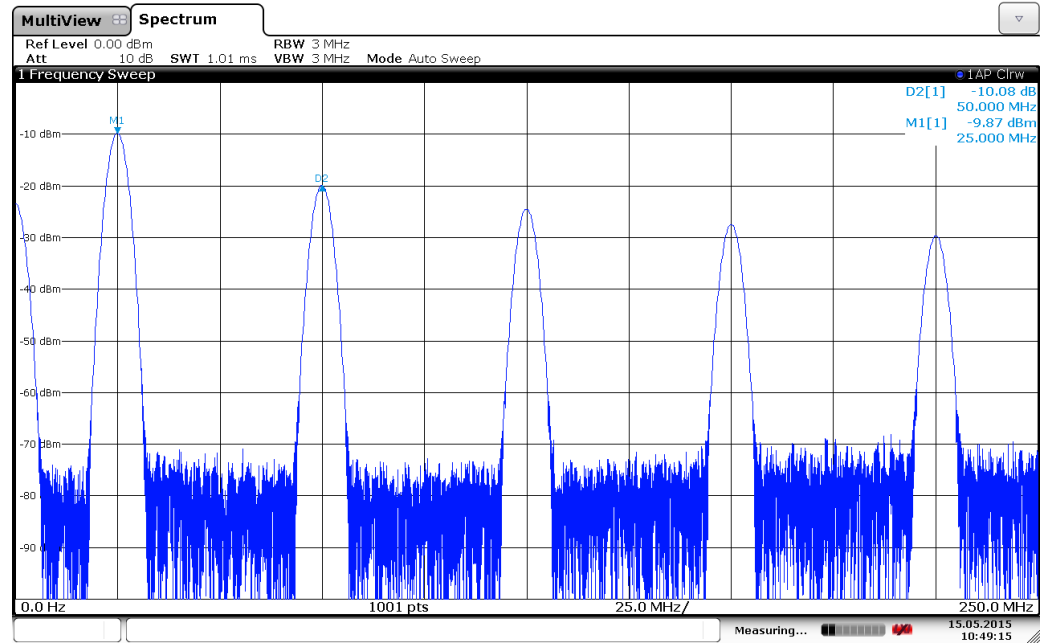
5. Remove the wideband converter board carefully.
6. Install the new wideband converter board.
7. Reconnect all RF cables at the wideband converter board.
Tip: The connector to plug in is written on the yellow tube on the cable.
8. Mount the inner lid1 (refer to chapter 4.2.5).
9. Mount the upper and lower cover (refer to chapter 4.2.5)
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Perform the Basic Instrument Checks according to chapter 4.2.6.1.
12. Perform a frequency response correction as described in chapter 4.2.6.2.

4.3.23 Replacing the R&S®RTO Cal source board (option R&S®FSW-B2000)

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the screws fastening the R&S®RTO Cal source board at the backside of the instrument.
3. Remove the R&S®RTO Cal source board using the BW2010 removal tool.
4. Reinstall the new R&S®RTO Cal source board to the instrument.
5. Reinstall the screws previously removed.
6. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
7. Perform the Basic Instrument Checks according to chapter 4.2.6.1.
8. Connect the output on the R&S®RTO cal source board to the input of the instrument by use of an adequate cable.
9. Activate the output by use of the following service commands:
 [SETUP : Service : Enter Password = 894129]
 [SETUP : Service : Enter Service Function:
 2.0.22.1.SIRIUS_R&S®RTO_CAL_SOURCE.CPLD.VCXO.VCXO_ON]
 [SETUP : Service : Enter Service Function:
 2.0.22.1.SIRIUS_R&S®RTO_CAL_SOURCE.CPLD.DIVIDER.DIV_2]
 [SETUP : Service : Enter Service Function:
 2.0.22.1.SIRIUS_R&S®RTO_CAL_SOURCE.CPLD.ATTENUATOR.4/d]
10. Set the FSW to the following setup:
 [PRESET]
 [AMP : Ref Level : 0 dBm]
 [FREQ : START : 0 Hz]

[FREQ : STOP : 250 MHz]
 [BW : Res BW manual: 3 MHz]

11. Evaluate the shown spectrum:



Date: 15.MAY.2015 10:49:14

Set Marker1 to 25MHz: -10.5dBm $\pm$ 3dB

Set Marker2 to 75MHz: 9.5 $\pm$ 1.5 dB lower than level at 25MHz

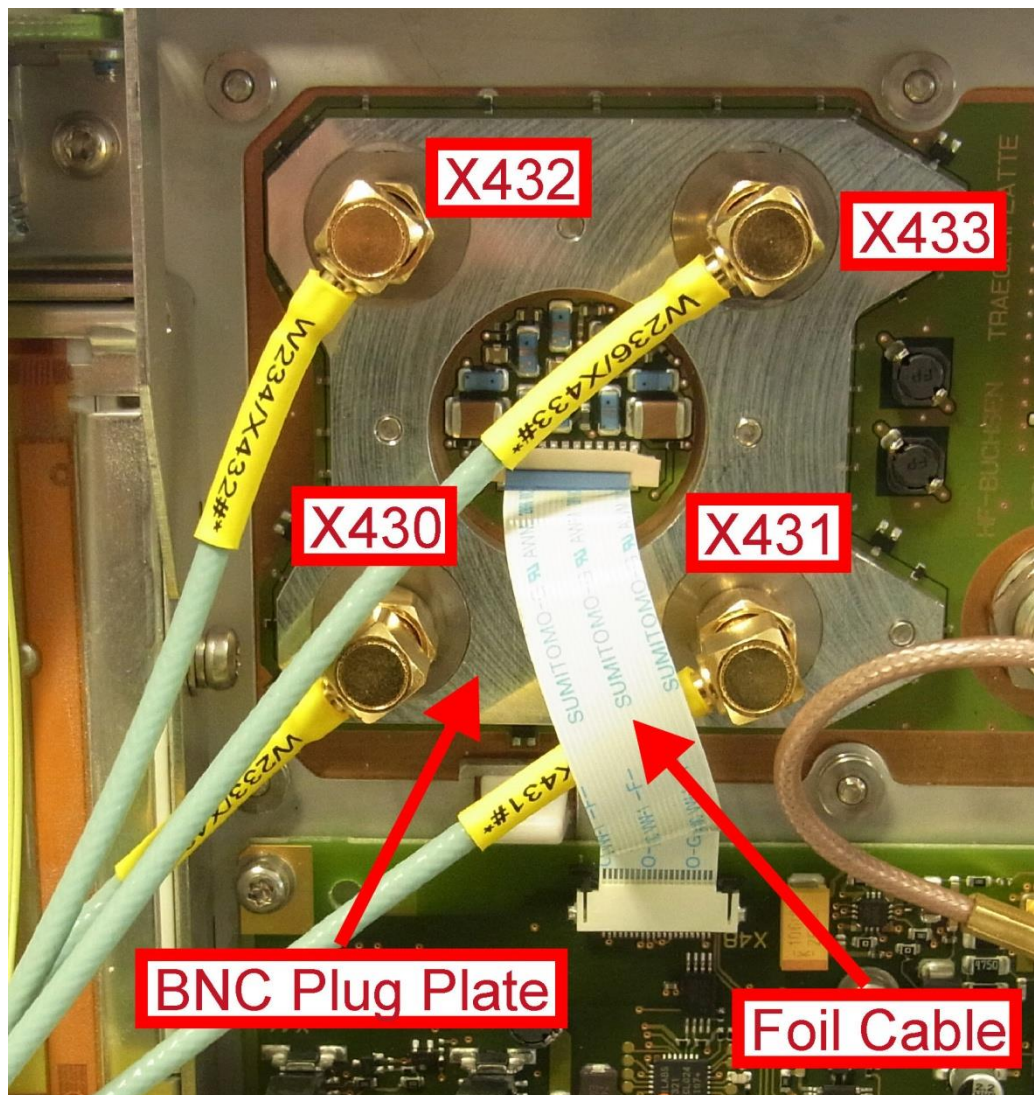
4.3.24 Replacing the Analog Baseband Inputs (option R&S®FSW-B71)

The option Analog Baseband Inputs consists of a Baseband Board, a coax relay and the BNC plug plate on the frontpanel. These parts are individually changeable.

4.3.24.1 Replacing the BNC plug plate



In R&S®FSW85 the R&S®FSW-B71 option consists of only two BNC inputs. So the BNC plug plate has only two SMA and BNC connectors. In the pictures below the R&S®FSW-B71 in FSW 8/13/26/43/50/67 is shown!



1. Switch off the instrument and disconnect the power plug.
2. Unmount the frontpanel (refer to chapter 4.2.5).
3. Unplug the four (for R&S®FSW85: two) SMA cables from the BNC plug plate.

For FSW 8/13/26/43/50/67:

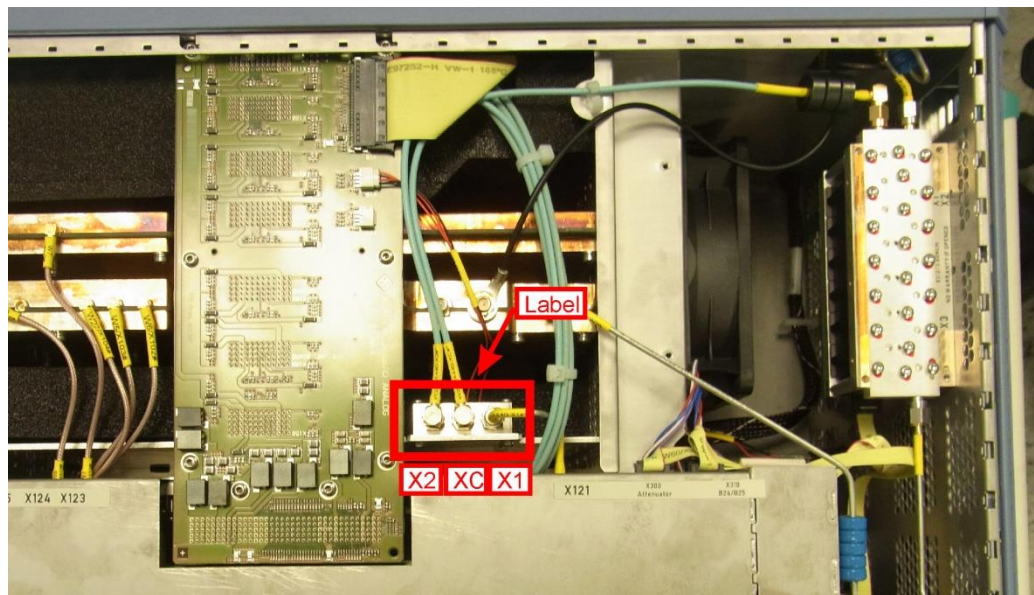
- Remove the label R&S®FSW connector around the input connector.
- 4. Unplug the B71 foil cable at the front panel.

5. Unscrew the six screws fixing the BNC plug plate.
6. Replace the BNC plug plate by a new one.
7. Fasten the six screws previously removed.

For FSW 8/13/26/43/50/67:

- Replace the label R&S®FSW connector around the input connector.
8. Reconnect the foil cable.
 9. Reconnect the four (for R&S®FSW 85: two) SMA cables to the BNC plug plate.
Tip: The connector to plug in is written on the yellow tube on the cable.
 10. Mount the frontpanel to the instrument (refer to chapter 4.2.5).
 11. Mount the right side cover (refer to 4.2.5).
 12. Mount the upper and lower cover (refer to 4.2.5).
 13. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
 14. Perform the Basic Instrument Checks according to chapter 4.2.6.1.
 15. Perform a frequency response correction as described in chapter 4.2.6.2.

4.3.24.2 Replacing the B71 Coax Relay in R&S®FSW8/13/26/43/50



1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to chapter 4.2.4.1).
3. Unmount the inner lid1 (refer to chapter 4.2.4.2).
4. Unplug the three SMA cables on the coax relay on the bottom side of the instrument.

5. Unplug the control cable at the Analog Motherboard.
6. Remove the metal sheet with the mounted coax relay.
7. Replace the coax relay by a new one.
Note: The label on the relay must be readable when the relay is mounted.
8. Insert the metal sheet with the mounted relay into the instrument.
9. Reconnect the control cable to Analog Motherboard.
Note: The control cable must be connected to X16.
10. Reconnect the three SMA cables to the relay.
Tip: The connector to plug in is written on the yellow tube on the cable.
11. Mount the inner lid1 (refer to chapter 4.2.5).
12. Mount the upper and lower cover (refer to chapter 4.2.5).
13. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
14. Perform the Basic Instrument Checks according to chapter 4.2.6.1.

4.3.24.3 Replacing the Input Connector carrier board

1. Switch off the instrument and disconnect the power plug.
2. Unmount the frontpanel (refer to chapter 4.2.5).
3. Unplug the four (for R&S®FSW 85: two) SMA cables from the BNC plug plate
For FSW 8/13/26/43/50/67:
 - a) Remove the label R&S®FSW connector around the input connector.
 - b) Uninstall the RF input connector (refer to chapter 4.3.2.6)
4. Unplug the foil cable at the front panel
5. Unplug the two RF cables.
6. Unscrew the 6 screws fastening the input connector carrier board.
7. Replace the old input connector carrier board by a new one.
Note: The BNC connectors and the BNC plug plate as well as the RF input connector are reused with the new input connector carrier board.
8. Reinstall the connectors to the new input connector carrier board.
9. Reinstall the input connector carrier board to the front unit.
10. Reconnect the two RF cables.
Tip: The connector to plug in is written on the yellow tube on the cable.
11. Reinstall the B71 foil cable.
12. Reinstall the frontpanel to the instrument. (refer to chapter 4.2.5)

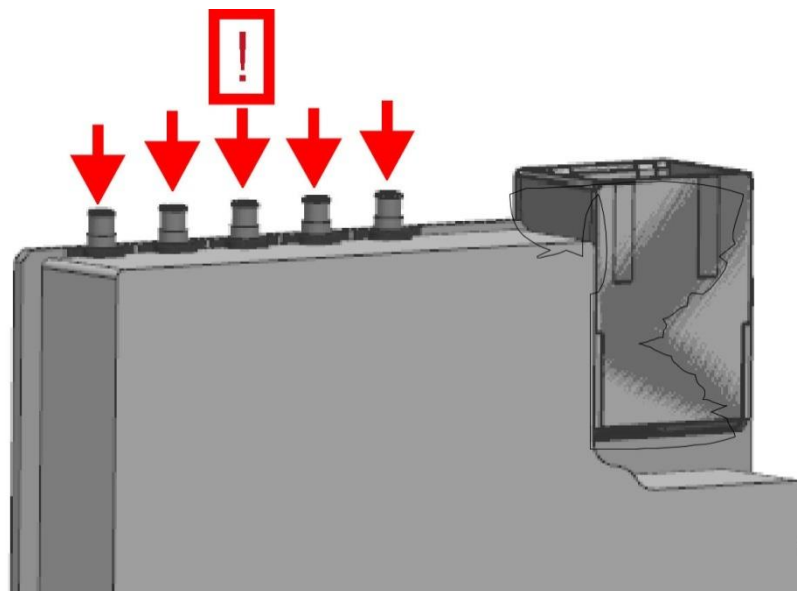
For FSW 8/13/26/43/50/67:

- ▶ Reinstall the label to the input connector carrier board (refer to chapter [4.3.2.6](#))
- 13. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
- 14. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).
- 15. Perform a frequency response correction as described in chapter [4.2.6.2](#).

4.3.24.4 Replacing the Analog Baseband board A230

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the screws fastening the B71 A/D converter board at the backside of the instrument.
3. Remove the B71 A/D converter board using the BW2010 removal tool.
4. Reinstall the new B71 A/D converter board to the instrument.

Note: Check the five SMP bullets!



5. Reinstall the screws previously removed.
6. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
7. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

4.3.25 Replacing the External Generator Control Board A240 (option R&S®FSW-B10)

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the four screws fastening the R&S®FSW-B10 controller board on the backside of the instrument

3. remove the R&S®FSW-B10 controller board from the instrument.
4. Reinstall the new R&S®FSW-B10 controller board to the instrument.
5. Reinstall the screws previously removed.
6. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
7. Perform the Basic Instrument Checks according to chapter [4.2.6.1](#).

4.3.26 Replacing the LO/IF connections for external mixers (option R&S®FSW-B21)

The LO/IF connections for external mixers is located on the microwave converter frontend. If there is any problem except a damaged frontpanel connector, the whole microwave converter frontend has to be replaced.

For R&S®FSW13/26 refer to chapter [4.3.8](#).

For R&S®FSW43 refer to chapter [4.3.9](#).

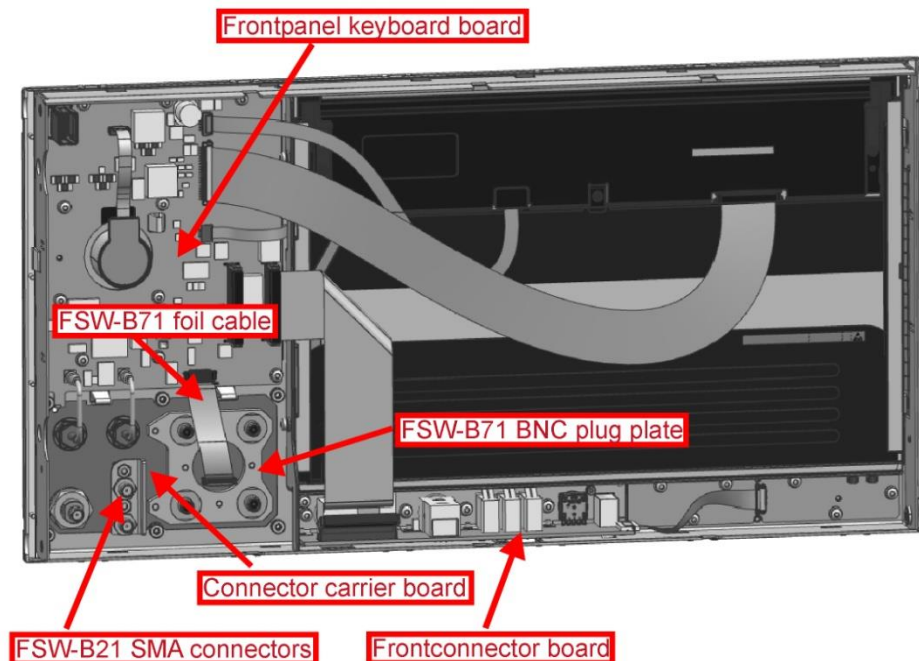
For R&S®FSW50/67 refer to chapter [4.3.10](#).

For R&S FSW85 refer to chapter [4.3.11.2](#)

4.3.26.1 Replacing the frontpanel connectors



The pictures below show a R&S®FSW 26/43/50/67. For R&S®FSW 85 the connectors can be replaced in the same way.



1. Switch off the instrument and disconnect the power plug.
2. Unmount the frontpanel (refer to chapter 4.2.5).
3. Replace the B21 SMA input connectors by new ones.
4. Mount the frontpanel to the instrument (refer to chapter 4.2.5).
5. Mount the right side cover if unmounted (refer to chapter 4.2.5).
6. Mount the upper and lower cover (refer to chapter 4.2.5).
7. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
8. Perform the Basic Instrument Checks according to chapter 4.2.6.1.
9. Perform a frequency response correction as described in chapter 4.2.6.2.

4.4 Troubleshooting

Malfunctions may have simple reasons but also may be caused by faulty components.

These troubleshooting instructions enable you to locate error causes down to board level and make the instrument ready for use again by means of board replacement.

We recommend that the instrument is shipped to our experts in the service centers (see address list) for module replacement and further error elimination.

For successfully detect an error perform the checks described in the in the flowcharts in the given order. The exact way to carry out the checks is described in the chapter after the flowcharts.

WARNING

Shock hazard

Before opening the casing, make sure that the instrument is switched off and disconnected from all power supplies.

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

NOTICE

Risk of damage to the boards

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

Utilities provided in the FSW for diagnostic purposes:

- Permanent monitoring of levels and frequencies in the instrument
- Selftest
- Frequency response correction



Frequent cause of problems: connections

When problems occur, first check whether any cables, plug-in connections of boards, etc. are damaged and whether they are connected properly.

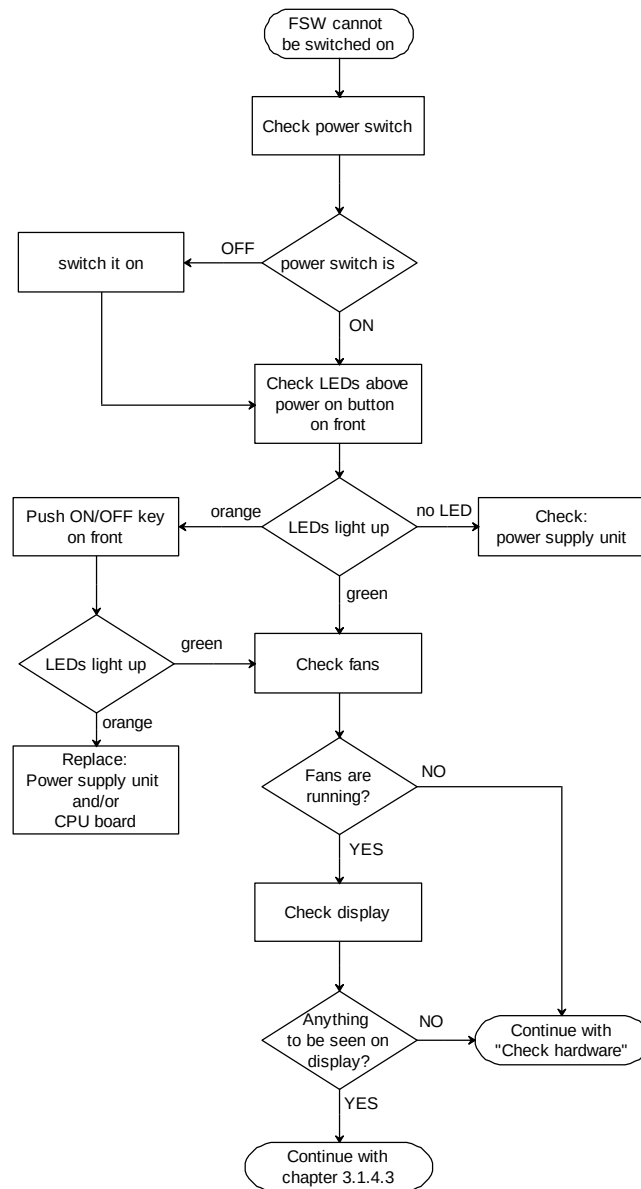
4.4.1 Measuring Equipment and Accessories

Item	Type of equipment	Specifications recommended	Equipment recommended	R&S-Order No.	Use
1	DC meter		R&S URE	0350.5315.02	Troubleshooting Start Up
2	spectrum analyzer		R&S FSV 30 R&S®FSW26	1307.9002.30 1312.8000.26	troubleshooting analog hardware
3	signal generator		R&S SMR20	1104.0002.20	troubleshooting analog hardware

4.4.2 Troubleshooting: Instrument cannot be Switched On

Before you get started with the algorithms make sure your wall outlet is functioning properly and your mains cable is ok.

4.4.2.1 Part 1: Basic Checks: Algorithm



4.4.2.2 Part 1: Basic Checks: Detailed Description

"Check power switch": The power switch is located on the back side of the instrument above power inlet. The setting of the switch is marked on the switch.

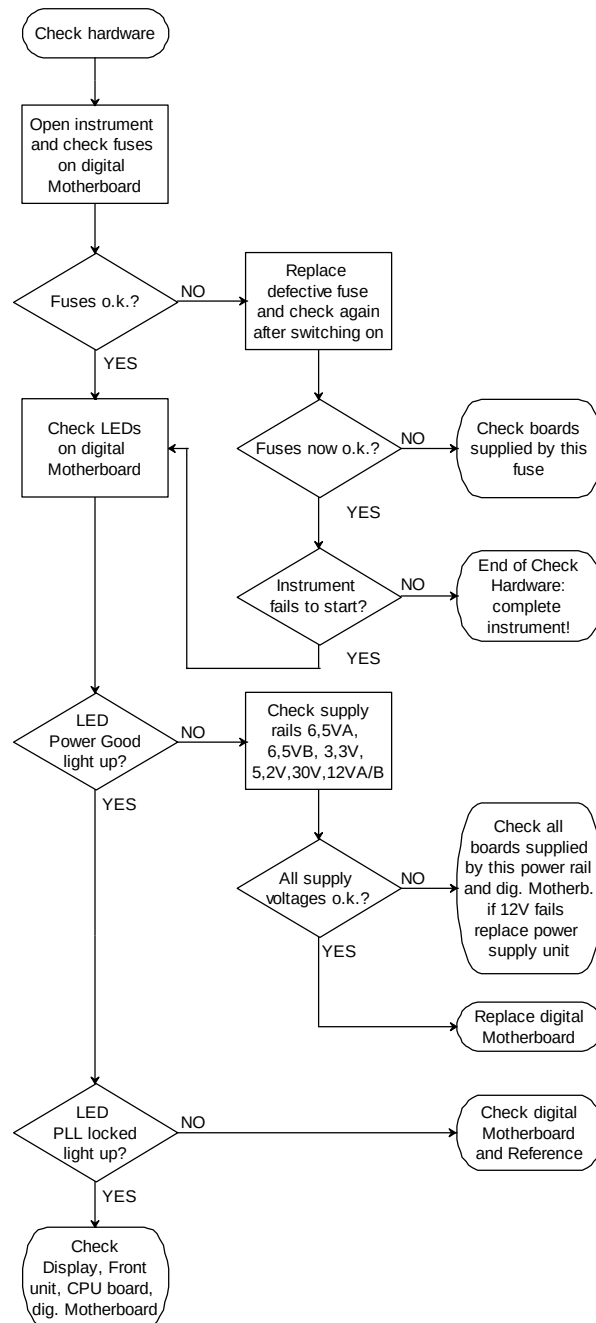
"Check LEDs above power on button on front": The LEDs to check are located above the power on button on the front of the instrument. There is a green LED which lights up when the instrument is switched on, and an orange one which lights up when the instrument is in standby state.

"Check fans": The two main fans of the instrument are located on the right side of the instrument. In a quiet surrounding you can hear if the fans are running. The fans start running with a delay of a few seconds after switching on the instrument.

"Check display": check the display for any displayed information. For detailed information refer to [4.4.3](#).

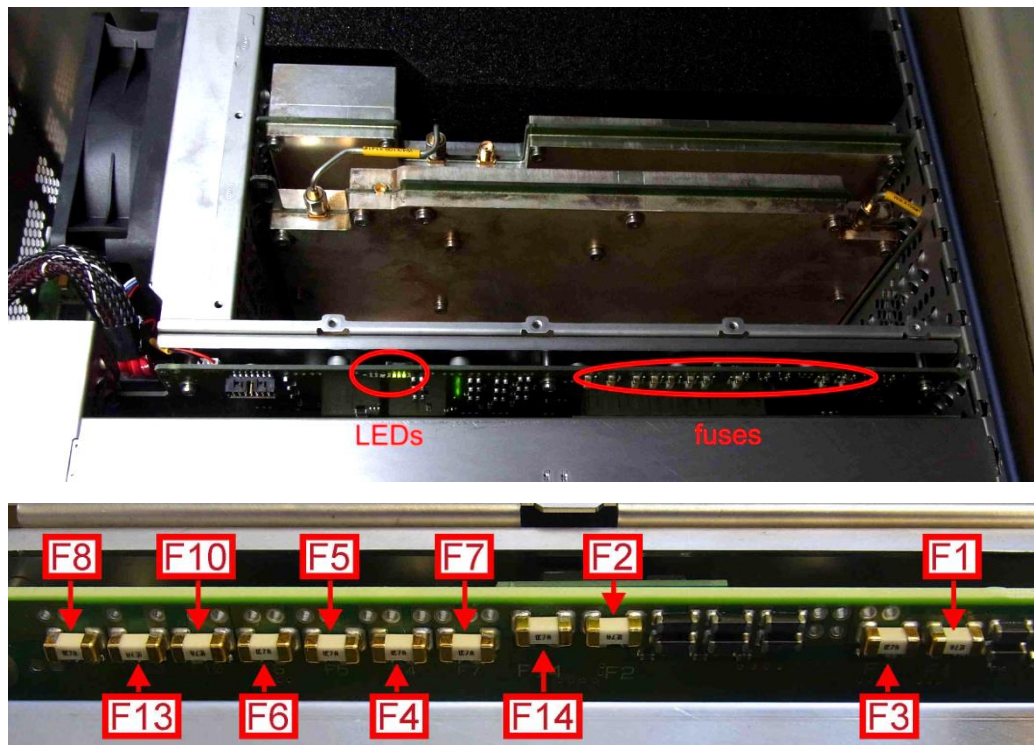
"Check Power Supply Unit": Check the voltages supplied by the power supply (refer to [Part 2: Hardware Checks: Detailed Description](#) "Check supply rails") First check the standby voltage. If this is present check the fuse F13 (refer to [Part 2: Hardware Checks: Detailed Description](#) "Check fuses on digital motherboard"). If fuse F13 is o.k. and the green LED on the front of the instrument is not lighting up after pressing the power on button replace the CPU Board.

4.4.2.3 Part 2: Hardware Checks: Algorithm



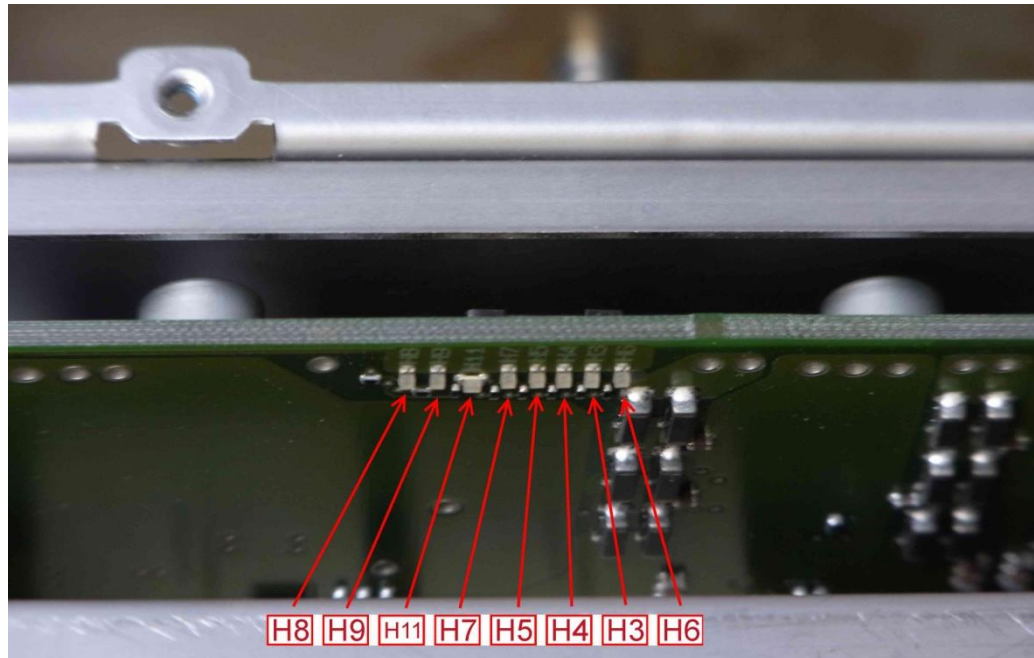
4.4.2.4 Part 2: Hardware Checks: Detailed Description

"Check fuses on digital motherboard": The fuses are located on the upper end of the digital motherboard. You have to disassemble the upper cover (refer to 4.2.4.1) and the inner lid (refer to 4.2.4.2) to reach the fuses. In case of a blown fuse a LED near the fuse will light up in red to indicate the fuse is defective. For replacing the defective fuse refer to 4.3.7.2.



F1	2079.5994.00	7A FF	Power supply rail for DC/DC converter 6,5V A
F2	2079.5994.00	7A FF	Power supply rail for DC/DC converter 6,5V B
F3	2079.5994.00	7A FF	Power supply rail for DC/DC converter 3,3V, - 6,5V, probe supply, 5V, 30V
F4	2079.5994.00	7A FF	Power supply rail for digital boards
F5	2079.5994.00	7A FF	Power supply rail for analog boards
F6	2079.5994.00	7A FF	Power supply rail for main fans
F7	2079.5994.00	7A FF	Power supply rail for microwave converter
F8	2079.5994.00	7A FF	Supply rail for detector extension board #1
F10	2079.5994.00	7A FF	Supply rail for CPU Board
F13	6100.7862.00	3A FF	Standby supply rail
F14	2079.5994.00	7A FF	Supply rail for detector extension board #2

"Check LEDs on digital motherboard": The LEDs on the digital motherboard are located near the fuses on the upper end of the digital motherboard. You have to disassemble the instrument in the same way as for checking the fuses. The LEDs indicate the status of the FPGA on the motherboard.



The LEDs give the following information:

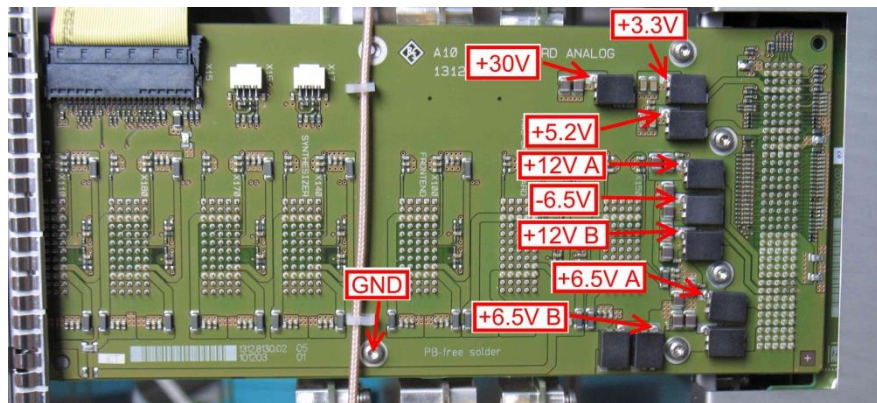
Designation	Function	Color
H3	For future use	
H4	PLL locked: The PLL of the FPGA is locked to the 128 MHz clock signal generated by the reference board	green
H5	Power good: All DC/DC converters on the digital motherboard are within their nominal output voltages	green
H6	Fan fail: one or both of the two main fans are not rotating	red
H7	For future use	
H8	For future use	
H9	For future use	
H11	For future use	

LED Power good is not lighting up: If this LED is staying dark one of the integrated DC/DC converters on the digital motherboard fails to supply the appropriate output voltage. This may be due to a short circuit or an overcurrent condition or due to a defect. Check the supply rails as described later.

LED PLL locked is not lighting up: If this LED is staying dark the FPGA is not supplied by a valid clock signal. Check the reference board for a missing SMP bullet first. If every bullet is installed properly this board or the digital motherboard might be defective.

LED Fan fail lights up: One or both of the main fans are not rotating. This may be due to a blocked fan or due to a defect. At first identify the fan which is not rotating. Then have a look if it is blocked. If the rotor is not blocked check the supply voltage on the connector on the digital motherboard: X322 and X321 pins 1+ 2 : rated value +11 V $\pm$ 1V. If this is o.k. replace fan (refer to: [Replacing the Fans](#)).

"Check supply rails": For this check you have to disassemble the lower cover (refer to [4.2.4.1](#)). The output voltages of the DC/DC converters located on the digital motherboard can be measured on the analog motherboard. All voltages are referring to ground. Use the screw shown in the picture below as ground point.



Name	Value	Fuse
+30V	+30 V $\pm$ 0.6 V	F3
+3.3V	+3,4 V – 0.1 V + 0.2 V	F3
+5.2V	+5,2 V $\pm$ 0.2 V	F3
+12V A	+12 V $\pm$ 0.1 V	F7
-6.5V	-6,5 V $\pm$ 0.2 V	F3
+12V B	+12 V $\pm$ 0.1 V	F5
+6.5V A	+6,5 V – 0.1 V + 0.5 V	F1
+6.5V B	+6,5 V – 0.1 V + 0.5 V	F2
+12V Standby*	+12 V $\pm$ 0,1 V	F13

* The standby voltage can be measured at fuse F13 on the top of the instrument. Use the lower pad of F13 for measuring. This voltage is also referring to ground. Use the instrument housing as ground point.

If the measured voltage is not within the given range first check the supply chain fuse. If the fuse is o.k. check for a short circuit on this power rail. To do so unplug all boards separately and check the voltage after you have unplugged one of the modules. If there is no short circuit the digital motherboard might be defective.

4.4.3 Troubleshooting: Firmware Does not Start

Check the instrument display for displayed information. In the following chapter typical problems are shown with the startup sequence. Carefully read the instructions below before starting an attempt to repair the instrument.

4.4.3.1 Normal Sequence for Starting the Instrument Firmware

Following switch-on, the FSW first boots the computer BIOS. After successful initialization of the computer, the Windows 7 operating system starts up. Subsequently, the measurement application is loaded as start-up program. Simultaneously, self tests are performed and error messages, if any, are output. For troubleshooting, it is advisable to connect a keyboard to one of the USB sockets.

Display Outputs During a Normal Startup Sequence:

Subsequent to switching on the R&S®FSW, the following BIOS message is displayed:

```
Phoenix - AwardBIOS v6.00PG, An Energy Star Ally
Copyright (C) 1984-2007, Phoenix Technologies, LTD.
R&S®FSW ANALYZER BIOS V1.00-1-38-4-1
Main Processor : Intel (R) Core(TM)2 Duo 2.52GHz (266x9.5)
Memory Testing :
```

Memory test

The memory test issues the memory capacity of the controller.

```
Phoenix - AwardBIOS v6.00PG, An Energy Star Ally
Copyright (C) 1984-2007, Phoenix Technologies, LTD.
R&S®FSW ANALYZER BIOS V1.00-1-38-4-1
Main Processor : Intel (R) Core(TM)2 Duo 2.52GHz (266x9.5)
Memory Testing : 8319936K OK + 64M shared memory
```

Note: If no result of the memory test is indicated or the displayed amount of memory is different, the memory might be defective.

Hardware test

The computer starts the hardware test. The test results are displayed on the screen. If errors occur during the boot procedure, these messages may indicate defects.

```
Phoenix - AwardBIOS v6.00PG, An Energy Star Ally
Copyright (C) 1984-2007, Phoenix Technologies, LTD.
R&S ANALYZER BIOS V7.0-4-62-1
Main Processor : Intel (R) Core (TM)2 Duo 2.28GHz (200x11.0)
Memory Testing : 4185024K OK + 8M shared memory
CPU Brand Name : Intel (R) Core (TM)2 Duo CPU T9400 @ 2.53GHz
C1E Bios Supported
EM64T CPU
```

IDE Channel 0 Master : None
IDE Channel 1 Master : FiB 2.5 SATA10000 (depending on the installed hard drive)
IDE Channel 2 Master : None
IDE Channel 2 Slave : None
IDE Channel 3 Master : None
IDE Channel 3 Slave : None

Note: If this hard drive entry is missing, the hard drive or the SATA ADAPTOR may be faulty.

Hardware check

Subsequently, BIOS starts the hardware check and displays all PC boards found.

This procedure can be interrupted using the ESC key on the connected external keyboard; any other key continues the boot process.

Operating system start

After this test, the BIOS is loaded and the operating system is started.

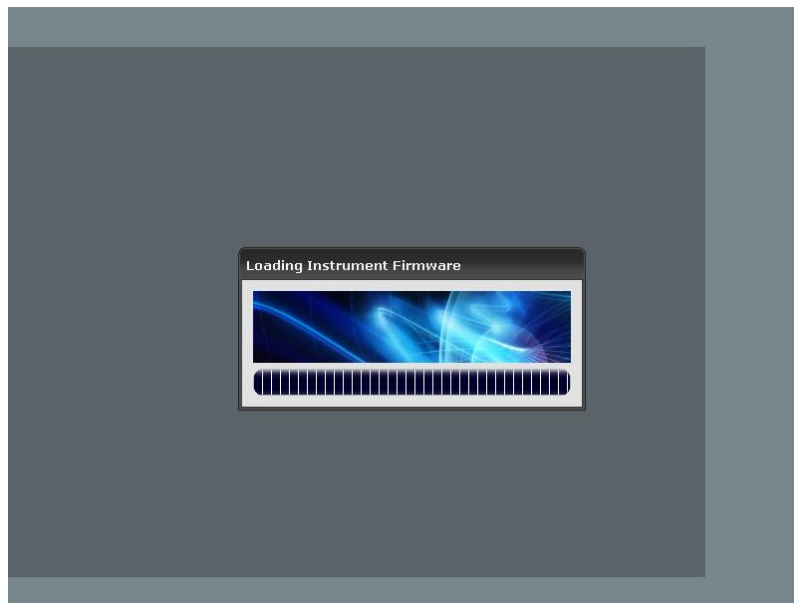
If the message "No System Disk or Disk error..." is displayed at this point, the contents of the hard drive are not correct. Replace the hard drive.



If the operating system on the hard drive has been destroyed or cannot be loaded correctly, Windows 7 reacts by displaying a "blue screen". This blue screen contains all essential information on the internal states of the computer. Be sure to have properly installed the harddrive to the instrument. (see chapter [Replacing SATA Hard Drive A91](#)). If the harddrive is installed properly Windows 7 and the instrument firmware must be updated. Contact the R&S service to perform the update.

Application start

Subsequent to starting the operation system, the application for the R&S®FSW is loaded in a start-up program. The program start is initiated automatically and generates a window that displays information on the start-up procedure.



While starting the application the hardware information is read and the measurement hardware is initialized. After the startup phase the firmware is started completely and you see the measurement display.

4.4.3.2 Errors During Startup of the Instrument

Errors when Starting the BIOS:

Memory test is not finished or no memory is found or the recognized size of the memory does not match with the installed amount of memory:

Check system memory on the CPU Board.

The hard disk drive is not recognized by the BIOS

Check the hard disk drive, the CPU Board and the SATA ADAPTOR .

Errors when booting Windows:

- **A blue screen is displayed at startup**
- Check hard disk drive, CPU Board and SATA ADAPTOR .

Errors when booting the firmware:

The error message "ERROR: Can't open driver or driver did not detect the detector board!" or "Can't detect PCI Board!" or "Driver access error: check detector board and the driver" is displayed

With this error message displayed the firmware cannot be started!

Check the detector board and the CPU Board for proper installation. The boards must be plugged in completely. If a failure of the CPU Board and the detector board is not applicable check the connectors on the digital motherboard. If there is no hardware defect prepare recover the windows installation and reinstall the firmware.

The error message "Detection of mandatory hardware component XX failed!" is displayed

This error message does not prevent the firmware from starting. However the instrument may not function properly after the firmware has come up.

The board information of the corresponding board cannot be read. This error can have multiple reasons: the EPROM located on the corresponding board is defective; the information stored in the board EPROM is destroyed; if many of this messages occur at boot up there might be a problem with the serial bus. To check this remove the boards one after another and start up the firmware until the messages initially displayed disappear. Note: If you have removed a board then for this board also this message is displayed. Ignore this message and concentrate on the initially displayed message.

- **The error message "Init SERDES PCIE-FPGA - SA-FPGA failed" is displayed**
- With this error message displayed the firmware cannot be started!
- The communication link in the digital signal processing cannot be established. The reason for this error is probably a defective detector board.
- **The error message "Hardware error (PCIE FPGA-DCM not locked): Shutdown and restart device!" is displayed**
- With this error message displayed the firmware cannot be started!
- There is a problem with the reference clock of the detector board. Without this clock the detector board cannot work. Check the reference board (don't forget to check the presence of the SMP bullet!). If the reference board is not the reason for the error check the detector board (check for presence of the SMP bullets!). If this board is not the reason for the error check the supply voltages as described in [Part 2: Hardware Checks: Algorithm](#). If you have replaced the digital motherboard check the cabling on the motherboard.
- **The error message "Missing smartcard or smartcard not initialized!" is displayed**
- With this error message displayed the firmware cannot be started!
- The smart card located on the CPU Board cannot be recognized. This can be due to a missing or falsely installed smart card. Reinstall the smart card and start over the instrument. If the error persists the smart card may be defective or wrong initialized. Contact your Rohde & Schwarz service for a replacement.
- **The error message "Wrong or defective smartcard!" is displayed**
- This error message does not stop the booting of the firmware but the instrument may not function properly after the firmware has come up.
The smart card located on the CPU Board cannot be read or the information stored on it is not correct. Contact your Rohde & Schwarz service for a replacement.
- **The error message "FAN is not running! ..." is displayed**
- Shutdown the instrument and check the fans. One or both of the main fans are not rotating. This may be due to a blocked fan or due to a defect. At first identify the fan which is not rotating. Then have a look if it is blocked. If the rotor is not blocked check the supply voltage on the connector on the digital motherboard: X322 and X321 pins 1+ 2: rated value +11 V $\pm$ 1V. If this is o.k. replace fan (refer to [Replacing the Fans](#)). If this is not o.k. check the fuse for the fans F6 (refer to [Part 2: Hardware Checks: Detailed Description](#)). If the fuse is o.k. replace the digital motherboard.

The error message: "This device needs the latest firmware version for correct operation. Do you want to update?"

This error message is displayed when one or more boards are installed which needs a newer release of the firmware to function correctly. You can finish the start of the instrument firmware by selecting "NO" but the instrument function may fail in some parts and any attempt of self alignment will fail. In the lower left edge of the instrument screen "WRONG FW" is displayed.

If you choose "YES" you will get to the instrument firmware update dialog. To update the firmware refer to the release notes of the corresponding firmware version.

4.4.4 Troubleshooting Errors on the Analog Hardware

4.4.4.1 Evaluating Selftest Results

The R&S®FSW has two selftest modes: The customer selftest and the factory selftest. For troubleshooting the R&S®FSW the factory selftest is recommended. The test limits are tighter and the error messages contain more details. To run the factory selftest switch into service mode by

[**SETUP** : Service : Service Function : Password = 894129]

and start it by

[**SETUP** : Service : Selftest : Start Selftest].

Error on supply voltages

If there is an error on the supply voltages on one board, this board is expected to be defective. If supply voltages on more than one board are affected check the supply voltages and fuses on the digital motherboard.

Error on the reference board

Check the LO2 signal as described in [Checking the LO2](#) and the LO3 signal as described in

[Checking the LO3](#).

Error on the synthesizer board

Check the LO1 as described in [Checking the LO1](#).

Error: LO2 level at frontend too low.

When this error occurs, either the reference board or the frontend board may be defective. To exclude the reference board check the LO2 signal as described in [Checking the LO2](#).

When this error occurs and the signal level and the frequency of the LO2 signal are in range, then the frontend board is expected to be defective.

Error: Supply current for LO1 driver out of range.

This error indicates that the frontend board is defective. If this error comes with an error on the supply voltages follow the instructions above.

Error: LO1 level at frontend too low.

In this test the LO1 level on the frontend board is checked. In case of an error either the LO1 level at the synthesizer board is out of range or the frontend board is defective. Follow "[Checking the LO1](#)" as described in [Checking the LO1](#) to find the reason for the error.

If the LO1 signal is in range, then the frontend board is expected to be defective and needs to be replaced.

Error: RF detector on frontend out of range. Measured signal level too large.

With this test the plausibility of the RF detector on the frontend board is checked. The input attenuator is set to 70 dB and the RF level detector voltage is checked without input signal.

When this test fails disconnect the RF-input cable on the frontend board at X101 and repeat the selftest. When this test point still fails, the frontend board is defective. Otherwise an error on the signal chain between the RF input connector and the frontend board is expected and it is recommended to perform the checks in [Checking the RF Path from RF Input to the Frontend Board](#).

Error: Level at RF level detector on the frontend below limit.

For this test the internal calibration source feeds a signal into the frontend board and the RF level detector measures the received signal power on the frontend board.

When this test fails check the signal fed into the RF input port of the frontend board at X101 as described in [Checking the RF Path from RF Input to the Frontend Board](#).

If the signal level and signal frequency are in range then the frontend board is expected to be defective.

4.4.4.2 Troubleshooting RF Signal Paths

Error: Input signals cannot be measured at any frequency

When input signals cannot be measured at any frequency, the checks described in this section should be carried out. When at least one of the signal path is functional follow the instructions below for failures at specific frequencies.

To check the signal paths on an FSW8 connect 10 MHz, 500 MHz and 2 GHz to the FSW and measure it with a span = 1 MHz and a resolution bandwidth = 10 kHz. On an FSW with a higher frequency range check e.g. 9 GHz and above additionally.

The frequency response of the R&S®FSW is aligned by the R&S®FSW service tool (see [Adjustment](#))

). When the frequency response correction is not successful perform the following steps:

1. Perform a selftest; if it fails follow the instructions in [Evaluating Selftest Results](#).
2. Execute a self alignment by

[**SETUP** : Alignment : Start Self Alignment].

When the self alignment passes then a defect RF input connector is expected (compare [Checking the RF Path](#)).

3. Check the intermediate frequency (IF3) fed into the detector board as described in [Checking the IF Signal Path](#).

If this test passes, the detector board is expected to be defective.

When this check fails for any frequency the local oscillator signals generated in the reference board and in the synthesizer board don't need to be checked. In the direct path ($f < 40$ MHz) the local oscillator signals are not used. For [R&S®FSW43/50/67](#) check the triplexer on the microwave converter frontend unit.

Note: The reference clock frequencies for the detector board are generated in the reference board.

Error: Input signals cannot be measured at specific frequencies

When frequencies at a specific range cannot be measured, the corresponding signal path may be defective. In this case follow the instructions depending on the type of error:

Error on frequencies below 40 MHz only

In this case the frontend board or the diplexer on the microwave converter frontend unit for [R&S®FSW13/26](#) or the triplexer for [R&S®FSW43/50/67](#) is defective. As higher frequencies can be measured an error on the detector board can be excluded. The LO frequencies from the synthesizer board and the reference board are not used for this signal path.

Note: Depending on frequency span and bandwidth the direct path might not be turned on by the firmware. To test the direct path apply a signal at e.g. 10 MHz and measure it with a span of 1 MHz and a resolution bandwidth = 10 kHz.

To check the diplexer/triplexer in an R&S®FSW containing a microwave converter follow the instructions in [Checking the DC Input Resistance](#) and [Checking the RF Path from RF Input to the Frontend Board](#).

Error on frequencies > 40 MHz and < 8 GHz

If the R&S®FSW works in the direct path or for frequencies above 8 GHz then the detector board is functional. To localize the error perform the following checks:

1. Perform a selftest; if it fails follow the instructions in [Evaluating Selftest Results](#).

2. The power level of the first and the second local oscillator are checked on the frontend board by the selftest. The third local oscillator (LO3) needs to be checked manually.
3. The LO3 signal is used in the frontend board for the RF path and for the microwave signal path. When the frequency range > 8 GHz is installed and is functional then the LO3 signal doesn't need to be checked.
4. Otherwise the LO3 signal should be checked as described in [Checking the LO3](#). When the third local oscillator signal is out of range, the reference board is defective.
5. The selftest procedure switches a broadband comb signal in the attenuator to the RF detector in the frontend board. When this test passes, the signal path for the calibration signal is OK. To make sure that there is an error on the RF input connector run the self alignment:
[**SETUP** : Alignment : Start Self Alignment].
6. If the self alignment passes, the RF input connector needs to be checked (see [Checking the RF Path from RF Input to the Frontend Board](#)).
7. Otherwise check the local oscillator signals manually described in [4.4.5](#).

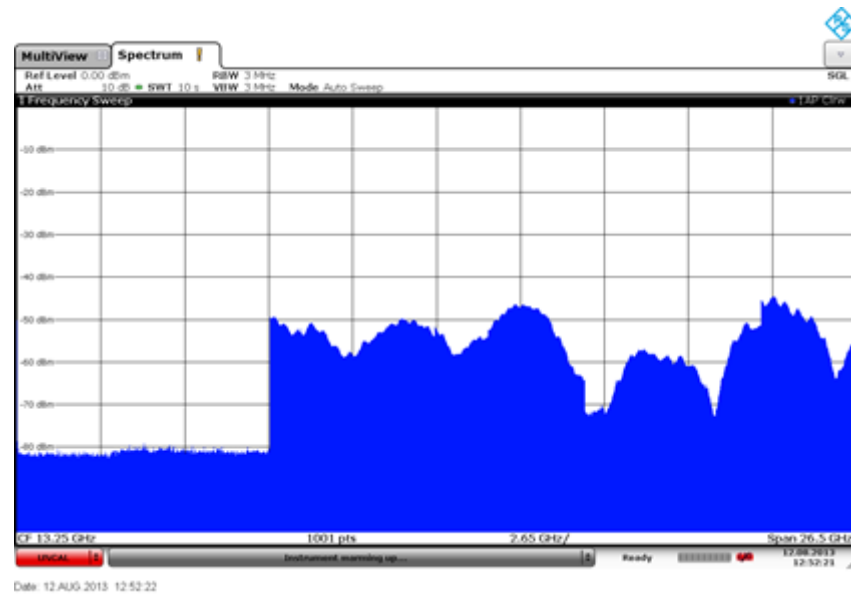
Error on frequencies > 8 GHz

The troubleshooting procedure described here is applicable for R&S®FSW with a frequency range above 8 GHz only.

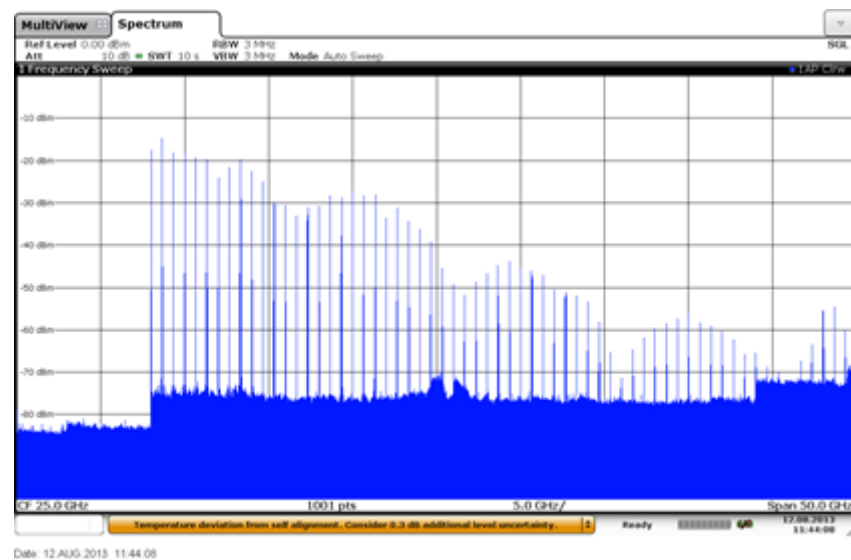
8. The first step is to exclude an error on the microwave converter frontend. If in both signal paths – YIG and YIF OFF ([**INPUT / OUTPUT** : YIG OFF]) – no signal is displayed, check the supply connection between the microwave converter baseboard and the microwave converter frontend. Furthermore, check the IF signal path as described in [Checking the IF Signal Path](#).
9. If only input signals in the YIG OFF can be measured, perform a YIG filter adjustment with the frequency response correction tool (see [Adjustment](#)). If the FSW is not functional after the YIG filter adjustment, the following step should be checked.
10. A rough check whether the YIG filter works right is to check the MWC calibration signal in fullspan sweep. For this check the following settings have to be done:
 - a) [PRESET]
 - b) [**SETUP** : Service : Support]
For FSW13/26: [Calibration Frequency MW and Small]

For all other instrument types: [Calibration frequency MW]
 - c) Sweep time: 10s
The following fullspan traces should be displayed:

For FSW13/26:



For all other instrument types, a comb spectrum should be displayed



In both cases a signal should appear in the whole frequency range. Otherwise, check the following step.

11. To check the YIG filter current source on the MWC baseboard and the YIG filter by itself, apply a CW signal at 9 GHz and -5 dBm on the RF input with the following settings on the R&S FSW instrument:
 - a) Preset
 - b) Center Frequency 9 GHz
 - c) Span 200 MHz
 - d) RBW 3 MHz
 - e) Sweep time 200ms
 - f) all other settings coupled
 - g) Enter the service password

[SETUP : Service : Service Function : Password = 30473035]

- h) Enter the following service function to activate the YIG-Filter sweep. In this operating mode the LO is set to a fixed frequency and doesn't sweep while the YIG-Filter still sweeps.

[SETUP : MORE : SERVICE : SERVICE FUNCTION 2.5.1.1]

- i) If everything is fine, the YIG-Filter curve should be displayed similar as on a network analyzer. The filter center frequency should be at the analyzer center frequency. The following picture for example shows a YIG-Filter curve of a FSW43 at 9 GHz



When the analyzer is aligned, the center frequency of the displayed filter curve should be quite independent from changing the sweep time. If the analyzer isn't aligned the YIG filter trace moves out of center when changing the sweep time. If the center frequency of the YIG-Filter curve at slow sweep times (**> 200ms @ 200 MHz span**) isn't at the analyzer center frequency after a YIG filter adjustment with the FSW-Service tool (**± 15 MHz mismatch**), replace the Microwave Converter Baseboard (see [Microwave Converter Unit \(R&S®FSW13/26/43/50\)](#)).

To reset the YIG Filter sweep perform the following service function:

[SETUP : MORE : SERVICE : SERVICE FUNCTION 2.5.1.0]

Note: the YIG filter sweep doesn't work in FFT mode!

4.4.5 Troubleshooting Performance Test

For a successful performance test follow the instructions in chapter 2. The internal self-alignment is started by

[**SETUP** : Alignment : Start Self Alignment]

and is mandatory for all tests.

4.4.5.1 Troubleshooting Checking the Reference Frequency Accuracy

When the reference frequency accuracy is out of range:

1. Repeat the reference frequency adjustment described in [3.2.2 Adjustment Sequence](#) or by using the adjustment tool described in [Adjustment Tool](#).
2. When the error still exists then remove the option R&S®FSW-B4 if installed, repeat the frequency adjustment and carry out the test without the option.
3. If the error is not caused by the option R&S®FSW-B4 then most probable the reference board needs to be changed.

4.4.5.2 Troubleshooting Checking Immunity to Interference

2nd IF Image Frequency Rejection

Depending on the signal path causing the insufficient image rejection the defective board can be identified:

1. For $f_{in} < 8$ GHz a problem on the frontend board is expected and changing the frontend board is recommended.
2. When the problem occurs for $f_{in} > 8$ GHz changing the microwave converter frontend is recommended.

3rd IF Image Frequency Rejection

When the 3rd IF image rejection is not sufficient then a problem on the frontend board is expected. Thus it is recommended to change this board.

1st IF Rejection

When the 1st IF rejection is not sufficient then a problem on the frontend board is expected. Thus it is recommended to change this board.

2nd IF Rejection

This error may be caused by two different reasons:

1. For $f_{in} < 8$ GHz a problem on the frontend board is expected and changing the frontend board is recommended.
2. When the problem occurs for $f_{in} > 8$ GHz changing the microwave converter frontend is recommended.

3rd IF Rejection

When the 3rd IF rejection is not sufficient then a problem on the frontend board is expected. Thus it is recommended to change this board.

4.4.5.3 Troubleshooting Checking Nonlinearities

Third-Order Intercept Point

Note: The results of this test depend on the level accuracy of the R&S®FSW. When there is an error on the test 0

Test equipment: 50 Ω termination (Section "Measurement Equipment", item 5)

Frequency range:

R&S®FSW 8:	DC to 8 GHz
R&S®FSW 13:	DC to 13.6 GHz
R&S®FSW 26:	DC to 26.5 GHz
R&S®FSW 43:	DC to 43.5 GHz
R&S®FSW 50:	DC to 50 GHz
R&S®FSW 67:	DC to 67 GHz
R&S®FSW 85:	DC to 85 GHz

Terminate the RF input of the FSW with 50 Ω

R&S FSW
settings:

- [PRESET]
- [AMPT : RF ATTEN MANUAL : 0 dB]
- [AMPT : -60 dBm]
- [INPUT:COUPLING:DC]
- [SPAN : 0 Hz]
- [TRACE 1 : AVERAGE]
- [TRACE 1 : SWEEP COUNT : {SWPCNT} ENTER]
- [MEAS : TIME DOMAIN POWER : MEAN]
- [FREQ : CENTER : {fn}]
- [BW : RBW MANUAL : {RBW}]
- [BW : VBW MANUAL : 1Hz]
- [BW : SWEEP TIME MANUAL : 100 ms]

Measurement:	Read out the mean marker and correct the measurement value by $-10 \times \log(\text{RBW} / 1 \text{ Hz})$: RBW = 1 Hz corresponds with 0 dB correction RBW = 10 Hz corresponds with -10 dB correction RBW = 100 Hz corresponds with -20 dB correction RBW = 1 kHz corresponds with -30 dB correction
Test frequencies:	RBW = 1 Hz; SWPCNT = 20; $f_n = 2 \text{ Hz}, 10 \text{ Hz}$ RBW = 10 Hz; SWPCNT = 5; $f_n = 30 \text{ Hz}, 90 \text{ Hz}$, RBW = 100 Hz; SWPCNT = 5; $f_n = 300 \text{ Hz}, 980 \text{ Hz}$ RBW = 1 kHz; SWPCNT = 1; $f_n = 9.8 \text{ kHz}, 98 \text{ kHz}, 998 \text{ kHz}, 9.8 \text{ MHz}, 30 \text{ MHz}$, 99 MHz to 7999 MHz in 100 MHz steps 8500 MHz to the maximum Frequency of the instrument in 500 MHz steps Test limits according to datasheet
Additional test frequencies with Option R&S®FSW-B24	Set the RF preamplifier to 30 dB gain and check with RBW = 1 kHz and SWPCNT = 1 the noise display with the following test frequencies: 50 MHz, 99 MHz to 7999 MHz in 100 MHz steps. For instruments with a maximum frequency above 8 GHz additional: 8500 MHz to the maximum Frequency of the instrument in 500 MHz steps Test limits according to datasheet
Additional test frequencies with Option R&S®FSW-B13	Activate the high pass (preamp off) and check the following test frequencies: 1051 MHz to 2850 MHz in 200 MHz steps and 2950 MHz Test limits according to datasheet.
YIG Filter Bypass	Activate the YIG Filter Bypass and check the following test frequencies:
For instruments with a maximum frequency > 8 GHz	For R&S FSW26/43/50/67 test frequencies are: 8001 MHz, 8500 MHz to maximum Frequency in 500 MHz steps. For R&S FSW85 test frequencies are: RBW = 1 Hz; SWPCNT = 20; $f_n = 2 \text{ Hz}, 10 \text{ Hz}$ RBW = 10 Hz; SWPCNT = 5; $f_n = 30 \text{ Hz}, 90 \text{ Hz}$, RBW = 100 Hz; SWPCNT = 5; $f_n = 300 \text{ Hz}, 980 \text{ Hz}$ RBW = 1 kHz; SWPCNT = 1; $f_n = 9.8 \text{ kHz}, 98 \text{ kHz}, 998 \text{ kHz}, 9.8 \text{ MHz}, 30 \text{ MHz}$, 99 MHz to 7999 MHz in 100 MHz steps 8001 MHz, 8500 MHz to maximum Frequency in 500 MHz steps. Test limits according to datasheet. Checking the Level Uncertainty and the Frequency Response then the third order intercept point cannot be measured accurately.

Note: When an error in the third-order intercept point appears together with an error in the noise display then follow the steps described in [Troubleshooting Checking Noise Display](#) first.

Depending on the error frequency the following checks should be done:

1. For an error below 8 GHz
 - a) Check the IF3 signal at the frontend board output as described in [Checking the IF Signal Path](#) for the frequency of interest.
 - b) Check the level of the LO-signals fed into the frontend board as described in [Checking the LO1](#), [Checking the LO2](#) and in [Checking the LO3](#).
 - c) When these checks do not indicate any other failure then it is recommended to change the frontend board.

Note: On an R&S®FSW comprising a microwave converter the third order intercept point could be caused also by a damaged diplexer on the microwave converter frontend for [R&S®FSW13/26](#) or a damaged triplexer for [R&S®FSW43/50/67](#). When changing the frontend board for [R&S®FSW13/26](#) or the triplexer for [R&S®FSW43/50/67](#) does not solve the problem repeat the test for f_{in} below 8 GHz by feeding the input signal directly to X101 on the frontend board to verify if the error is caused in the signal path between the RF input connector and the frontend board.
2. For an error above 8 GHz
 - a) Check the LO1 signal fed into the microwave converter frontend as described in [Checking the LO1](#).
 - b) When the LO1 signal is in range it is recommended to change the microwave converter frontend.

Second-Order Harmonic Distortion

The second-order harmonic distortion of the R&S®FSW can only be measured when the input signal is clean enough. When an error exists the input signal should be verified by:

1. Setup the test as described in [0](#)

2. Test equipment: 50 Ω termination (Section "Measurement Equipment", item 5)
Frequency range:

R&S®FSW 8:	DC to 8 GHz
R&S®FSW 13:	DC to 13.6 GHz
R&S®FSW 26:	DC to 26.5 GHz
R&S®FSW 43:	DC to 43.5 GHz
R&S®FSW 50:	DC to 50 GHz
R&S®FSW 67:	DC to 67 GHz
R&S®FSW 85:	DC to 85 GHz

Terminate the RF input of the FSW with 50 Ω

R&S FSW
settings:

- [PRESET]
- [AMPT : RF ATTEN MANUAL : 0 dB]
- [AMPT : -60 dBm]
- [INPUT:COUPLING:DC]
- [SPAN : 0 Hz]
- [TRACE 1 : AVERAGE]
- [TRACE 1 : SWEEP COUNT : {SWPCNT} ENTER]
- [MEAS : TIME DOMAIN POWER : MEAN]
- [FREQ : CENTER : {fn}]
- [BW : RBW MANUAL : {RBW}]
- [BW : VBW MANUAL : 1Hz]
- [BW : SWEEP TIME MANUAL : 100 ms]

Measurement: Read out the mean marker and correct the measurement value by
-10 x log (RBW / 1 Hz):

RBW = 1 Hz corresponds with 0 dB correction

RBW = 10 Hz corresponds with -10 dB correction

RBW = 100 Hz corresponds with -20 dB correction

RBW = 1 kHz corresponds with -30 dB correction

Test frequencies: RBW = 1 Hz; SWPCNT = 20; f_n = 2 Hz, 10 Hz

RBW = 10 Hz; SWPCNT = 5; f_n = 30 Hz, 90 Hz,

RBW = 100 Hz; SWPCNT = 5; f_n = 300 Hz, 980 Hz

RBW = 1 kHz; SWPCNT = 1; f_n = 9.8 kHz, 98 kHz, 998 kHz, 9.8 MHz, 30 MHz,
99 MHz to 7999 MHz in 100 MHz steps

8500 MHz to the maximum Frequency of the instrument in 500 MHz steps

Test limits according to datasheet

Additional test frequencies with Option R&S®FSW-B24 Set the RF preamplifier to 30 dB gain and check with RBW = 1 kHz and SWPCNT = 1 the noise display with the following test frequencies:

50 MHz, 99 MHz to 7999 MHz in 100 MHz steps.

For instruments with a maximum frequency above 8 GHz additional:

8500 MHz to the maximum Frequency of the instrument in 500 MHz steps

Test limits according to datasheet

Additional test frequencies with Option R&S®FSW-B13 Activate the high pass (preamp off) and check the following test frequencies:

1051 MHz to 2850 MHz in 200 MHz steps and 2950 MHz

Test limits according to datasheet.

YIG Filter Bypass Activate the YIG Filter Bypass and check the following test frequencies:

For instruments with a maximum frequency > 8 GHz For R&S FSW26/43/50/67 test frequencies are:

8001 MHz, 8500 MHz to maximum Frequency in 500 MHz steps.

For R&S FSW85 test frequencies are:

RBW = 1 Hz; SWPCNT = 20; f_n = 2 Hz, 10 Hz

RBW = 10 Hz; SWPCNT = 5; f_n = 30 Hz, 90 Hz,

RBW = 100 Hz; SWPCNT = 5; f_n = 300 Hz, 980 Hz

RBW = 1 kHz; SWPCNT = 1; f_n = 9.8 kHz, 98 kHz, 998 kHz, 9.8 MHz, 30 MHz,
99 MHz to 7999 MHz in 100 MHz steps

8001 MHz, 8500 MHz to maximum Frequency in 500 MHz steps.

Test limits according to datasheet.

3. Checking the Level Uncertainty and the Frequency Response.

4. Change the input attenuation of the R&S®FSW to 10 dB by
[AMPT : RF Atten Manual : 10 dB].

5. Repeat the measurement. With this setting the recommended harmonic suppression must be reached. If the level of the second-order harmonic is too high a lowpass filter needs to be added.

When the error occurs for $2 \times f_{in}$ below 8 GHz either the frontend board or the diplexer in the microwave converter for [R&S®FSW13/26](#) or the triplexer for [R&S®FSW43/50/67](#)

is defective. For an error at $2 \times f_{in} > 8 \text{ GHz}$ the microwave converter frontend is defective.

4.4.5.4 Troubleshooting Checking IF Filters

The IF filters on the R&S®FSW are realized by digital filters. When an error exists repeat the self-alignment by

[**SETUP** : Alignment : Start Self Alignment]

and check the result.

4.4.5.5 Troubleshooting Checking Spurious Response

Spurious responses exceeding the limits may have different reasons. The following steps may help for troubleshooting:

1. Make sure that the upper and lower cover and the inner lid are mounted correctly (see [4.2.4 Disassembling the Instrument](#)).
2. Check whether all RF cable connectors within the R&S®FSW are tightened correctly.
3. Check the RF-input connector and the 50 Ohm resistor connected. If necessary clean the connectors carefully.
4. Make sure that no electronic devices around the R&S®FSW under test inject the spurious signal.

4.4.5.6 Troubleshooting Checking Noise Display

Note: The results of this test depend on the level accuracy of the R&S®FSW. When there is an error on the test [0](#)

Test equipment: 50 Ω termination (Section "Measurement Equipment", item 5)

Frequency range:

R&S®FSW 8:	DC to 8 GHz
R&S®FSW 13:	DC to 13.6 GHz
R&S®FSW 26:	DC to 26.5 GHz
R&S®FSW 43:	DC to 43.5 GHz
R&S®FSW 50:	DC to 50 GHz
R&S®FSW 67:	DC to 67 GHz
R&S®FSW 85:	DC to 85 GHz

Terminate the RF input of the FSW with 50 Ω

R&S FSW
settings:

- [PRESET]
- [AMPT : RF ATTEN MANUAL : 0 dB]
- [AMPT : -60 dBm]
- [INPUT:COUPLING:DC]
- [SPAN : 0 Hz]
- [TRACE 1 : AVERAGE]
- [TRACE 1 : SWEEP COUNT : {SWPCNT} ENTER]
- [MEAS : TIME DOMAIN POWER : MEAN]
- [FREQ : CENTER : {fn}]
- [BW : RBW MANUAL : {RBW}]
- [BW : VBW MANUAL : 1Hz]
- [BW : SWEEP TIME MANUAL : 100 ms]

Measurement:

Read out the mean marker and correct the measurement value by
 $-10 \times \log(\text{RBW} / 1 \text{ Hz})$:

RBW = 1 Hz corresponds with 0 dB correction

RBW = 10 Hz corresponds with -10 dB correction

RBW = 100 Hz corresponds with -20 dB correction

RBW = 1 kHz corresponds with -30 dB correction

Test frequencies:

RBW = 1 Hz; SWPCNT = 20; fn = 2 Hz, 10 Hz

RBW = 10 Hz; SWPCNT = 5; fn = 30 Hz, 90 Hz,

RBW = 100 Hz; SWPCNT = 5; fn = 300 Hz, 980 Hz

RBW = 1 kHz; SWPCNT = 1; fn = 9.8 kHz, 98 kHz, 998 kHz, 9.8 MHz, 30 MHz,
 99 MHz to 7999 MHz in 100 MHz steps

8500 MHz to the maximum Frequency of the instrument in 500 MHz steps

Test limits according to datasheet

Additional test
frequencies with
Option
R&S®FSW-B24

Set the RF preamplifier to 30 dB gain and check with RBW = 1 kHz and SWPCNT = 1
 the noise display with the following test frequencies:

50 MHz, 99 MHz to 7999 MHz in 100 MHz steps.

For instruments with a maximum frequency above 8 GHz additional:

8500 MHz to the maximum Frequency of the instrument in 500 MHz steps

Test limits according to datasheet

Additional test frequencies with Option R&S°FSW-B13 Activate the high pass (preamp off) and check the following test frequencies:

1051 MHz to 2850 MHz in 200 MHz steps and 2950 MHz

Test limits according to datasheet.

YIG Filter Bypass Activate the YIG Filter Bypass and check the following test frequencies:

For instruments with a maximum frequency > 8 GHz For R&S FSW26/43/50/67 test frequencies are:

8001 MHz, 8500 MHz to maximum Frequency in 500 MHz steps.

For R&S FSW85 test frequencies are:

RBW = 1 Hz; SWPCNT = 20; f_n = 2 Hz, 10 Hz

RBW = 10 Hz; SWPCNT = 5; f_n = 30 Hz, 90 Hz,

RBW = 100 Hz; SWPCNT = 5; f_n = 300 Hz, 980 Hz

RBW = 1 kHz; SWPCNT = 1; f_n = 9.8 kHz, 98 kHz, 998 kHz, 9.8 MHz, 30 MHz,

99 MHz to 7999 MHz in 100 MHz steps

8001 MHz, 8500 MHz to maximum Frequency in 500 MHz steps.

Test limits according to datasheet.

Checking the Level Uncertainty and the Frequency Response then the noise display cannot be measured accurately.

Depending on the error frequency follow the instructions below:

1. For an error below 8 GHz

- a) Check the IF3 signal at the frontend board output as described in [Checking the IF Signal Path](#) for the frequency of interest.
- b) Check the level of the level of the LO-signals fed into the frontend board as described in [Checking the LO1](#), [Checking the LO2](#) and in [Checking the LO3](#).
- c) When these checks do not indicate any other failure then it is recommended to change the frontend board.

Note: A failure in the performance test of the displayed average noise level can also be caused by an increased attenuation between the RF input connector and the frontend board. When changing the frontend board does not solve the problem measure the insertion loss of the following components at the frequency of interest with the instrument settings describe of the performance test

- Attenuator A40 with
maximum insertion loss: 1 dB for $f < 3$ GHz, 1.5 dB for $f < 8$ GHz
- Microwave converter frontend from X160 to X167
maximum insertion loss: 1 dB for $f < 3$ GHz, 1.5 dB for $f < 8$ GHz
- Preamplifier B24
maximum insertion loss: 1 dB for $f < 8$ GHz
- Electronic Attenuator B25
maximum insertion loss: 1 dB for $f < 8$ GHz

2. For an error above 8 GHz

Note: When the error occurs with the activated YIG-filter only, perform a YIG filter alignment by the R&S®FSW service tool (see [Adjustment](#)) and a self-alignment. If this doesn't solve the problem, the YIG filter may be the reason for the error.

- a) Check the LO1 signal fed into the microwave converter frontend as described in [Checking the LO1](#).
- b) When the LO1 signal is in range it is recommended to change the microwave converter frontend.

4.4.5.7 Troubleshooting Checking the Level accuracy and the Frequency Response

Absolute Level accuracy

When the level accuracy at 64 MHz is out of range perform a frequency response correction by means of the R&S®FSW service tool (see [Adjustment](#)).

Frequency Response

When the frequency response is out of range also a frequency response correction with the R&S®FSW service tool (see [Adjustment](#)) may be helpful.

When there problem still remains the troubleshooting steps described in [Troubleshooting RF Signal Paths](#) may help to identify the reason for the error.

4.4.5.8 Troubleshooting Checking the Display Nonlinearity

When the check "display nonlinearity" is out of specification verify the step attenuator (see chapter [Test Equipment](#), item 9) used.

When the step attenuator is functional then change the detector board A200.

4.4.5.9 Troubleshooting Checking the RF Attenuator Accuracy

When an error in the RF attenuator accuracy appears together with an error in the return loss at the RF input follow the steps described in [Troubleshooting Checking the Return Loss at the RF Input](#).

The exact attenuation of the RF attenuator is corrected by the R&S®FSW service tool. Thus executing a frequency response correction may be helpful.

Otherwise check the accuracy of the step attenuator (see chapter [Test Equipment](#), item 9) used.

When these measures do not solve the problem, the RF attenuator needs to be changed.

4.4.5.10 Troubleshooting Checking the Phase Noise

The phase noise can only be measured accurately when the performance test of the level accuracy and of the noise display do not show any failure.

Note: Follow the instructions described in [2.11 Checking the Phase Noise](#) carefully.

An insufficient phase noise performance may be caused either by the synthesizer board, the reference board or the frontend board. An error in the detector board could also cause a bad phase noise performance; however it is quite unlikely.

When the error occurs on offset frequencies

- below 1 kHz: most probable the reference board causes the error.
- from 1 kHz up to 100 kHz: most probable the synthesizer board causes the error.
- above 1 MHz: most probable the frontend board causes the error.

4.4.5.11 Troubleshooting Checking the Return Loss at the RF Input

When the return loss of the R&S®FSW is below the specification consider the following cases:

1. The return loss is too low at any attenuator setting:
An error on the RF input connector X1 or on the mechanical attenuator A60 is expected.
2. The return loss is too low for $a_{R\&S\&FSW} \leq 10$ dB only:
Disconnect the cable at the attenuator output and connect a 50 Ohm termination (chapter "[4.4.1 Measuring Equipment and Accessories](#)", item 5) instead. Repeat the measurement.
If the return loss shows valid results with this resistor the faulty device is behind the attenuator. Repeat this check by connecting the 50 Ohm termination on the output of the preamplifier (R&S®FSW-B24), the output of the electronic attenuator (R&S®FSW-B25) and on the output of the microwave converter frontend (X167) if these modules are available.
3. **Note:** On an R&S®FSW with a microwave converter frontend installed, the input signal is fed into the frontend board at X112 when the instrument is set a frequency below 40 MHz.
4. The return loss is too low for higher attenuations only:
In this case a defect on the attenuator is expected.

4.4.5.12 Troubleshooting the Bandwidth Extension R&S®FSW-B160

For troubleshooting the bandwidth extension the IF output signal on the rear panel of the instrument should be checked. To enable this output start the I/Q analyzer by

- [**PRESET**]
- [**MODE** : I/Q Analyzer]
- [**MEAS CONFIG** : Display Config : Spectrum]
- [**FREQ** : f_{CENTER}] with $300 \text{ MHz} < f_{\text{CENTER}} < 8 \text{ GHz}$
- [**AMPT** : -20 dBm]
- [**AMPT** : RF Atten Manual : **0 dB**]

and turn on the wideband mode by

[**BW** : SAMPLE RATE : 200 MHz]

With this setting an input signal with $f = f_{\text{CENTER}} \pm 80 \text{ MHz}$, $f < 8 \text{ GHz}$ and signal level $P = -20 \text{ dBm}$ should be visible at the IF WIDE output of the R&S®FSW-B160 with an IF-frequency $250 \pm 80 \text{ MHz}$ and a level of -30 dBm to -10 dBm .

Note: For $300 \text{ MHz} < f_{\text{CENTER}} < 8 \text{ GHz}$ the IF signal will appear in inverted position.

Note: The IF will be switched on only when the firmware detects the bandwidth extension. Therefore check the availability of the option under [SETUP : System Config : Versions + Options].

In case the IF signal is in range then the RF and IF signal path to the wideband ADC board is working.

If the input signal is not displayed properly in the spectrum view with the settings described above then an error either on the wideband ADC board A290 or on the detector extension board A220 exists. Errors on the detector extension board can be detected in most cases by the internal selftest.

If the IF signal is out of range and RF signals cannot be measured with the settings described above then check the basic performance tests of the R&S®FSW first. If the basic performance tests show valid results and the IF signal is out of range then

1. Check the SMP bullet on the wideband ADC board (depicted in [4.3.19 Replacing the Bandwidth Extension \(option R&S®FSW-B160, R&S®FSW-B160R and R&S®FSW-B320\)](#))).

If the bullet is OK then

2. Check the IF signal at the frontend board at X104.
When this signal is OK then check the cabling from X104 on the frontend board to the wideband ADC board. In case this cable is OK too, the wideband ADC board A290 is faulty.

IF Frequency response

The IF frequency response of the R&S®FSW-B160 is aligned by the self alignment which is started by:

[**SETUP** : Alignment : Start Self Alignment].

When the self alignment passes and the IF frequency response is violating the specification then an error on the comb signal for the self alignment is expected. Thus the reference board A120 should be replaced.

4.4.6 Troubleshooting Tests

This chapter describes the tests required for troubleshooting the analog hardware of an R&S®FSW.

4.4.6.1 Checking the LO1

Test equipment: Spectrum analyzer (chapter "[4.4.1 Measuring Equipment and Accessories](#)", item 2):

- center frequency: 10.49 GHz
- frequency span: 500 MHz
- reference level: 20 dBm
- resolution bandwidth auto

Test setup:

- ▶ Disconnect the RF cable on X141 on the synthesizer board and check the signal with a spectrum analyzer.
- ▶ When there is an error in the frequency range above 8 GHz repeat the check on the LO1 signal for the microwave path on X142 on the synthesizer board.

R&S®FSW settings:

- [PRESET]
- [FREQ : CENTER : **1.5 GHz**]
- [FREQ : SPAN : 0 Hz]
- [BW : Res BW manual : 10 kHz]

Evaluation Check frequency and level of the signal on the spectrum analyzer.

Expected frequency range: 10.49 GHz $\pm$ 30 MHz

Expected signal level: > +8 dBm

a) Signal level is out of range

→ The synthesizer board is expected to be defective.

b) Signal frequency is out of range

→ Check the LO3 signal at 1280 MHz as described in [Checking the LO3](#). If the LO3 signal is within the limits, the synthesizer board is expected to be defective.

Note: The exact LO frequency depends on the actual IF frequency of the R&S®FSW. Therefore with the settings above a deviation of $\pm$ 30 MHz is possible. The measured signal must be a CW signal without modulation.

Test equipment: Spectrum analyzer (chapter "[4.4.1 Measuring Equipment and Accessories](#)", item 2):

- center frequency: 10.49 GHz
- frequency span: 500 MHz
- reference level: 20 dBm
- resolution bandwidth auto

Test setup:

- ▶ Disconnect the RF cable on X141 on the synthesizer board and check the signal with a spectrum analyzer.
- ▶ When there is an error in the frequency range above 8 GHz repeat the check on the LO1 signal for the microwave path on X142 on the synthesizer board.

FSW settings:

- [PRESET]
- [FREQ : CENTER : **1.5 GHz**]
- [FREQ : SPAN : 0 Hz]
- [BW : Res BW manual : 10 kHz]

Evaluation	Check frequency and level of the signal on the spectrum analyzer. Expected frequency range: 10.49 GHz $\pm$ 30 MHz Expected signal level: > +8 dBm a) Signal level is out of range → The synthesizer board is expected to be defective. b) Signal frequency is out of range → Check the LO3 signal at 1280 MHz as described in Checking the LO3. If the LO3 signal is within the limits, the synthesizer board is expected to be defective.
Note:	The exact LO frequency depends on the actual IF frequency of the R&S®FSW. Therefore with the settings above a deviation of $\pm$ 30 MHz is possible. The measured signal must be a CW signal without modulation.

4.4.6.2 Checking the LO2

Test equipment: Spectrum analyzer (chapter "[4.4.1 Measuring Equipment and Accessories](#)", item 2):

- center frequency: 7680 MHz
- frequency span: 1 MHz
- reference level: 20 dBm
- resolution bandwidth 100 kHz

Test setup: ► Disconnect the RF cable on X108 on the frontend board and check the signal fed in by the reference board with a spectrum analyzer.

FSW settings:

- [PRESET]
- [FREQ : CENTER : 1.5 GHz]
- [FREQ : SPAN : 0 Hz]

Evaluation	Check frequency and level of the signal on the spectrum analyzer. Expected frequency range: 7680 MHz $\pm$ 100 Hz Expected signal level: > +8 dBm ► Signal level is too low In this case the reference board is defective. ► Signal frequency is out of range If the option B4 is installed remove it from the instrument and check the LO2 signal without the option R&S®FSW B4. When the measured frequency is still out of range while the option R&S®FSW B4 is not installed, the reference board is defective.
------------	--

Note: The frequency accuracy depends on the reference frequency accuracy of the DUT and the spectrum analyzer. When the references of the FSW and the test equipment are connected, the frequency should be exactly 7680 MHz.

The LO2 signal is not used in the microwave signal path.

4.4.6.3 Checking the LO3

Test equipment: Spectrum analyzer (chapter [4.4.1 Measuring Equipment and Accessories](#)", item 2):

- center frequency: 1280 MHz
- frequency span: 1 MHz
- reference level: 20 dBm
- resolution bandwidth 100 kHz

Test setup:

- ▶ Disconnect the RF cable on X106 on the frontend board and check the signal fed in by the reference board with a spectrum analyzer.
- ▶ When a failure on the synthesizer board exists then measure the signal fed into X143. Here, the LO3 signal is used as a reference signal.

FSW settings:

- [PRESET]
- [FREQ : CENTER : 1.5 GHz]
- [FREQ : SPAN : 0 Hz]

Evaluation Check frequency and level of the signal on the spectrum analyzer.

Expected frequency range: 1280 MHz $\pm$ 100 Hz

Expected signal level: +7 dBm .. 11 dBm

- ▶ Signal level is too low
In this case the reference board is defective.

- ▶ Signal frequency is out of range
If installed, check the reference frequency output of the option FSW B4. If the reference frequency is in range, the reference board is defective.

Note: The frequency accuracy depends on the reference frequency accuracy of the DUT and the spectrum analyzer. When the references of the FSW and the test equipment are connected, the frequency should be exactly 1280 MHz.

The synthesizer board uses the LO3 signal as a reference.

4.4.6.4 Checking the DC Input Resistance

Input signals exceeding the R&S®FSW maximum input power of the R&S®FSW may destroy the diplexer on the microwave converter frontend for R&S®FSW13/26 or the triplexer for R&S®FSW43/50/67 or the input section on the frontend board.

When signals below 8 GHz cannot be measured perform the following test:

Test equipment: Multimeter (chapter 4.4.1 Measuring Equipment and Accessories", item 15):

Test setup:

- ▶ Connect an RF cable on the RF input of the R&S®FSW and check the DC input resistance R_{IN} with the multimeter.
- ▶ **Note:** Use the RF-cable for measuring the resistance in order to protect the RF input connector.

FSW settings:

- [PRESET]
- [AMP : RF Atten Manual : 0 dB]
- [FREQ : CENTER : f_{IN}] (f_{IN} see below)
- [FREQ : SPAN : 0 Hz]
- [BW : Res BW manual: 10 kHz]
- [INPUT/OUTPUT : Input Source Config : DC]

Evaluation **On a R&S®FSW8:**

Measure the DC input resistance R_{IN} for

$$f_{IN} = \{10 \text{ MHz}, 500 \text{ MHz}, 2 \text{ GHz}, 4.5 \text{ GHz}, 6 \text{ GHz}\}$$

The expected input resistances are

$$\text{for } f_{IN} = 10 \text{ MHz: } 40 \, \Omega < R_{IN} < 80 \, \Omega$$

$$\text{for } f_{IN} > 100 \text{ MHz: } 500 \, \Omega < R_{IN} < 2000 \, \Omega$$

If the input resistance R_{IN} is out of range, the frontend board is expected to be defective.

On a R&S®FSW13/26/43/50/67:

Measure the DC input resistance R_{IN} for

$$f_{IN} = \{10 \text{ MHz}\}$$

The expected input resistances are

$$\text{for } f_{IN} = 10 \text{ MHz: } 40 \, \Omega < R_{IN} < 80 \, \Omega$$

If the input resistance R_{IN} is out of range, the microwave converter frontend is expected to be defective.

4.4.6.5 Checking the RF Path from RF Input to the Frontend Board

If you expect a defect on the RF path between RF-input and the frontend board you should check the RF input connector first visually.

As a second step the return loss at the RF input may be checked as described in [Troubleshooting Checking the Return Loss at the RF Input](#). If the test fails follow the troubleshooting guideline described in [Troubleshooting Checking the RF Attenuator Accuracy](#).

For checking the path manually perform the following test:

Test equipment: Spectrum analyzer (chapter "[4.4.1 Measuring Equipment and Accessories](#)", item 2):

- Center frequency: 64 MHz
- Frequency span: 128 MHz
- Reference level: 10 dBm
- Resolution bandwidth: auto

Signal Generator (chapter "[4.4.1 Measuring Equipment and Accessories](#)", item 3)

- Frequency 64 MHz
- Level 0 dBm

Test setup: ► Disconnect the RF cable on X101 on the frontend board and check the signal fed into the frontend board.

FSW settings:

- [PRESET]
- [FREQ : 64 MHz]
- [FREQ : SPAN : 0 Hz]
- [AMP : REF LEVEL : -20 dBm] (in this case the RF attenuator is set to 0 dB)
- [BW : Res BW Manual : 10 kHz]

Evaluation

Check frequency and level of the signal on the spectrum analyzer.

Expected frequency: Generator frequency

Expected signal level: -3 dBm ... 0 dBm

If the signal level is too low perform the following checks:

- ▶ Check the signal at the input of the step attenuator. If the signal level is too low, the RF input connector is expected to be defective.
- ▶ Check the signal at the output of the step attenuator. If the signal level is too low, the attenuator is expected to be defective.
- ▶ When a preamplifier (R&S®FSW-B24) is installed check the signal level at the output of the preamplifier. If the signal level is too low, the preamplifier is expected to be defective.
- ▶ When an electronic attenuator (R&S®FSW-B25) is installed check the signal level at the output of the electronic attenuator. If the signal level is too low, the electronic attenuator is expected to be defective.
- ▶ Check the signal at the RF-input (X101) of the frontend board. If the signal level is too low on an FSW with a frequency range > 8 GHz the diplexer on the microwave converter for [R&S®FSW13/26](#) or the triplexer for [R&S®FSW43/50/67](#) is expected to be defective.

Note:

This test may be repeated at any other frequency with the same FSW settings. For frequencies > 2 GHz an insertion loss up to 5 dB is expected.

For frequencies > 8 GHz the FSW needs to be set to a frequency > 8 GHz. In this case the signal can be checked on the input and output of the attenuator, on the output of the preamplifier and on the input of the microwave converter frontend unit but not on the input of the frontend board.

When the input frequency of the FSW is set to a frequency below 40 MHz then the direct path will be activated. With this setting on an FSW with microwave converter, the input signal is fed via X112 into the frontend board.

4.4.6.6 Checking the IF Signal Path

Test equipment: Spectrum analyzer (chapter "4.4.1 Measuring Equipment and Accessories", item 2):

- center frequency: 50 MHz
- frequency span: 100 MHz
- reference level: 10 dBm
- resolution bandwidth auto

Signal generator (chapter "4.4.1 Measuring Equipment and Accessories", item 3).

- Frequency f_{IN} MHz
- Level -20 dBm

Test setup:

- ▶ Disconnect the RF cable on X102 and X103 on the frontend board and check the signal output on these connectors with the spectrum analyzer.
- ▶ Connect the signal generator to the RF input of the R&S®FSW.
- ▶ Perform the measurement for the frequencies listed below.
- ▶

FSW settings:

- [PRESET]
- [FREQ : f_{IN}]
- [FREQ : SPAN : 0 Hz]
- [AMPT : REF LEVEL : -40 dBm] (to set all attenuators to the minimum)
- [BW : Res BW Manual : 10 kHz]

Evaluation Check frequency and level of the signals output at X102 and X103 with the spectrum analyzer.

Expected frequency: 10 MHz up to 90 MHz

f_{IN}	10 MHz	64 MHz	800 MHz	2 GHz	4 GHz	7.9 GHz
min level in dBm	-25	-16	-16	-8	-8	-8

On an FSW comprising a microwave converter use the additional test frequencies (if applicable):

f_{IN}	10 GHz	13.5 GHz	17 GHz	26.4 GHz	30 GHz
min level in dBm	-15	-15	-15	-15	-15

If the measured signal level is too low make sure that there is no error in the RF path from the RF input to the frontend board (see [Checking the RF Path from RF Input to the Frontend Board](#)).

An error in the frequency range up to 8 GHz indicates a defect frontend board, while an error above 8 GHz indicates a defect on the microwave converter frontend unit.

Compare the signal level of the two output signals at X102 and X103. If the output powers differ by more than 3 dB then the error is on the frontend board

When the FSW under test contains a microwave converter and the error is in the direct path ($f_{IN} < 40$ MHz) then the direct path input signal on the frontend board at X112 should be checked.

4.4.6.7 Checking the IF Signal Path for Input Frequencies > 8 GHz

Test equipment: Spectrum analyzer (chapter "[4.4.1 Measuring Equipment and Accessories](#)", item 2):

- center frequency: 1330 MHz
- frequency span: 100 MHz
- reference level: 10 dBm
- resolution bandwidth auto

Signal generator (chapter "[4.4.1 Measuring Equipment and Accessories](#)", item 3).

- Frequency f_{IN} MHz
- Level -20 dBm

- Test setup:
- ▶ Disconnect the RF cable on X164 on the microwave converter frontend board and check the signal output with the spectrum analyzer.
 - ▶ Connect the signal generator to the RF input of the R&S®FSW.
 - ▶ Perform the measurement for the frequencies listed below.

- FSW settings:
- [PRESET]
 - [FREQ : f_{IN}]
 - [FREQ : SPAN : 0 Hz]
 - [AMPT : REF LEVEL : -40 dBm] (to set all attenuators to the minimum)
 - [BW : Res BW Manual : 10 kHz]

Evaluation Check frequency and level of the signal at X164 with the spectrum analyzer.

Expected frequency: 1290 MHz up to 1370 MHz

f_{IN}	10 GHz	13.5 GHz	17 GHz	26.4 GHz	30 GHz
min level in dBm	-15	-15	-15	-15	-15

If the measured signal level is too low make sure that there is no error in the RF path from the RF input to the input connector of the frontend board X101 (see [Checking the RF Path from RF Input to the Frontend Board](#)).

An error in the frequency range up to 8 GHz indicates a defect on the frontend board, while an error above 8 GHz indicates a defect on the microwave converter frontend unit.

Compare the signal level of the two output signals at X102 and X103. If the output powers differ by more than 3 dB then the error is on the frontend board

When the FSW under test contains a microwave converter and the error is in the direct path ($f_{IN} < 40$ MHz) then the direct path input signal on the frontend board at X112 should be checked.

5 Software Update / Installing Options

This chapter contains information on updating software, restoring the operating-system installation and installing options to the FSW. Additional manuals obtained together with a software/firmware update or with subsequently acquired options can be filed here.

5.1 Installation of new FSW Software

For information on updating software refer to the release notes. The most recent version is provided on our Internet site at www.rohde-schwarz.com/firmware/FSW.

5.2 Installing Options

A list of all available hardware and software options is provided on our Internet site at www.rohde-schwarz.com/product/FSW.

For retrofitting, note the mounting instructions enclosed with the options.

WARNING

Shock hazard

Before opening the housing, ensure that the instrument is switched off and disconnected from the power supply by removing the plug from the AC and DC power connector.

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

NOTICE

Risk of electrostatic discharge

Protect the operational site against electrostatic discharge to avoid damage to electronic components of the modules. For details refer to the safety instructions at the beginning of this manual.

When installing hardware options, note:

1. Switch off the instrument and disconnect the power supply cables.
2. Open the instrument at the necessary parts (refer to [4.2.1](#) and [4.2.4](#))
3. Plug in the option and fix it, if required, using the screws previously removed.

4. Complete the instrument as described in [4.2.5](#)
5. Switch on the R&S®FSW.
6. Install additional software, if required, according to the instructions enclosed with the option.
7. If an adjustment is required for this option, the appropriate notes can be found in the installation instructions for the option.

6 Documents

This chapter provides information on the ordering of spare parts and contains the spare part list and the documents for the complete FSW8/13/26/43/50 unit.

6.1 Spare Parts

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

NOTICE

Risk of damaging a module

When shipping a module, observe the instructions provided in the section titled "Procedure in Case of Service and Ordering of Spare Parts" at the beginning of this document.

ItemNo.	Designation	Stock No.
10	ZN WELDING-FRAME VAR08 - 67	1313.6999.00
12	ZN WELDING-FRAME VAR85	1313.5840.00
15	DZ CABLE TIE	1308.1028.00
16	DZ FLAT CABLE HOLDER	0254.2055.00
20	EV FAN 119X119X38 67L/S 12V PWM L240	1313.0155.00
21	EV FAN 80X80X25 23L/S 12V PWM	3589.1763.00
27	VN EXPANDING RIVET 4 PA BK	3529.0990.00
25	MZ FAN SHEET	1311.0812.00
30	EV FAN COLLAR 119-60-10 (T0.7)	1304.9947.00
32	MZ FAN LOCKING FSW	1313.4821.00
35	DZ CABLE-HOLDER	1130.0941.00
40	EL SPEAKER 2W/8 OHM IP65	6148.3244.00

ItemNo.	Designation	Stock No.
50	EL SPEAKER HOLDER 50	1313.0110.00
60	LAUTSPRECHER KABEL	1313.0284.00
71	ED MOTHERBOARD DIGITAL VAR 67 (replaced by 1325.3625.02)	1313.7695.02
73	ED MOTHERBOARD DIGITAL	1325.3625.02
78	DZ CABLE HOLDER	6124.0368.00
81	ZN HOLDER MOTHERBOARD DIGITAL	1313.7889.00
91	VS SCREW M2.5 X 5 ISR PA	1096.4973.00
7A FF	F1 Power supply rail for DC/DC converter 6,5V A	2079.5994.00
7A FF	F2 Power supply rail for DC/DC converter 6,5V B	2079.5994.00
7A FF	F3 Power supply rail for DC/DC converter 3,3V, -6,5V, probe supply, 5V, 30V	2079.5994.00
7A FF	F4 Power supply rail for digital boards	2079.5994.00
7A FF	F5 Power supply rail for analog boards	2079.5994.00
7A FF	F6 Power supply rail for main fans	2079.5994.00
7A FF	F7 Power supply rail for microwave converter	2079.5994.00
7A FF	F8 Supply rail for digital option modules	2079.5994.00
7A FF	F10 Supply rail for CPU board	2079.5994.00
3AFF	F13 Standby supply rail	6100.7862.00
7A FF	F14 Power supply rail for Detector Extension	2079.5994.00
110	ED MOTHERBOARD ANALOG FSW	1312.8130.02
111	ED MOTHERBOARD ANALOG LONG	1321.5017.02
121	VS SCREW M2.5 X 5 ISR PA	1096.4973.00
125	DZ CABLE-HOLDER	1093.9045.00
137	NJ POWER SUPPLY UNIT	1321.5417.02
138	VS SCREW M2.5 X 5 ISR PA	1096.4973.00

ItemNo.	Designation	Stock No.
141	NR IPC 11/4	1206.3216.00
145	MZ SCREENING SHIELD PROCESSOR IPC11	1322.8155.00
152	KB BACKPLANE PSU600 LABELED	1321.5052.00
153	ZN SPACER PLATE PSU600	1321.5000.00
161	ZN MODULE BACKPLANE IPC11	1322.8661.00
162	KB BACKPLANE IPC11 LABELED	1321.6136.00
	IPC 10/6	1206.0223.00
	KB BACKPLANE IPC10 LABELED	1321.5375.00
	MZ SCREENING SHIELD PROCESSOR IPC10	1325.4973.00
	ZN MODULE BACKPLANE IPC10	1313.7720.00
163	VS 965/ISR-M2.5X6-A4-PA	1148.3288.00
166	VS SPRING LOCK WASHER DIN 127	0082.4786.00
170	VS SCREW M2.5X5-ISR-PA	1096.4973.00
171	VS 7985/ISR-M2.5X8-A4-PA	1148.2730.00
172	VS WASHER DIN 125	0082.4663.00
173	VS WASHER DIN 125	0088.3146.00
174	VS NUT DIN934-M2.5-A4 0088.0230.00	0088.0230.00
180	FP SATA ADAPTOR	1308.0280.00
190	MB SPECIAL SCREW M3	1304.9199.00
200	DG SATA DATACABLE 265	1091.3440.00
210	DS SATA POWER CABLE 100 IPC10	1313.0103.00
223	ZM SOLID STATE DRIVE FSW	1312.9336.07
300	ZE ATTENUATOR 6-STEP	1137.0599.03
320	320 ZE 6-STEP ATTENUATOR 75DB 26GHZ C	1170.0107.02

ItemNo.	Designation	Stock No.
321	321 ZE 6-STEP ATTENUATOR 75DB 43GHZ C	1170.0107.04
322	322 ZE 6-STEP ATTENUATOR 75DB 67GHZ C	1170.0107.03
323	ZE ATTENUATOR FSW85 70DB C	1177.0090.02
327	MZ INSULATING FOIL ATTENUATOR FSW85	1325.4715.00
340	DY ATTENUATOR CABLE	1312.9607.00
341	DY ATTENUATOR CABLE	1325.4721.00
350	EE SYNTHESIZER 17G	1312.8100.02
355	FJ COAXIAL TERMINATION FEMALE	5354.1422.00
356	FJ COAXIAL TERMINATION FEMALE	5354.1422.00
357	FJ TERMINATION 50 OHM	0249.7823.00
358	FJ TERMINATION 50 OHM	5354.1422.00
359	FJ TERMINATION 50 OHM	0249.7823.00
360	EE FRONTEND 8 GHz	1312.8046.02
370	EE DETECTORBOARD (replaced by 1313.7050.02)	1312.8175.02
371	EE DETECTORBOARD	1313.7050.02
380	EE REFERENCE (replaced by 1313.7050.04)	1312.8075.02
381	EE REFERENCE (replaced by 1313.7050.06)	1312.8075.04
382	EE REFERENCE	1312.8075.06
	Drawing MWC Frontend Unit 1312.8298.01 (13.6GHz, 26.5GHz)	
402	ZE MWC FRONTEND UNIT 13.6GHZ	1312.8298.12
403	ZE MWC FRONTEND UNIT 26.5GHZ	1312.8298.25
405	MZ INSULATING FOIL YIG HOLDER	1313.2912.00
1300	ED MW CONVERTER FRONTEND 26.5 GHz	1312.8300.02
1320	EY YIG BANDPASS FILTER	1093.9222.00

ItemNo.	Designation	Stock No.
1330	DX CABLE W1	1093.8284.00
1340	ZE YIG-FILTER 3-30GHZ	1301.1022.07
1361	ZN YIG HOLDER	1313.6430.00
1380	MZ YIG WASHER	1313.1174.00
1390	ZN YIG SHIELDING 26.5	1313.1168.00
1420	DW RF CABLE W16 (YIG 26.5GHZ)	1312.9765.00
1430	DW RF CABLE W17 (YIG 26.5GHZ)	1312.9771.00
1450	DW RF CABLE W16 FT(YIG 13.6GHZ)	1313.2858.00
1460	DW RF CABLE W17 (YIG 13.6GHZ)	1313.2864.00
1470	ZN YIG WASHER 13.6GHZ	1313.2841.00
	Drawing MWC Frontend Unit 1312.8323.01 sheet 1 (43GHz)	
410	ZE MW CONVERTER UNIT 43GHZ	1312.8323.42
1600	ZE MW CONVERTER FRONTEND 43 GHz	1312.8330.02
1610	ZE YIG-FILTER 7-43GHZ	1300.9007.43
1620	ZE TRIPLEXER 50	1301.0503.03
1630	EE TRIPLEXER BOARD 43GHZ	1313.4844.02
-	MZ GAP PAD 60X50X2.0	1321.5246.00
1720	RF CABLE W17 (YIG 43GHZ)DW	1313.4509.00
1730	DW RF CABLE W30 (YIG 43GHZ)	1313.4996.00
1740	DW RF CABLE W31 (YIG 43GHZ)	1313.5005.00
	Drawing MWC Frontend Unit 1312.8323.01 sheet 2 (50GHz, 67GHz)	
411	ZE MW CONVERTER UNIT 43GHZ	1312.8323.49
412	ZE MW CONVERTER UNIT 67GHZ	1321.5300.67
413	ZE MW CONVERTER UNIT 43GHZ	1312.8323.67

ItemNo.	Designation	Stock No.
1600	ZE MW CONVERTER FRONTEND 43 GHz	1312.8330.02
1603	MW CONVERTER FRONTEND 43 GHz	1321.5681.02
1611	ZE YIG-BANDPASS FILTER WITH CABLES (replaced with 1321.5075.02)	1321.5069.02
1612	ZE YIG-FILTER 7-50GHZ WITH CABLES	1321.5075.02
1613	ZE YIG-FILTER 7-50GHZ WITH CABLES	1321.5075.02
1620	ZE TRIPLEXER 50	1301.0503.03
1630	EE TRIPLEXER BOARD 43GHZ	1313.4844.02
-	MZ GAP PAD 60X50X2.0	1321.5246.00
1715	DW RF CABLE W2 (50GHZ)	1313.5528.00
1740	DW RF CABLE W31 (YIG 43GHZ)	1313.5005.00
	Drawing MWC Frontend 1321.5300.01	
412	ZE MW CONVERTER UNIT 67GHZ	1321.5300.67
2910	EE FSW67 CONVERTER	1313.7266.02
2920	ZE TRIPLEXER 65	1304.3003.04
2930	ZE MULTIPLIER 46	1304.1000.02
2970	DW RF CABLE W150	1321.5423.00
2980	DW RF CABLE W151	1321.5430.00
	Drawing MWC Frontend Unit 1312.8323.01 sheet 3 (85GHz)	
414	ZE MW CONVERTER UNIT 43GHZ	1312.8323.85
1603	MW CONVERTER FRONTEND 43 GHz	1321.5681.02
1615	ZE YIG-FILTER 7-50GHZ	1300.9007.50
1616	DW HF-KABEL W17 (YIG 50GHZ)	1313.7820.00
-	MZ GAP PAD 60X50X2.0	1321.5246.00

ItemNo.	Designation	Stock No.
	Drawing FSW85 FRONTEND UNIT 85GHZ 1321.5469.01 sheet 1+2 (85GHZ)	
415	ZE FSW85 FRONTEND UNIT 85GHZ	1321.5469.85
416	VS 965/ISR M2.5 X 6 A4 PA	1148.3288.00
417	VS SCREW M2.5 X 5 ISR PA	1096.4973.00
425	AZ INSULATING M3	3587.8225.00
431	EE MWC BASE BOARD	1312.9294.03
436	EE MWC50 BASE BOARD	1313.4215.03
437	ZE MWC85 BASE BOARD UNIT	1321.5446.85
438	DY RIBBON CABLE W4800	1325.4173.00
439	DY RIBBON CABLE W495	1325.4167.00
450	DG IPASS CABLE 26 PIN	1313.1680.00
451	DG IPASS CABLE 26 PIN 0.5M	1321.6313.00
455	DZ CABEL TIE	1308.1028.00
520	DY FRONT CABLE W40	1312.9588.00
530	AZ LIGHT PIPE	3586.5216.00
552	ED RF CONNECTOR BOARD FSW 85GHZ	1322.9651.02
560	DV RF-CABLE W50	1312.9388.00
561	DV RF-CABLE W50	1325.2606.00
570	DW RF CABLE W1 (8GHZ)	1312.9394.00
580	DW RF CABLE W1 (13.6GHZ)	1312.9620.00
600	VS 965/ISR M2.5 X 6 A4 PA	1148.3288.00
605	FJ ADAPTOR N-BU/SMA-ST	0343.0257.00
610	FJ ADAPTOR PC3.5 ST/BU	1127.9512.00
615	FJ ADAPTOR K ST/BU	1127.9529.00

ItemNo.	Designation	Stock No.
616	FJ ADAPTER RPC-1.85F-M	3589.1292.00
620	DW RF CABLE W1 (43GHZ)	1313.7508.00
621	DW RF CABLE W1 (50GHZ)	1313.5486.00
622	ZM REPLACEMENTADAPTER 1MM FEMALE IC+OC	1177.2170.00
623	MZ EMC SHIELDING SPRING	1177.2305.00
624	ZM CONNECTOR HEAD REPLACEMENT ADAPTER M5	1177.2228.00
625	DW RF CABLE W2 (8GHZ)	1312.9536.00
626	ZM MOUNTING REPLACEMENT ADAPTER	1177.1209.00
630	DW RF CABLE W2 (26,5GHZ)	1312.9542.00
631	DW RF CABLE W2 (43GHZ)	1313.4938.00
632	DW RF CABLE W2 (50GHZ)	1313.5528.00
635	DW RF-CABLE W3	1312.9636.00
640	DW RF-CABLE W3	1312.9465.00
641	DW RF-CABLE W3	1325.4421.00
645	DW RF CABLE W4	1312.9471.00
650	DW RF CABLE W5	1312.9642.00
651	DW RF CABLE W5 (FSW85)	1322.9397.00
655	DV RF CABLE W6	1312.9659.00
656	DV RF CABLE W6 (FSW85)	1322.9400.00
660	DV RF CABLE W7	1312.9507.00
661	DV RF CABLE W7 (FSW85)	1322.9422.00
665	DV RF CABLE W8	1312.9513.00
666	DV RF CABLE W8	1322.9439.00
670	DW RF CABLE W9 (LO2)	1312.9520.00

ItemNo.	Designation	Stock No.
671	DW RF CABLE W9 (LO2) 50GHZ	1313.5886.00
672	DW RF CABLE W9 (LO2)	1322.9445.00
673	DW RF CABLE W9 (LO2) FSW85	1325.2987.00
675	DW RF CABLE W10	1312.9665.00
676	DV RF CABLE W10 (43GHZ)	1313.5163.00
680	DV RF CABLE W11	1312.9671.00
681	DV RF CABLE W11 (43GHZ)	1313.5870.00
685	DW RF CABLE W12	1312.9688.00
686	DW RF CABLE W12 (43GHZ)	1313.5534.00
687	DW RF CABLE W12 (67GHZ)	1321.5846.00
695	DV RF CABLE W15	1312.9713.00
700	DV RF-CABLE W18	1313.0003.00
703	DV RF-CABLE W19	1313.0290.00
705	DV RF CABLE W22	1313.0755.00
706	DV RF CABLE W22	1322.9416.00
708	DY CABLE W34	1313.5286.00
709	DV RF CABLE W360	1313.6682.00
710	KB REAR PANEL FSW PRINTED	1313.0510.00
713	MP COVER	1313.6624.00
716	KB REAR PANEL COVER 1 PRINTED	1322.7571.00
720	KB REAR PANEL COVER 2 PRINTED	1313.0426.00
725	KB REAR PANEL COVER 3 PRINTED	1313.0432.00
730	KB REAR PANEL COVER 4 PRINTED	1313.0449.00
735	KB REAR PANEL COVER 5 PRINTED	1313.0455.00

ItemNo.	Designation	Stock No.
738	VS SCREW M2.5 X 5 ISR PA	1096.4973.00
741	MZ COVER ANALOG 2	1322.7920.00
742	MZ COVER FSW T450	1313.6918.00
743	ZN COVER ANALOG T550	1313.6382.00
744	MZ FAN COVER FSW T550	1313.6401.00
745	VS 965/ISR M2.5 X 6 A4 PA	1148.3288.00
748	VS SCREW M2.5 X 5 ISR PA	1096.4973.00
770	OS INLAYLABEL KEYBOARD FSW	1312.9788.00
775	OS INLAYLABEL JACKPANEL SIRIUS 8/13 GHz	1313.0232.00
780	OS INLAYLABEL JACKPANEL FSW	1312.9594.00
785	OS INLAYLABEL JACKPANEL FSW85	1325.3331.00
793	VS 965/ISR M2.5 X 6 A4 PA	1148.3288.00
794	VS 965/ISR M2.5 X 6 A4 PA	1148.3288.00
795	VS SCREW M2.5 X 5 ISR PA	1096.4973.00
900	KN BW2010 5E FRONTGRIFF	1174.3981.00
905	VS SCREW M4 X 20 ISR PA	1096.5005.00
906	VS SCREW M4 X 20 ISR PA	1096.5005.00
910	MM CAP	1174.5378.00
916	MF PROFILE STRIP	1322.7694.00
917	MZ COVER STRIP	1322.8232.00
918	VS 965/ISR-M3X6-A4-PA	1148.2781.00
920	BW2010 HOLDER BASE	1174.0353.00
922	7985/ISR-M4X10-A4-PA	1148.2669.00
925	KN BW2010 5HU REAR FOOT COMPL.	1174.6522.00

ItemNo.	Designation	Stock No.
930	MZ BW2010 5U D450 SIDE PANEL	1176.3672.00
931	MZ BW2010 5U D550 SIDE PANEL	1325.3819.00
935	MM BW2010 3E HANDLE T450	1174.6322.00
936	MM BW2010 3E TRAGEGRIFF T550	1174.6345.00
940	MM BW2010 3E COVERHANDLE	1174.6397.00
946	ZN COVER TOP	1322.8303.00
947	ZN COVER TOP T550	1322.8690.00
951	ZN COVER BOTTOM	1322.8284.00
952	ZN COVER BOTTOM T550	1322.8710.00
-	MZ BW2010 ADJUSTMENT SPRING	1174.0860.00
1000	DV RF CABLE W131	1313.3019.00
1010	DV RF CABLE W132	1313.3025.00
1020	EP CERAMIC LOWPASS FILTER	3587.8331.00
1026	RF-CABLE W134	1313.5905.00
1027	RF CABLE W135	1313.5957.00
1030	DW RF CABLE W470	1322.9045.00
1031	DW RF CABLE W471	1322.9768.00
1032	DW RF CABLE W485	1322.9774.00
1033	DW RF CABLE W486	1322.9780.00
1034	DW RF CABLE W487	1322.9797.00
1035	DW RF CABLE W491	1322.9122.00
1036	DV RF CABLE W488	1322.9151.00
1037	DV RF CABLE W489	1322.9168.00
1038	DH RF CABLE W490	1322.9051.00

ItemNo.	Designation	Stock No.
1039	DV RF CABLE W492	1322.9139.00
1120	SUPPORT RAIL	1313.3790.00
1130	SCREW M2.5X5-ISR-PA	1096.4973.00
1160	FJ PROTECTION CAP	1066.2095.00
1180	FJ TERMINATION 50 OHM	0249.7823.00
1185	FJ TERMINATION 50 OHM	0249.7823.00
1220	VS SCREW M2.5 X 5 ISR PA	1096.4973.00
1230	MZ SPACER	1313.6901.00
1250	DV RF CABLE W360	1325.3302.00
1270	VS 965/ISR M3 X 6 A4 PA	1148.2781.00
1276	VS SCREW M2.5 X 5 ISR PA	1096.4973.00
1290	OS CAUTION LABEL FRONT GRIP	1325.5311.00
-	LITHIUM BATTERY CR2032	0858.2049.00
-	HS SYSTEM DRIVE WITH SOFTWARE FSW for IPC10	1312.9336.07
-	HS SYSTEM DRIVE WITH SOFTWARE FSW for IPC11	1312.9336.08
	Drawing Frontpanel 1312.8023.01	
1000	KB FRONTCOVER FSW (PRINTED) #	1312.9613.00
	# order also	
	OS INLAYLABEL KEYBOARD FSW	1312.9788.00
	VAR 08	1313.0649.00
	VAR 13	1313.0655.00
	VAR 26	1312.9794.00
	VAR 43	1313.0661.00
	VAR 50	1313.5705.00

ItemNo.	Designation	Stock No.
	VAR 67	1313.7637.00
1020	SF RUBBER KEYPAD SET	1312.8523.00
1035	FD FRONTPANEL KEYBOARD	1321.5617.02
1036	ED FRONTPANEL KEYBOARD FSW (replaced by 1321.5617.02)	1312.8530.03
1050	ED FRONTCONNECTOR FSW	1312.8275.02
1100	ZM DISPLAY WITH TOUCHSCREEN 12.1 INCH	1313.1268.00
1150	EM ROTARY PULSE ENCODER L18 (AXIS 14) M. KEY	0852.2876.00
1200	OK ROTARY KNOB RD30 WFA	0852.0921.00
1210	OK KNOB 12 WFA	1304.6777.00
	Drawing R&S FSW-B4 1313.2758.00	
-	OCXO-OPTION BOARD	1312.8230.02
	R&S FSW-B8	
-	DETECTOR BOARD	1313.7050.08
-	DETECTOR BOARD	1313.7050.26
	Drawing FSW-B10 1313.7489.00	
-	EE EXT GEN CONTROL	1313.1751.02
	Drawing FSW-B21 1313.1116.00	
2600	ZE MW CONVERTER UNIT 26,5GHZ	1312.8298.28
-	ED MW CONVERTER FRONTEND 26.5 GHz	1312.8300.03
2620	FJ ADAPTOR SMA / SMA	0513.1734.00
2640	DW RF CABLE W20	1313.6660.00
2645	DW RF CABLE W20 FSW85	1322.9980.00
2650	DV RF CABLE W21	1313.1068.00

ItemNo.	Designation	Stock No.
	Drawing R&S FSW-B24 1313.0903.00 D1 (VAR13 - 8/13GHz)	
2300	EE MW PREAMP 8/13GHZ	1313.0184.02
2320	ZE RELAIS UNIT 13GHZ	1164.6113.13
2360	DW RF CABLE W24 (8/13.6GHZ)	1313.0532.00
2370	DW RF CABLE W25 (8/13.6GHZ)	1313.0549.00
	Drawing R&S FSW-B24 1313.0855.00 D1 + D2 (VAR13 - 8/13GHz)	
-	ZE ELECTRONIC ATTENUATOR UNIT	1313.1039.02
	Drawing R&S FSW-B24 incl. FSW-B25 1313.0855.00 D4 (VAR13 - 8GHz)	
-	EE ELECTRICAL ATTENUATOR	1313.0203.02
-	ZE RELAIS UNIT 26.5GHZ	1164.6113.26
	Drawing R&S FSW-B24 1313.0903.01 D1 (VAR26/27 - 26,5GHz)	
2310	EE MW PREAMP 26.5GHZ	1312.9113.02
2311	EE MW PREAMP 26.5GHZ R2	1313.4609.02
2330	ZE RELAIS UNIT 26.5GHZ	1164.6113.26
2380	DV RF CABLE W24	1313.0478.00
2390	DV RF CABLE W25	1313.0484.00
	Drawing R&S FSW-B24 1313.0855.00 D3 (VAR26/27 - 26,5GHz)	
2282	DV RF CABLE W275	1325.3148.00
2283	DV RF CABLE W276	1325.3254.00
	Drawing R&S FSW-B24 incl. FSW-B25 1313.0855.00 D6 (VAR26 - 26,5GHz)	
-	EE ELECTRICAL ATTENUATOR	1313.0203.02
-	ZE RELAIS UNIT 26.5GHZ	1164.6113.26
Drawing R&S FSW-B24 1313.5792.00 D1 (VAR43/49/50/51/66/67/68 - 43GHz - 50GHz - 67GHz)		

ItemNo.	Designation	Stock No.
2213	ZE PREAMP UNIT 50GHZ	1313.4967.49
2214	ZE PREAMP UNIT 50GHZ	1313.4967.51
2215	ZE PREAMP UNIT 43GHZ	1313.4967.43
2216	ZE PREAMP UNIT 50GHZ	1313.4967.50
2217	ZE PREAMP UNIT 50GHZ - VAR67	1313.4967.67
2218	ZE PREAMP UNIT 50GHZ - VAR66	1313.4967.66
2219	ZE PREAMP UNIT 50GHZ - VAR68	1313.4967.68
2261	DW RF CABLE W23 (43GHZ)	1313.5128.00
2262	DW RF CABLE W23 (50GHZ)	1313.6030.00
2263	DW RF CABLE W23 (467GHZ)	1322.8549.00
2274	DW RF CABLE W27 (43/50GHZ)	1313.5134.00
2275	DW RF CABLE W153 (67GHZ) B24	1321.6413.00
	Drawing R&S FSW-B71 1313.1651.01 D1 + D2	
2710	EE BASE BAND ADC	1313.1722.02
2720	ED RF CONNECTOR BOARD 8GHZ	1313.3077.02
2721	OS INLAYLABEL JACKPANEL FSW B71 8/13GHZ	1313.5970.00
2730	ED RF CONNECTOR BOARD 26GHZ	1313.3619.02
2731	OS INLAYLABEL JACKPANEL FSW B71 26GHZ	1313.5986.00
2732	OS INLAYLABEL JACKPANEL FSW85	1322.8790.00
2740	FJ FLANGE PANEL 4X BNC-SMA	1313.6618.00
2747	FJ FLANGE PANEL 2X BNC-SMA	1325.2593.00
2820	ZE RELAIS UNIT	1313.6976.00
	Drawing R&S FSW-B160 / -B320 1312.1668.01	
-	EE DETECTOR EXTENSION	1312.8200.02

ItemNo.	Designation	Stock No.
-	EE WIDE BAND ADC	1312.9220.02
-	EE DETECTOR EXTENSION (AGF)	1312.8200.04
-	EE DETECTOR EXTENSION (AGP)	1312.8200.06
-	KB REAR PANEL DETECTOR EXTENSION PRINTED	1313.0378.00
	Drawing R&S FSW-B500 - B512 - B512R 1313.4296.01	
-	EE DETECTOR EXTENSION	1313.3577.03
-	EE WIDEBAND ADC 1200-N	1313.6201.02
-	EE CONNECTING BOARD B500R	1313.5934.02
-	DV RF CABLE W221	1322.9597.00
-	MZ COOLING PAD 48X48	1322.9468.00
-	MZ COOLING PAD 30X30	1322.9474.00
-	MT SECONDARY FAN B500	1321.6220.00
-	MB ISOLATION BUSH POM	1322.9280.00
	MF ISOLATION BUSH POM	1322.9274.00
	MK TEL-Z1500-SI 48MMX48MM	1324.9913.00
	MZ GAP PAD ADC B500R	1331.4494.00
	DX SUPPLY CABLE FAN B500R	1331.4536.00
	EV BLOWER 40X40X28 LONGLIFE	1324.9907.00
	MZ TOLERANCE COMPENSATION LARGE	1331.4620.00
	MZ TOLERANCE COMPENSATION	1325.3660.00
	R&S FSW-B1200 1331.6400.04	
	EE WIDEBAND CONVERTER	1331.5903.02
	EE WIDEBAND ADC	1331.5726.02
	EE DETECTOR EXTENSION 2 REV3 - VAR04	1331.5949.04

ItemNo.	Designation	Stock No.
	DV HF KABEL W1101	1331.6600.00
	DW HF-KABEL W1102	1331.6151.00
	DV HF KABEL W1103	1331.6168.00
	DV HF KABEL W1104	1331.6174.00
	DW HF KABEL W1105	1331.6180.00
	DV HF-KABEL W1106	1331.6616.00
	DW HF-KABEL W1107	1331.6622.00
	DW HF-KABEL W1108	1331.6639.00
	DW HF-KABEL W1109	1331.6645.00
	DW HF-KABEL W1110	1331.6651.00
	DW HF-KABEL W1111	1331.6668.00
	DW HF-KABEL W1112	1331.6674.00
	DV HF KABEL W1113	1331.6680.00
	MZ LUEFTER AUSGLEICHSMATTE	1325.3660.00
	MZ AUSGLEICHSMATTE GROSS	1331.4620.00
	EV LÜFTER 40X40X28 LONGLIFE	1324.9907.00
	DZ KABELBI.RD50BR2.4L200	0099.2181.00
	OS LUEFTERUNIT AUFKLEBERSATZ	1331.4794.00
	MZ WAERMELEITPAD ADC B1200	1331.6939.00
	DX VERSORGUNGSKABEL LUEFTER B500R	1331.4536.00
	MK WÄRMELEITPAD 48MM X 48MM 50W /	1324.9913.00
	MP ABDECKKAPPE. RD8.7/7.1 TMAX1.6	1313.6624.00
	ZM BW2010 RUECKWANDFUSS 5HE, Hoch	1174.6922.00
	ED MOTHERBOARD DIGITAL FSWX	1331.6139.02

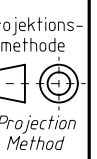
ItemNo.	Designation	Stock No.
	R&S FSW-B2000 1225.4750.02/26	
-	EE ALIGNMENT SIGNAL SOURCE	1325.3177.02
-	ZE MWC FRONTEND UNIT 26.5GHZ	1312.8298.29

6.2 Available Power Cables

Stock No.	Earthed-contact connector	Preferably used in
DS 0006.7013.00	BS1363: 1967' 10 A, 250 V complying with IEC 83: 1975 standard B2	Great Britain
DS 0006.7020.00	Type 12, 10 A, 250 V complying with SEV-regulation 1011.1059, standard sheet S 24 507	Switzerland
DS 0006.7036.00	Type 498/13, 10 A, 250 V complying with US-regulation UL 498, or with IEC 83	USA/Canada
DS 0041.4752.00	GB2099, GB1002, 10 A, 250 V approvals CCC	China
DS 0041.6232.00	JIS C 8303, 7A, 125 V AC approvals PSE (JET)	Japan
DS 0006.7107.00	Type SAA3, 10 A, 250 V, complying with AS C112-1964 Ap.	Australia
DS 0025.2365.00 DS 0099.1456.00	DIN 49 441, 10 A, 250 V, angular DIN 49 441, 10 A, 250 V, straight approvals VDE, ÖVE, CEBEC, KEMA, S, D, N, FI, LCIE, IMQ, UCIEE	Europe (except Switzerland)

6.3 Mechanical Drawings

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Projektions-
methode
Projection
Method

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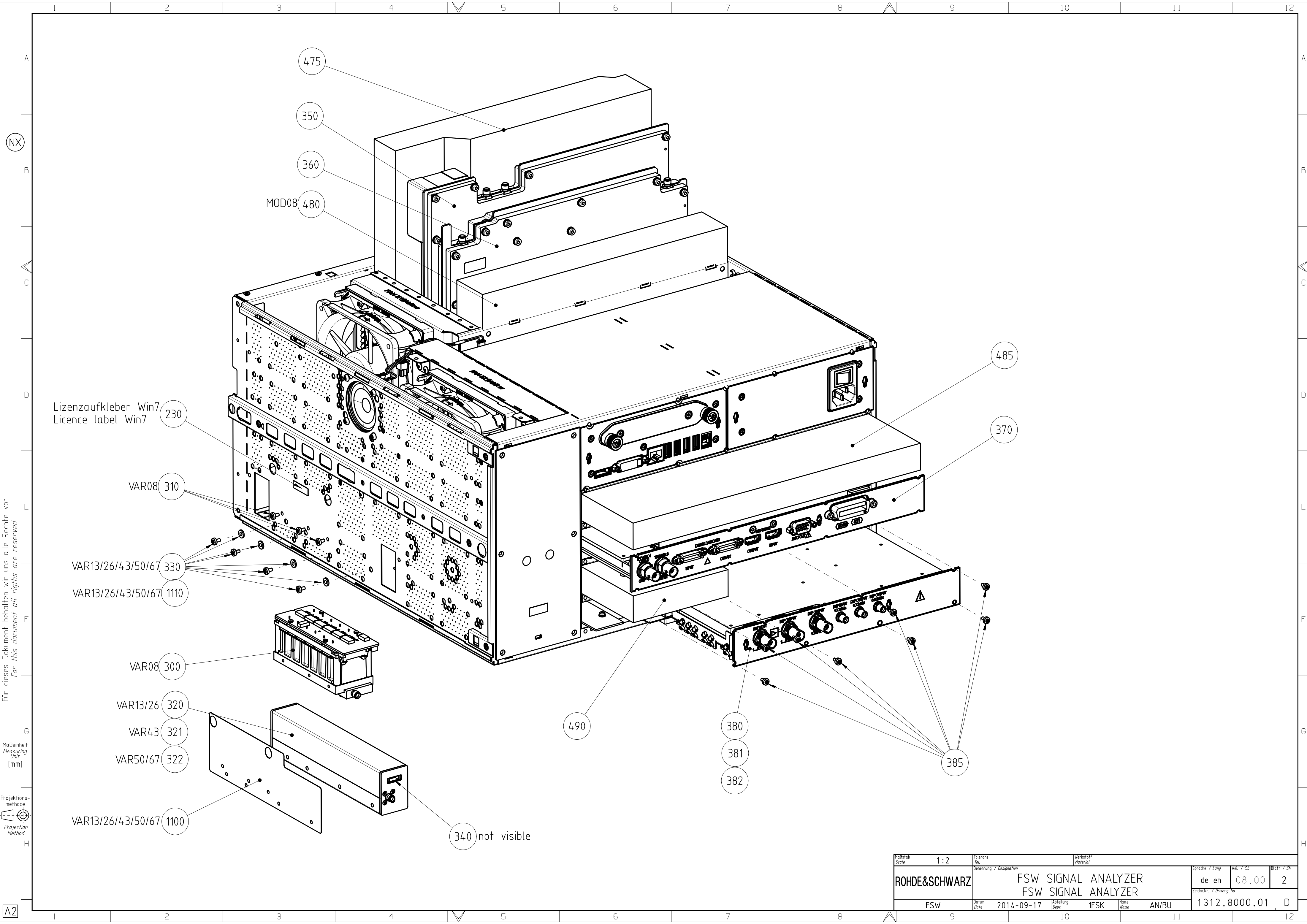
NX

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Maßeinheit
Measuring Unit
[mm]

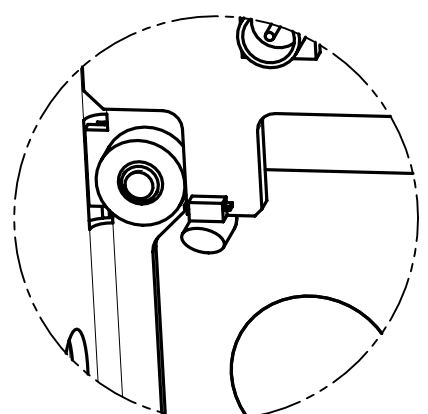
Projektions-
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A2



Maßstab Scale	1 : 2	Toleranz Tol.	Werkstoff Material				
ROHDE&SCHWARZ		Benennung / Designation			Sprache / Lang.	Aes. / C.L.	Blatt / Sh.
		FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER			de en	08.00	2
FSW	Datum Date	2014-09-17	Abteilung Dept.	1ESK	Name Name	AN/BU	
		Zeichn.Nr. / Drawing No.			1312.8000.01 D		

A2



Maßstab Scale		1 : 2		Toleranz Tol		Werkstoff Material									
ROHDE&SCHWARZ		Benennung / Designation						Sprache / Lang.		Art. / C.L.		Blatt / Sh.			
		FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER						de en		12.00		3			
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FSW		Datum Date		2015-02-26		Abteilung Dept.		1ESK		Name Name		AN/bu		1312.8000.01 D	

NX

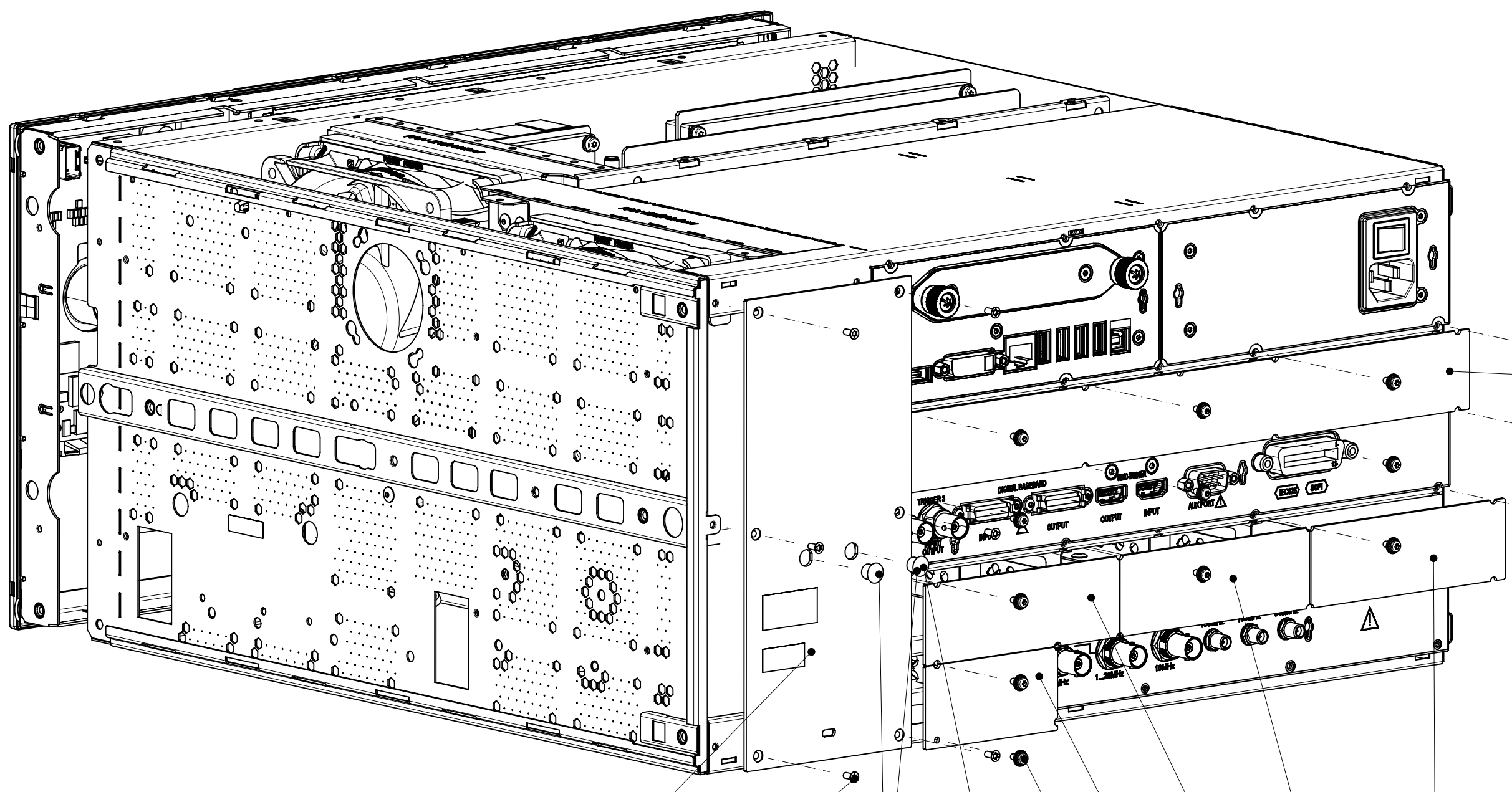
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Maßeinheit
Measuring Unit
[mm]

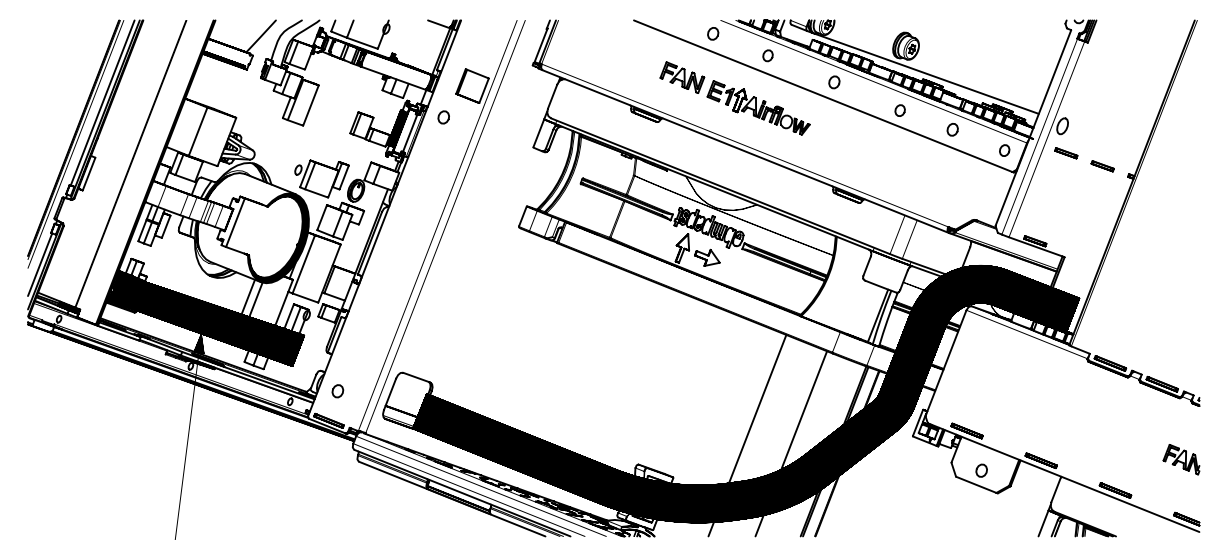
Projektions-
methode
Projection
Method

A2

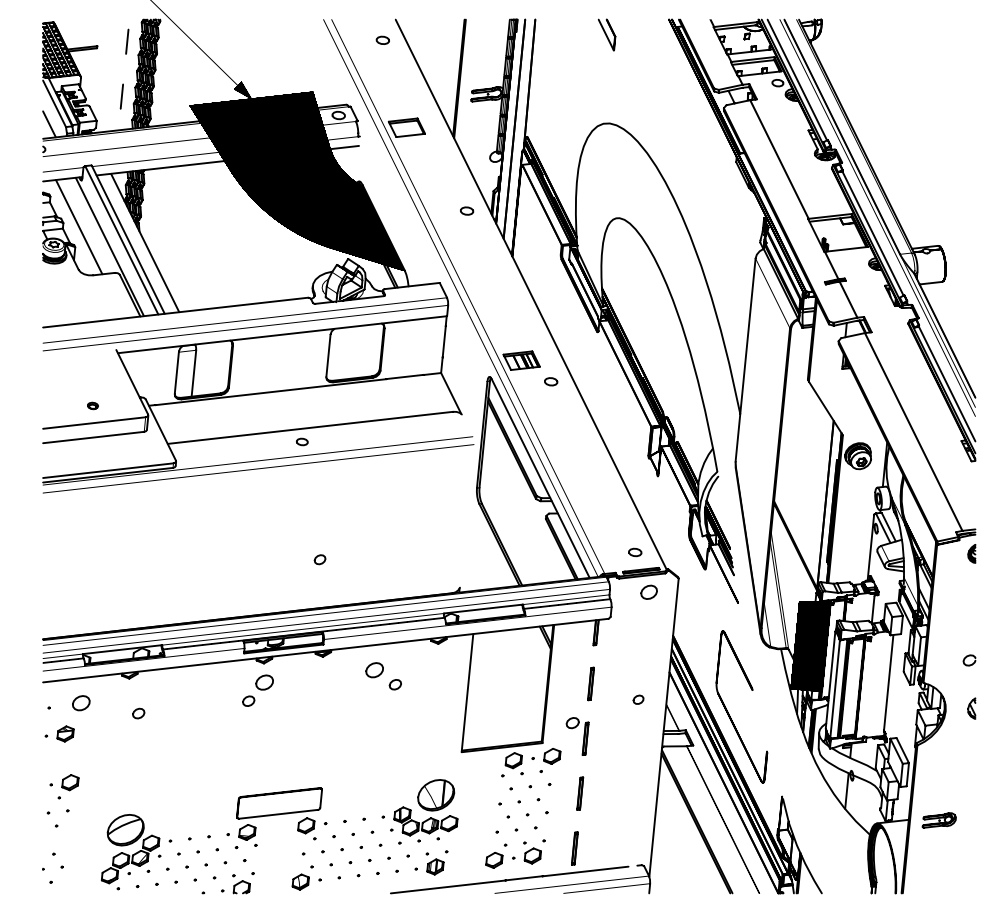
1170



VAR 08/13/26
VAR 43/50/67/85



Displaykabel wie dargestellt einstecken (2x)
insert displaycable as shown (2x)



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Maßstab Scale	1:2	Toleranz Tol.	ISO2768-m	Werkstoff Material		Sprache / Lang.	de en	Aes. / C.C.	08.00	Blatt / Sh.	4
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FSW	Datum Date	2014-10-27	Abteilung Dept.	1ESK	Name Name	AN/PG	D				

NX

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A2

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Maßinheit
Measuring Unit
[mm]

Projektions-
methode
Projection
Method

VAR08

VAR13/26

VAR43/50

VAR43

VAR50

VAR67

VAR85

Verlegung Pos. 340 (Kabel W60) siehe Fotos

Ansicht von oben

VAR13/26/43/50/67

VAR43/50

VAR08/13/26/43/50

VAR43/50

VAR50/67

VAR43

VAR26

VAR13

VAR08/13

VAR08/13

VAR08

VAR13

VAR26/43

VAR50/67

VAR26/43/50/67

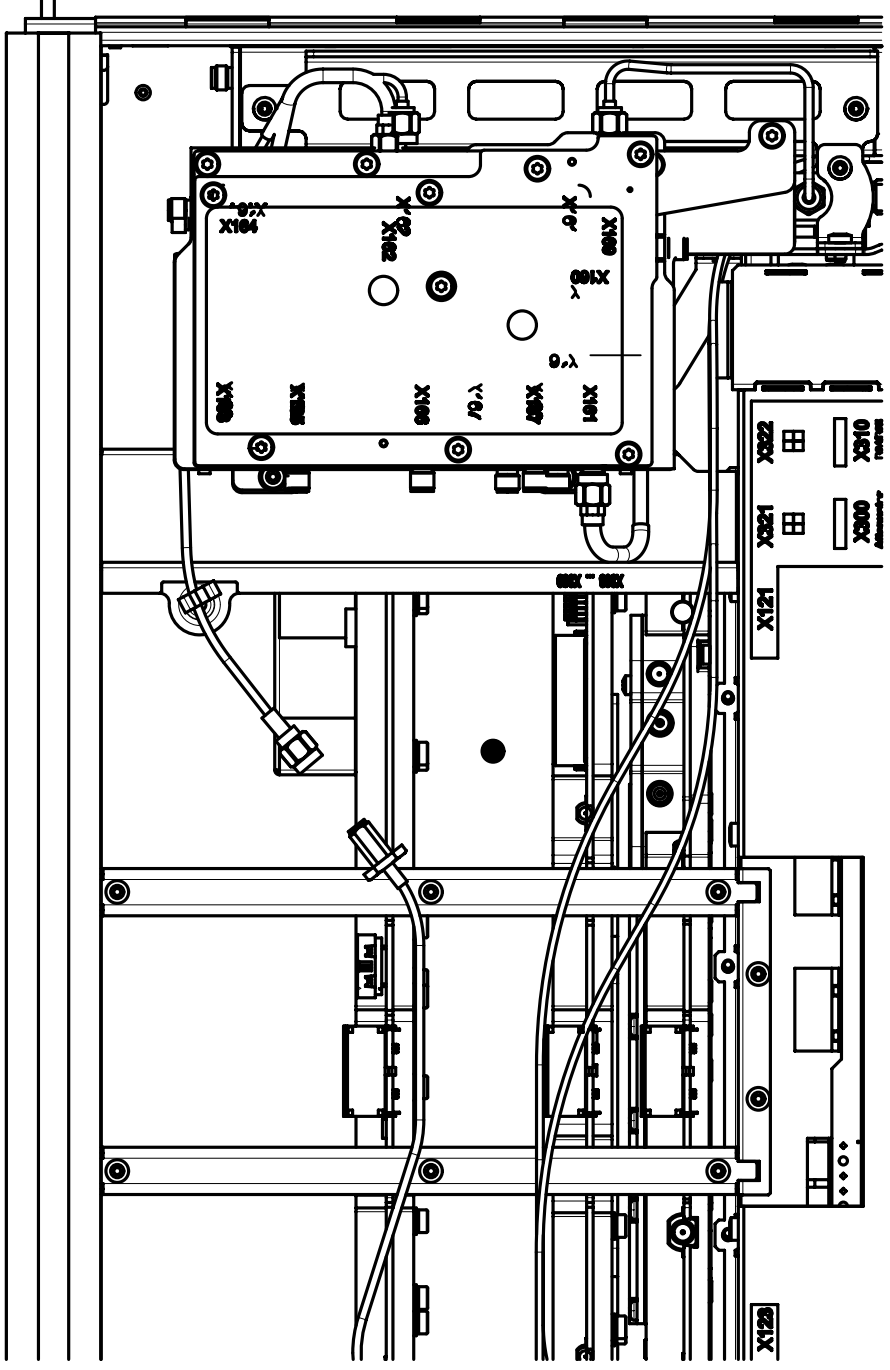
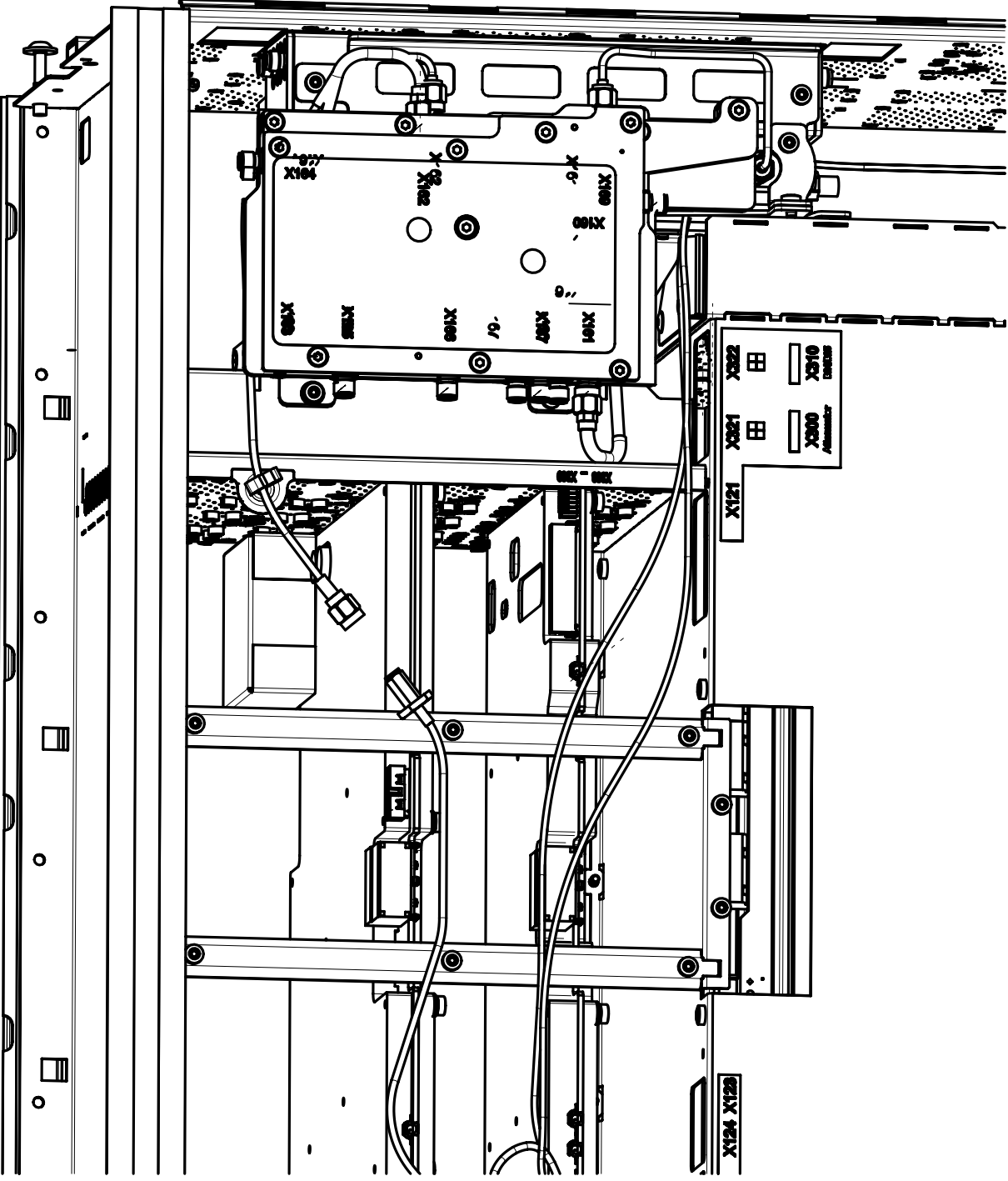
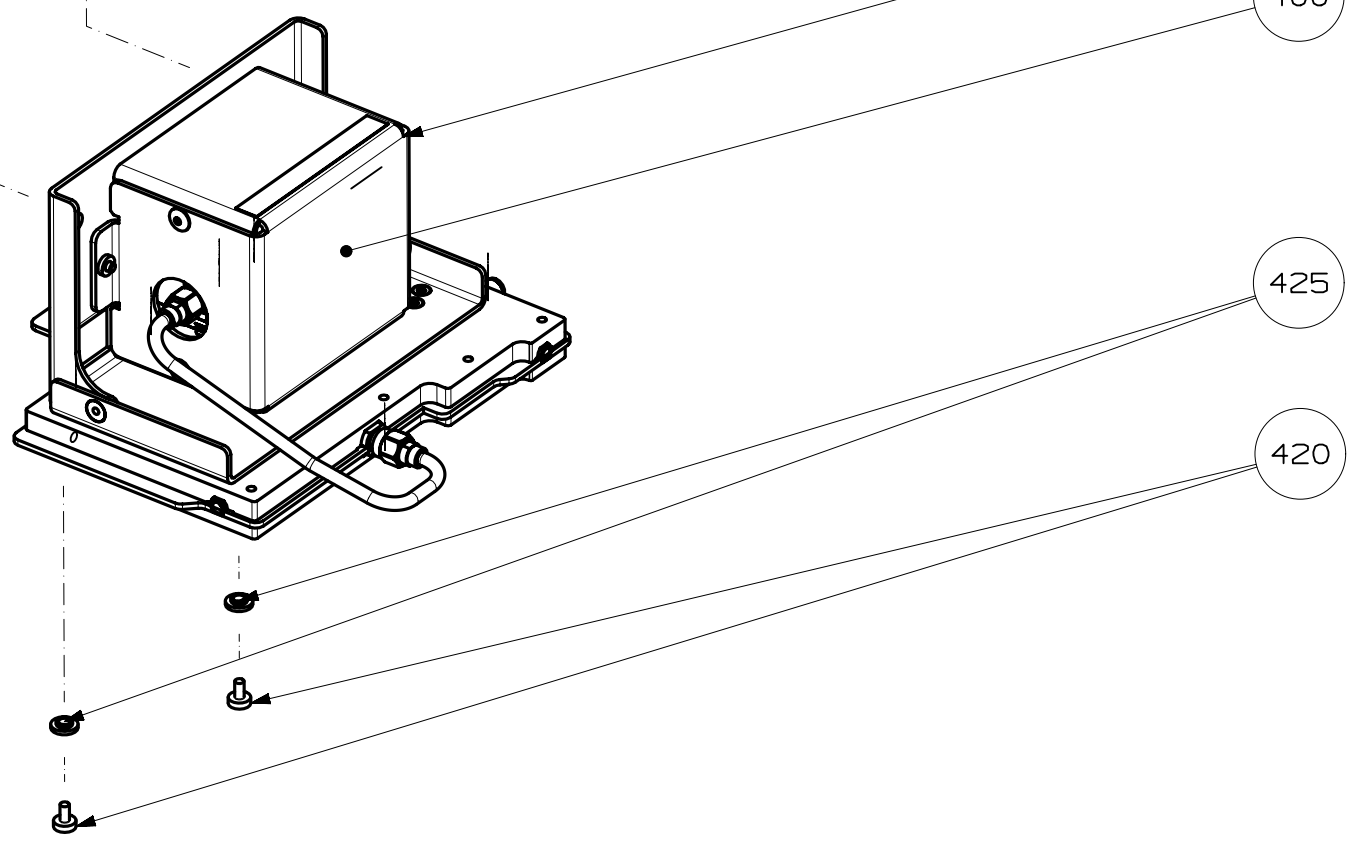
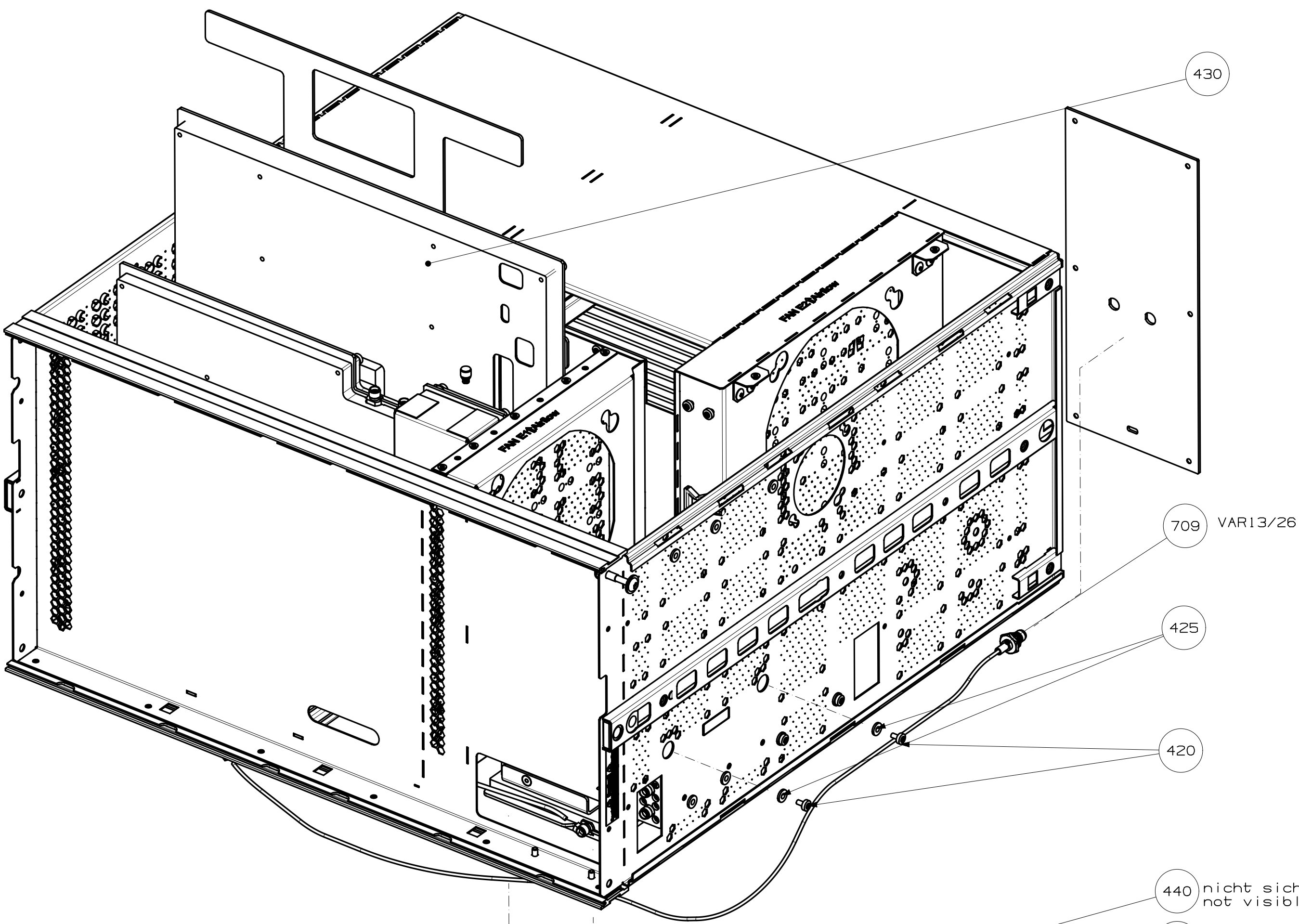
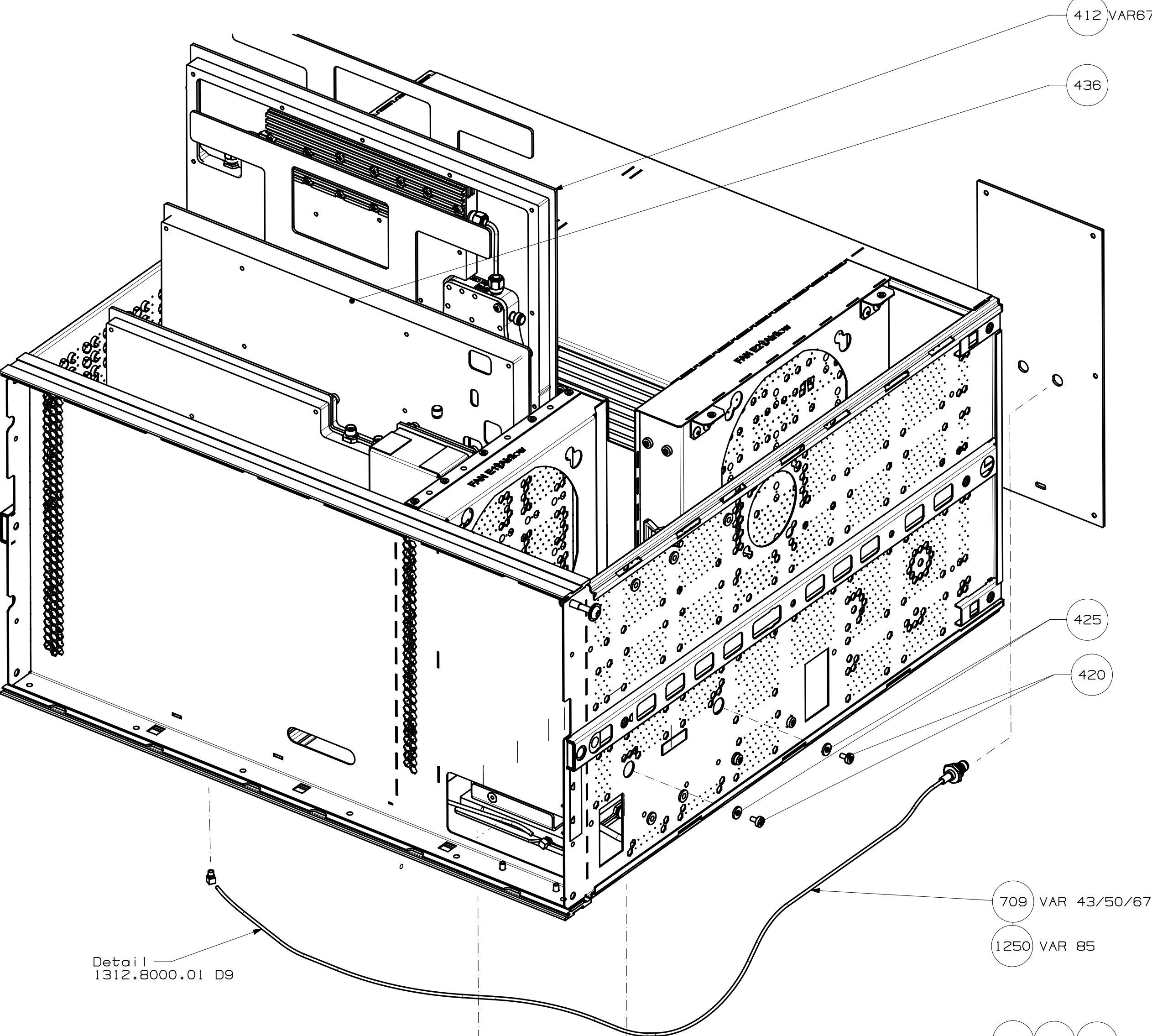
VAR08

VAR13

Maßstab Scale	2:1	Toleranz Tol.					Werkstoff Material				
ROHDE&SCHWARZ	Benennung / Designation						Sprache / Lang.		Aes. / C.C.	Blatt / Sh.	
	FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER						de en		06.00	5	
							Zeichn.Nr. / Drawing No.				
FSW	Datum Date	2015-03-16	Abteilung Dept.	1ESK	Name Name	AN/BU	1312.8000.01		D		

VAR 43/50/67

VAR 13 / 26

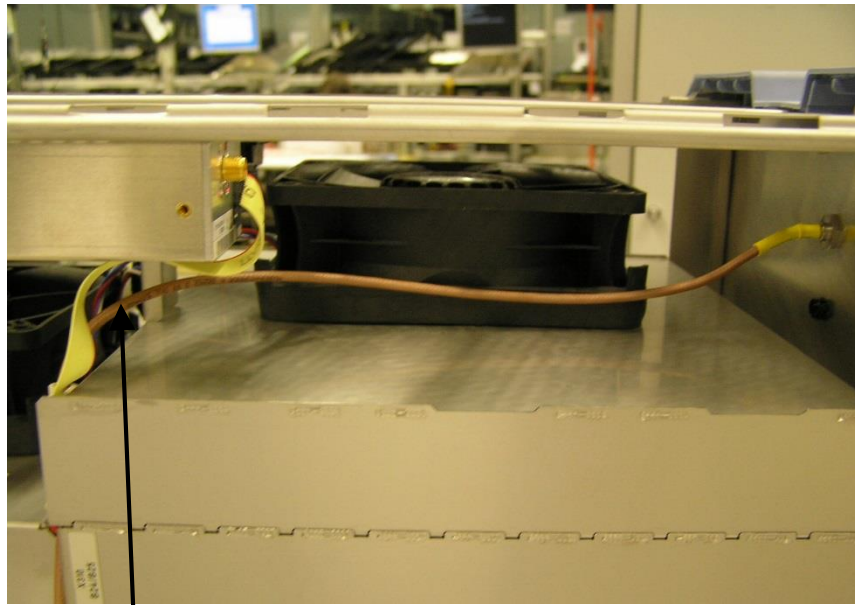


Zeichn. / Scale	1:2	Version / Revision		Werkstoff / Material		Drucke / Long	An / 7.11	Blatt / 38	
ROHDE&SCHWARZ		FSW SIGNAL ANALYZER				de en	08.00	7	
FSW	Notiz / Note	2015-02-24	Änderung / Change	IESK	Notiz / Note	AN/BU	1312.8000.01	D	

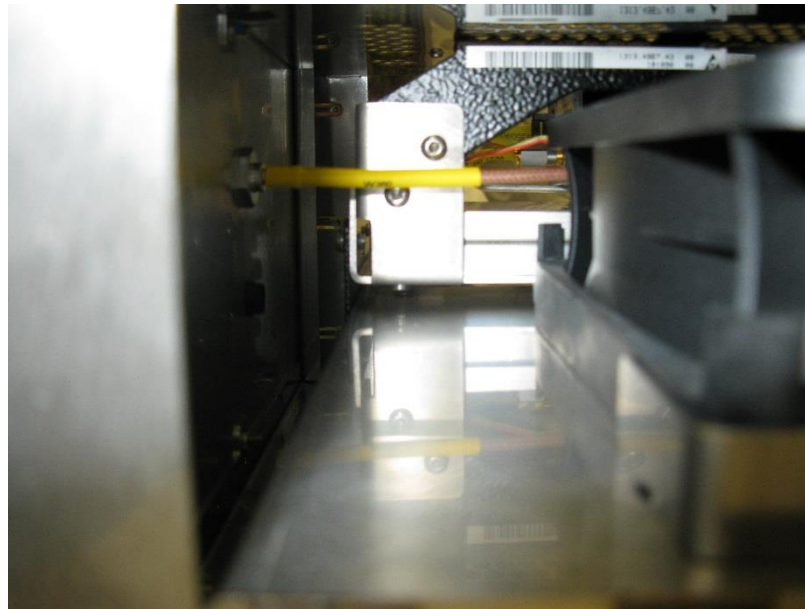
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Projektions-
methode
Projection
Method

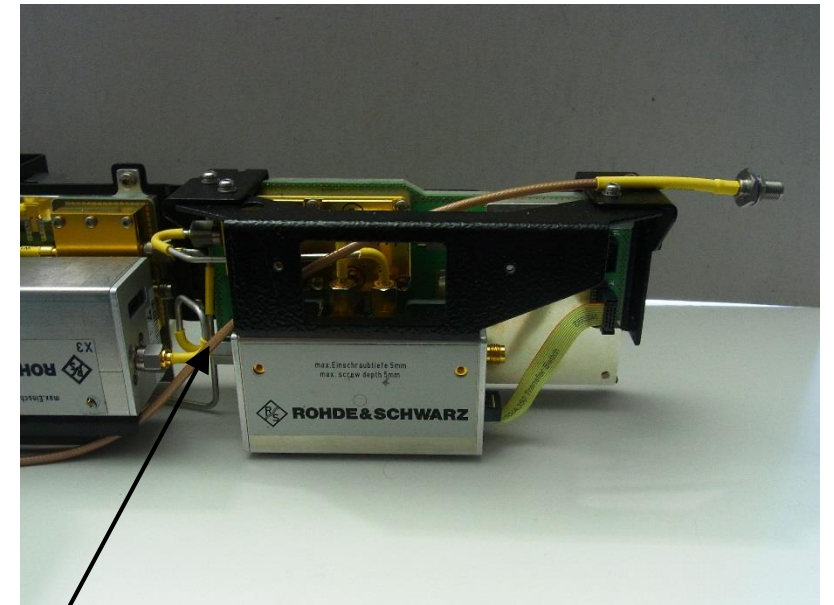
Nr.1 ohne B24 / without B24



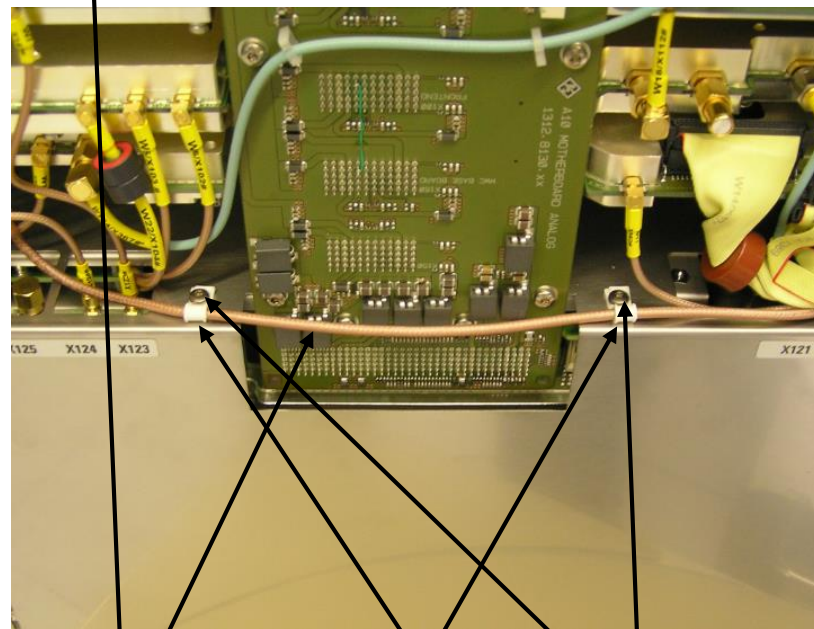
Nr.2 mit B24 / with B24



Nr.3 mit B24 / with B24



Nr.4

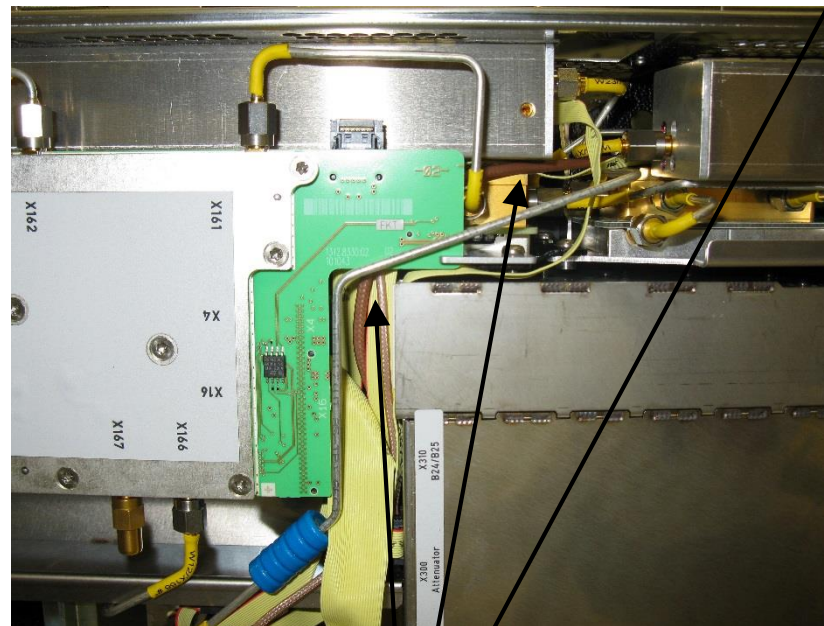


709

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Nr.5 mit B24 / with B24

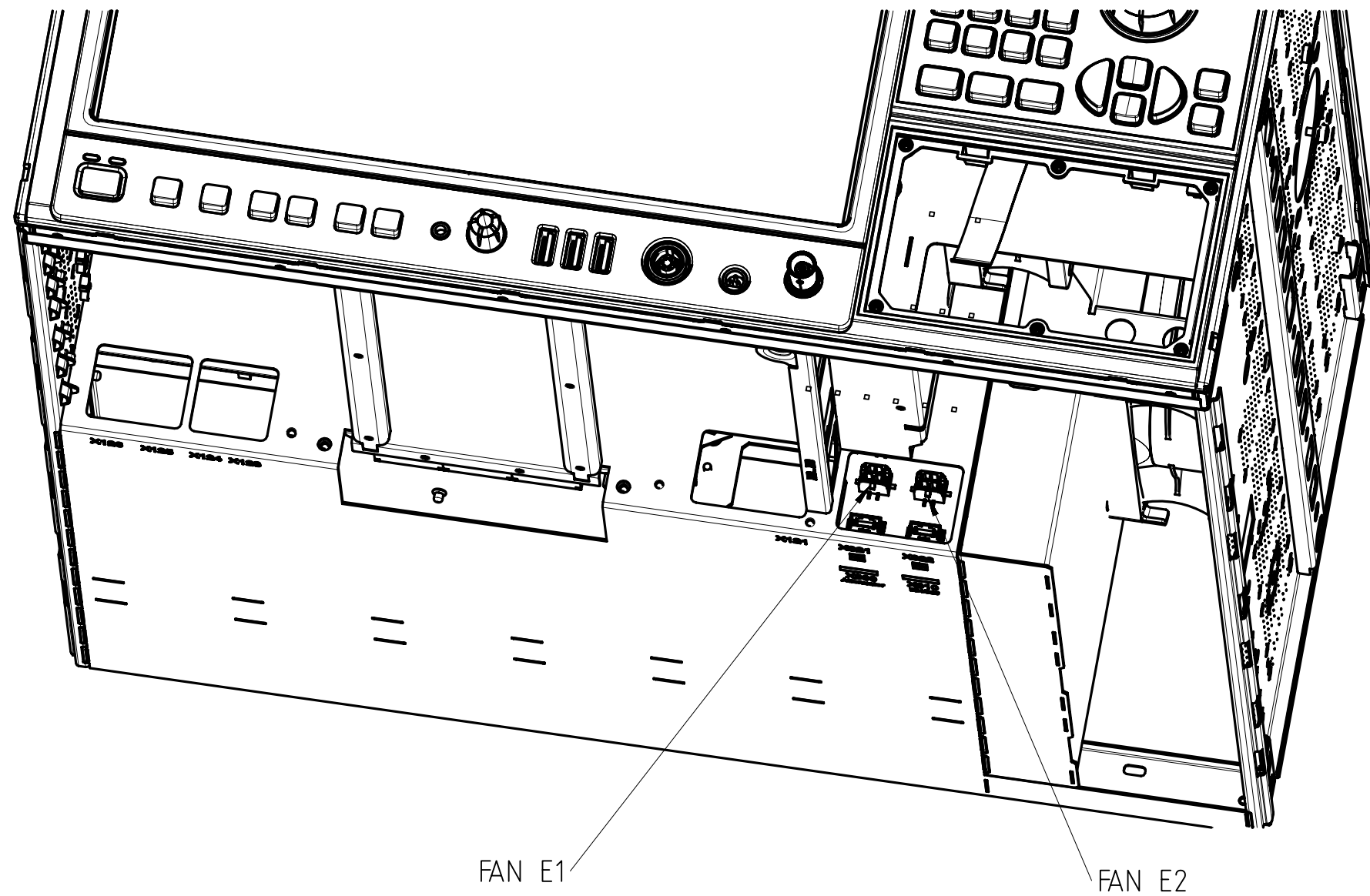
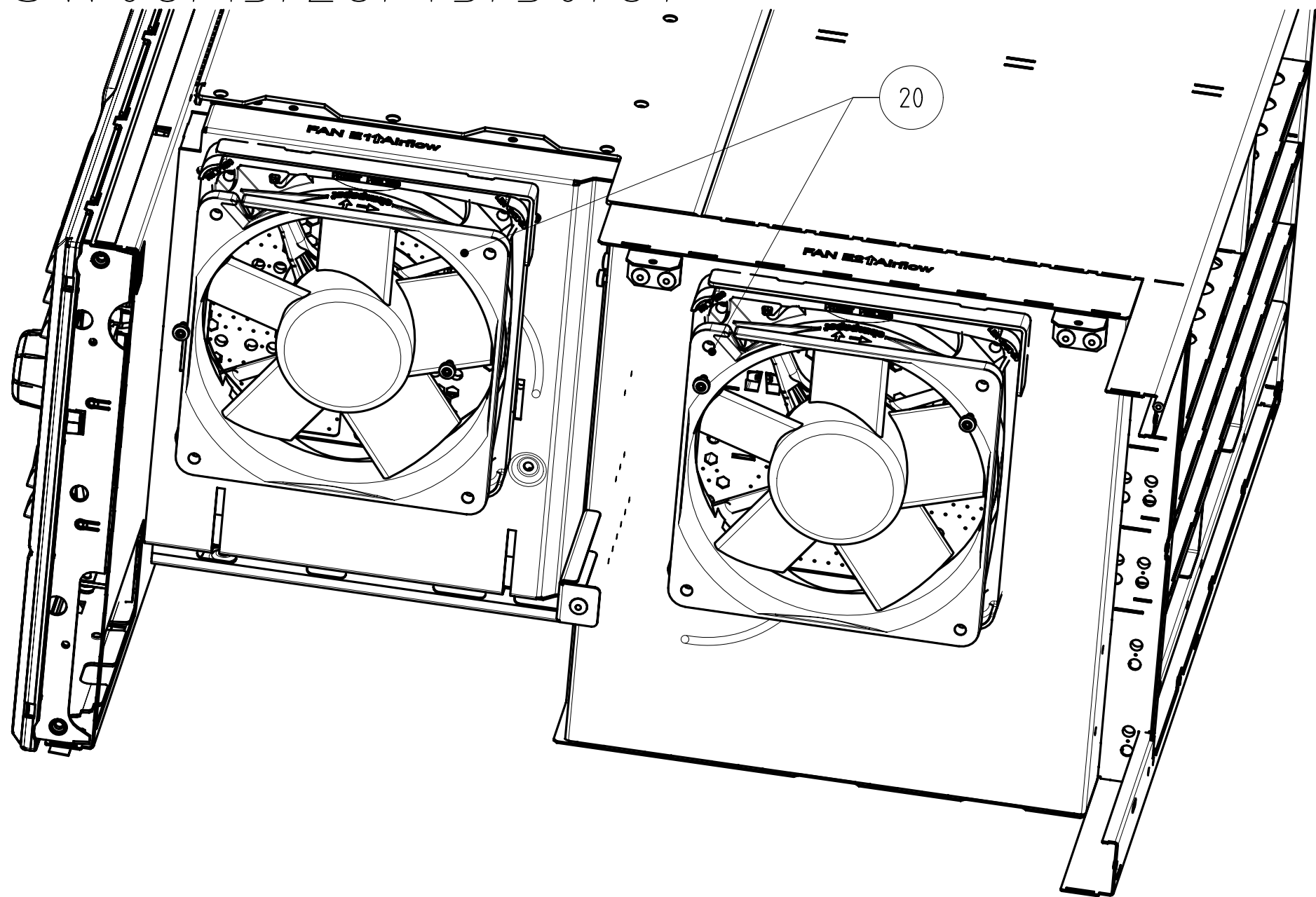


VAR 13 / 26 / 43 / 50 / 67
MOD 13 / 26 / 43 / 50 / 67

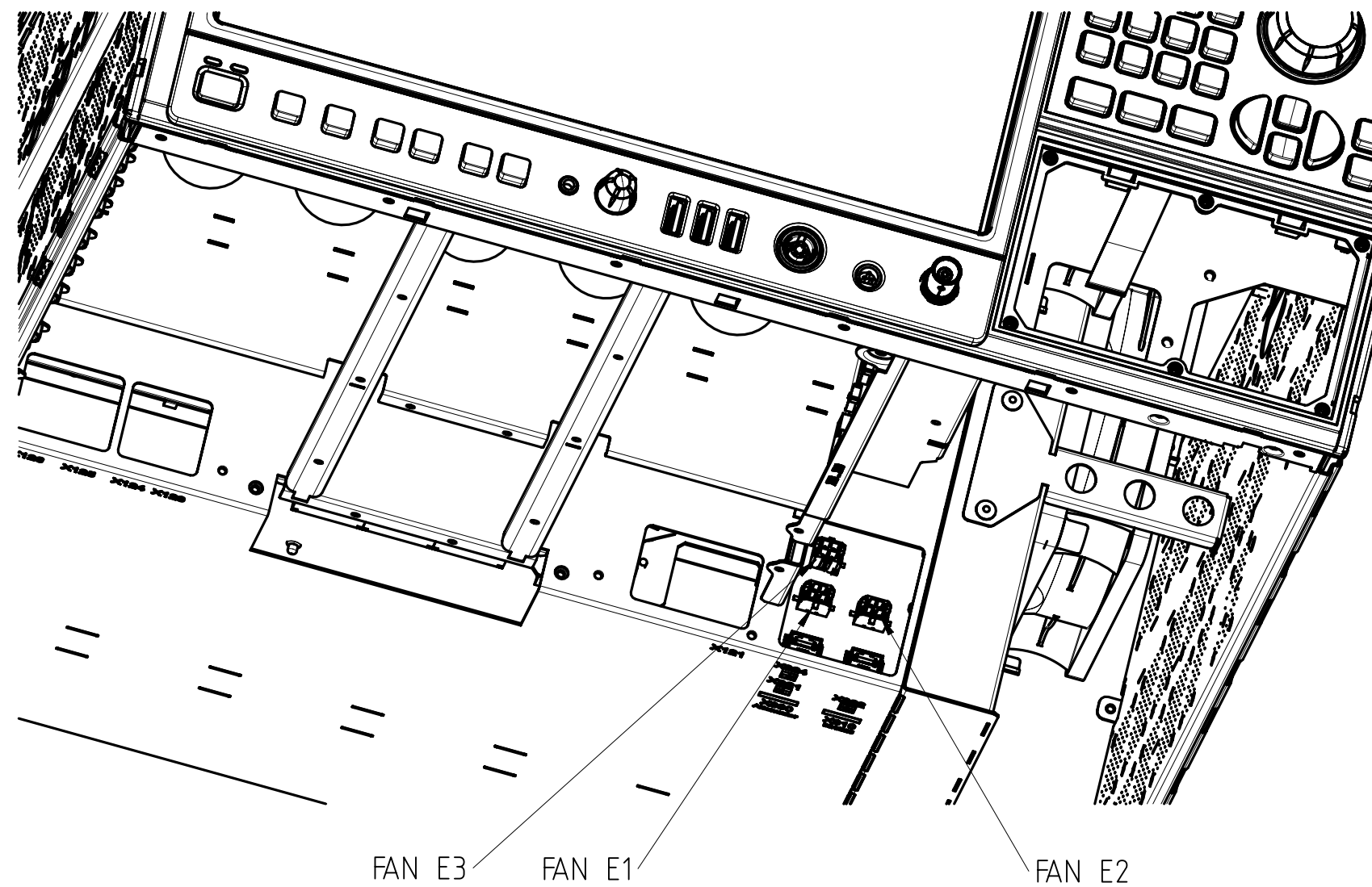
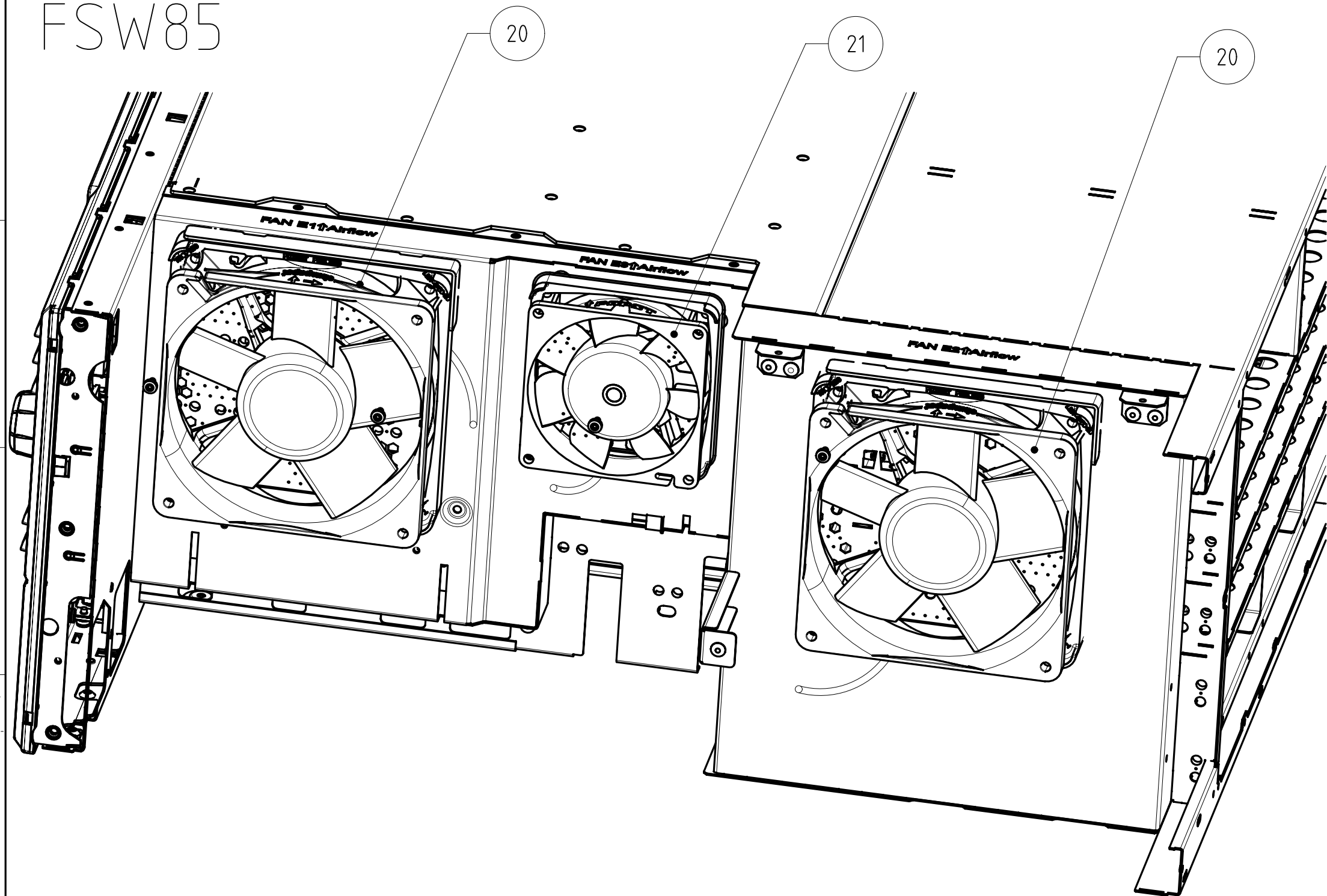
709

 FSW	Benennung/Designation FSW SIGNAL ANALYSER FSW SIGNAL ANALYSER			Sprach./Lang de en	Ä.1. / C.1 03.00	Blatt/Sheet 9
	Datum/ Date	2014-07-14	Abt. / Dept.	1ESK	Name / Name	AN/Bu
					Zeichn. Nr. / Drawing No. 1312.8000.01	
					D	

FSW08/13/26/43/50/67



FSW85



Einsteckposition an Steckerblech
siehe D 1312.8000.01 D 1 (Detail D)

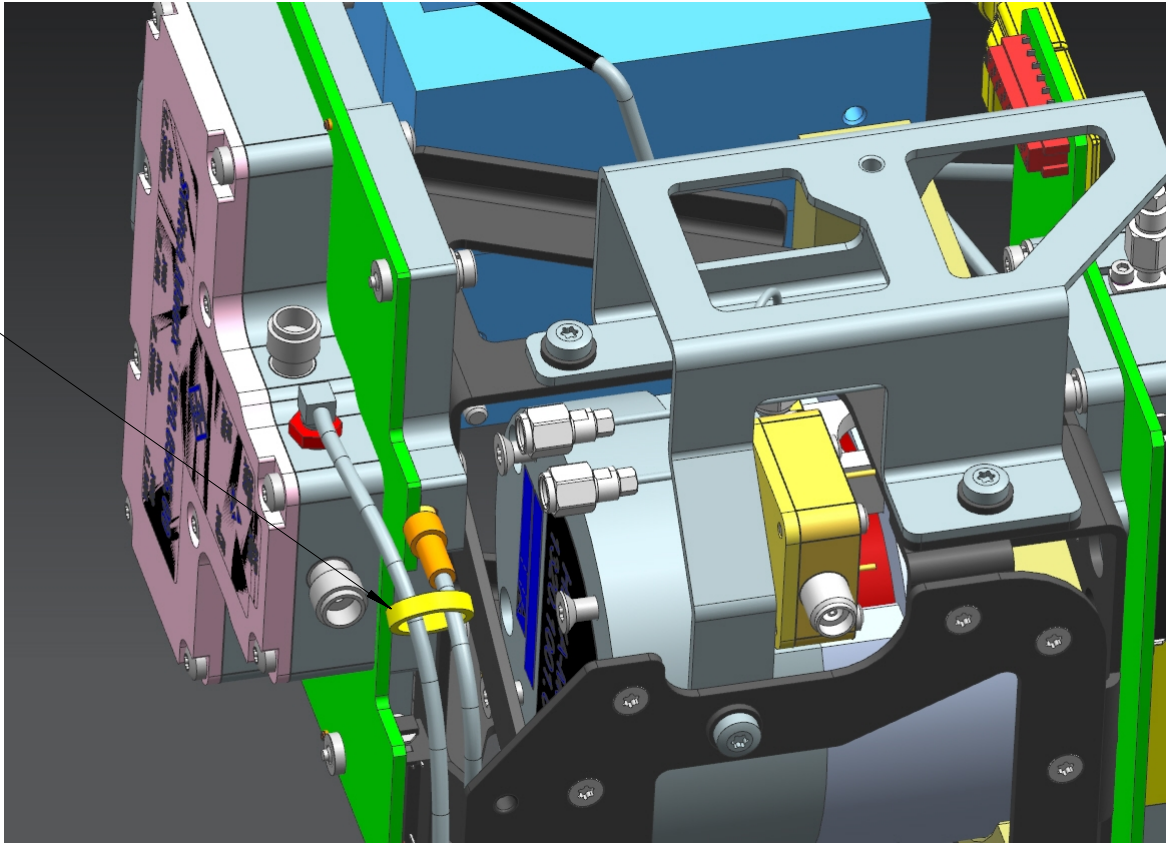
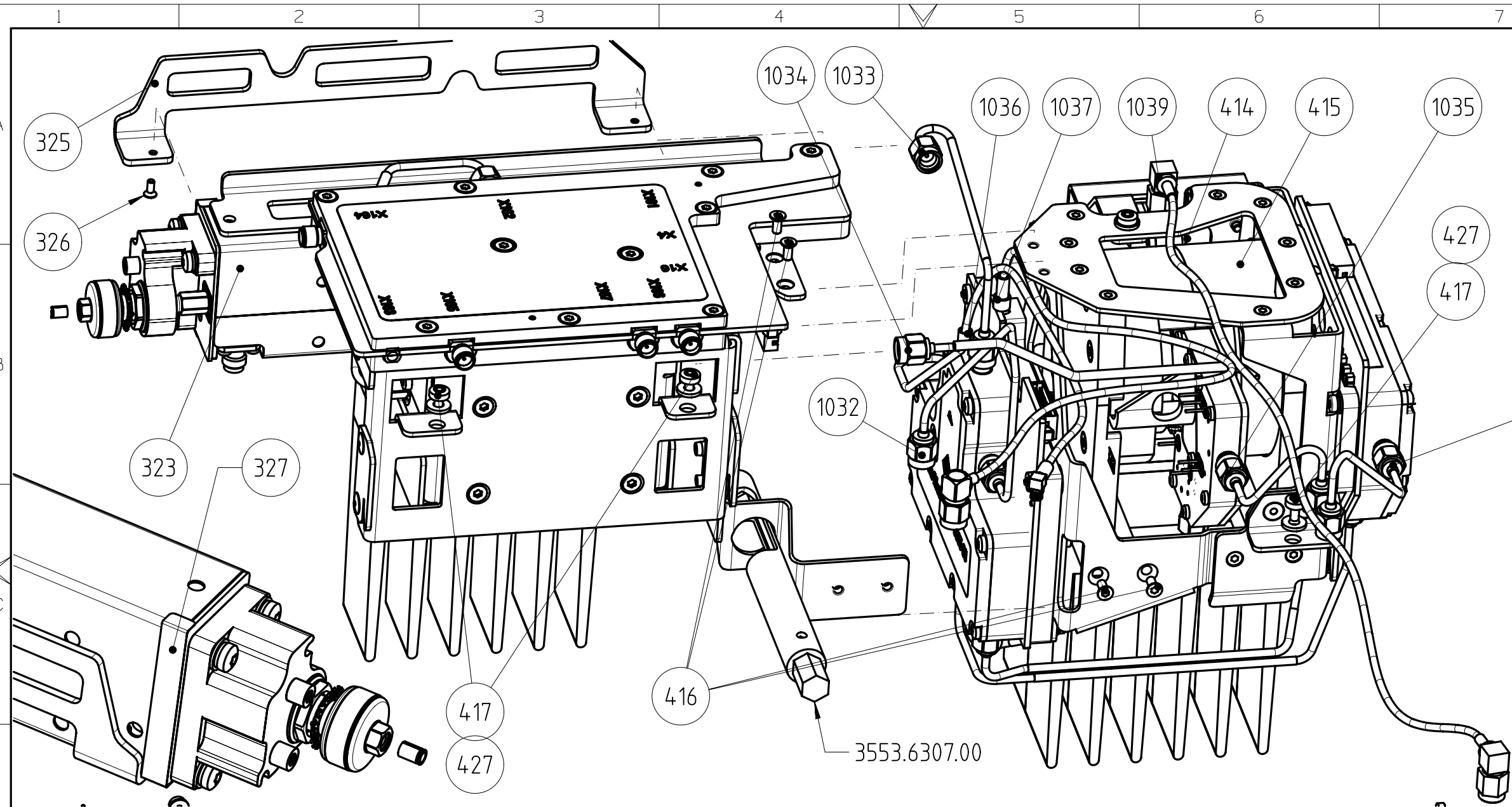
Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material		Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
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FSW	Datum Date	2015-03-09	Abteilung Dept.	1ESK	Name Name	AN/BU	Zeichn.Nr. / Drawing No. 1312.8000.01 D

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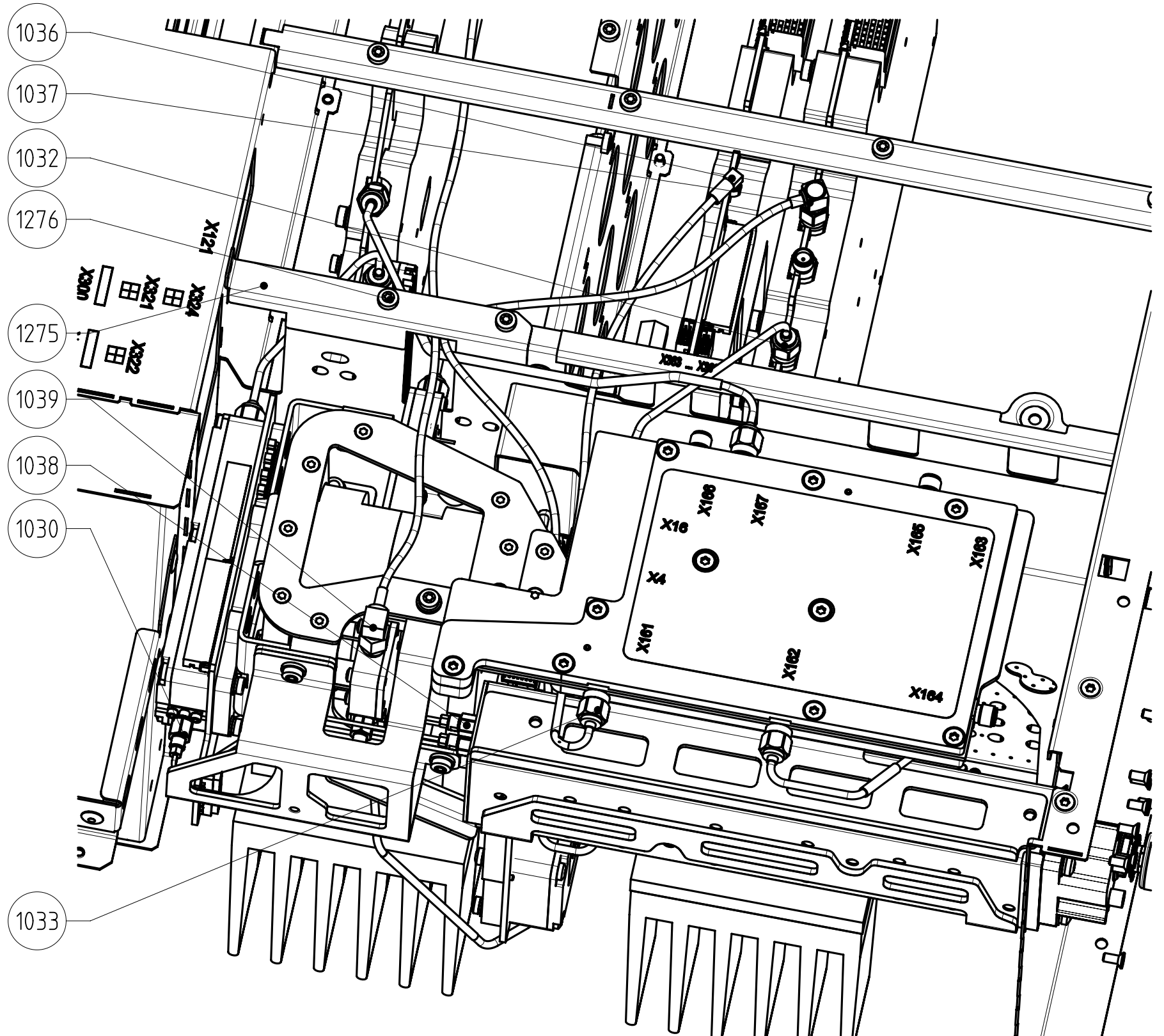
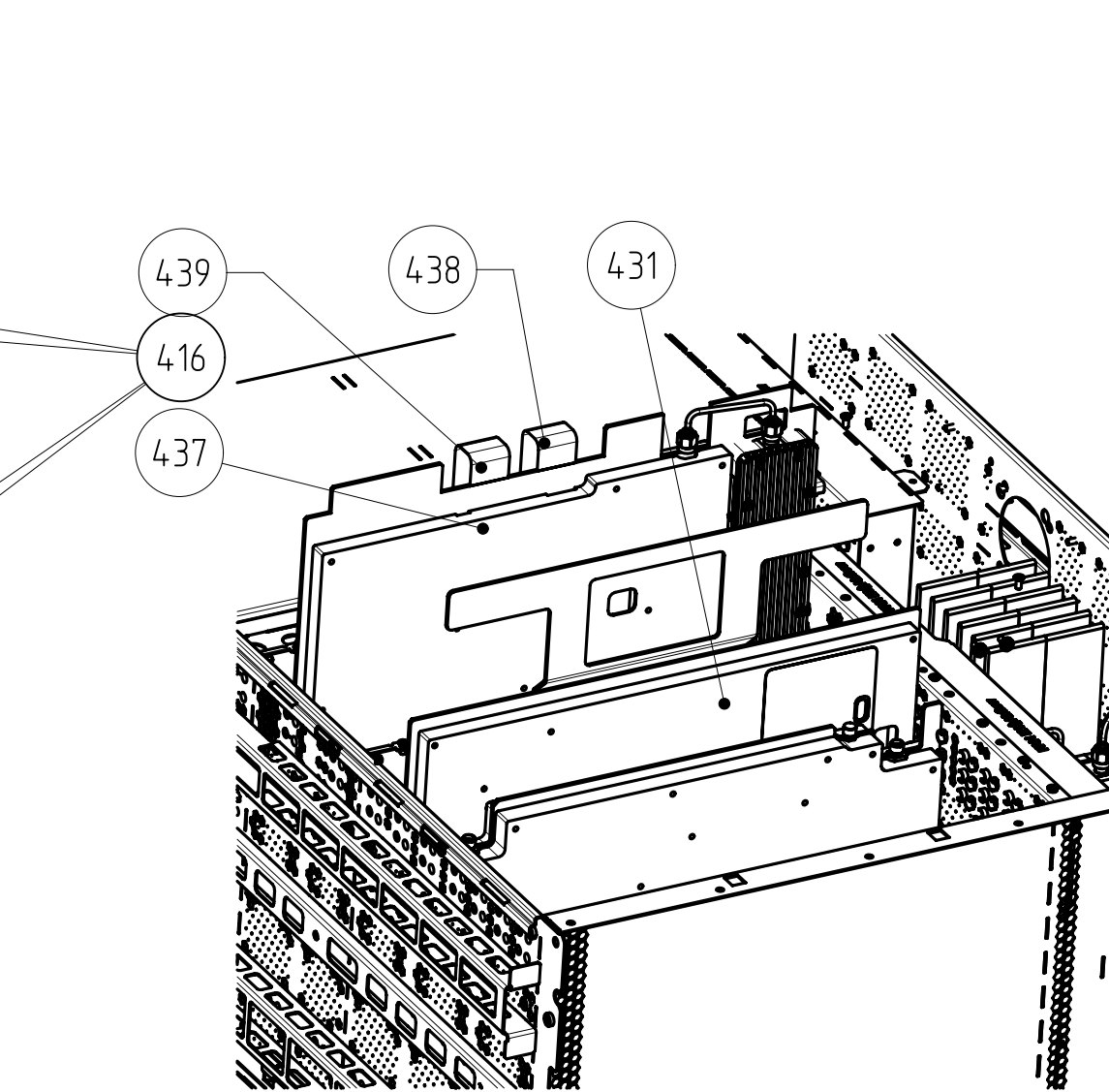
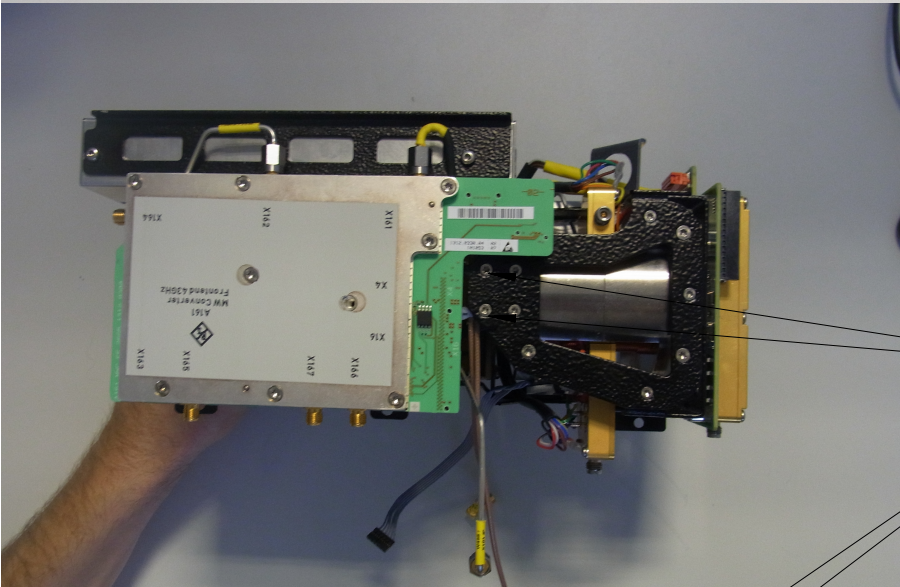
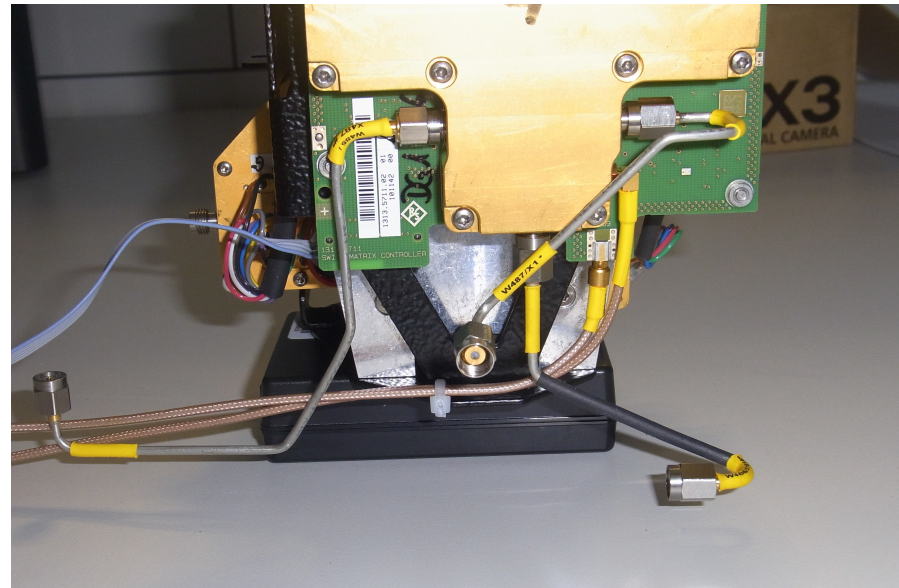
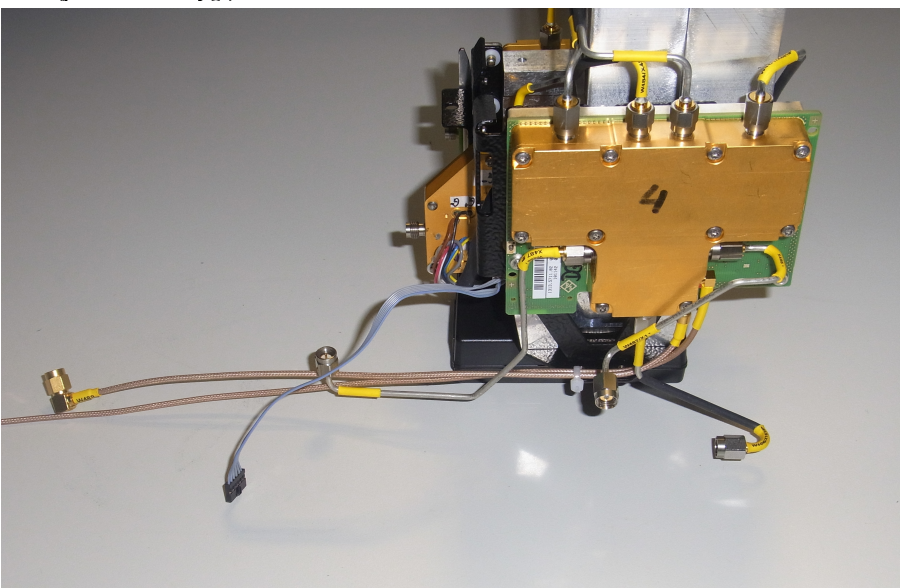
Maß Einheit
Measuring Unit
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Projektions-
methode
Projection
Method

A2



FSW85

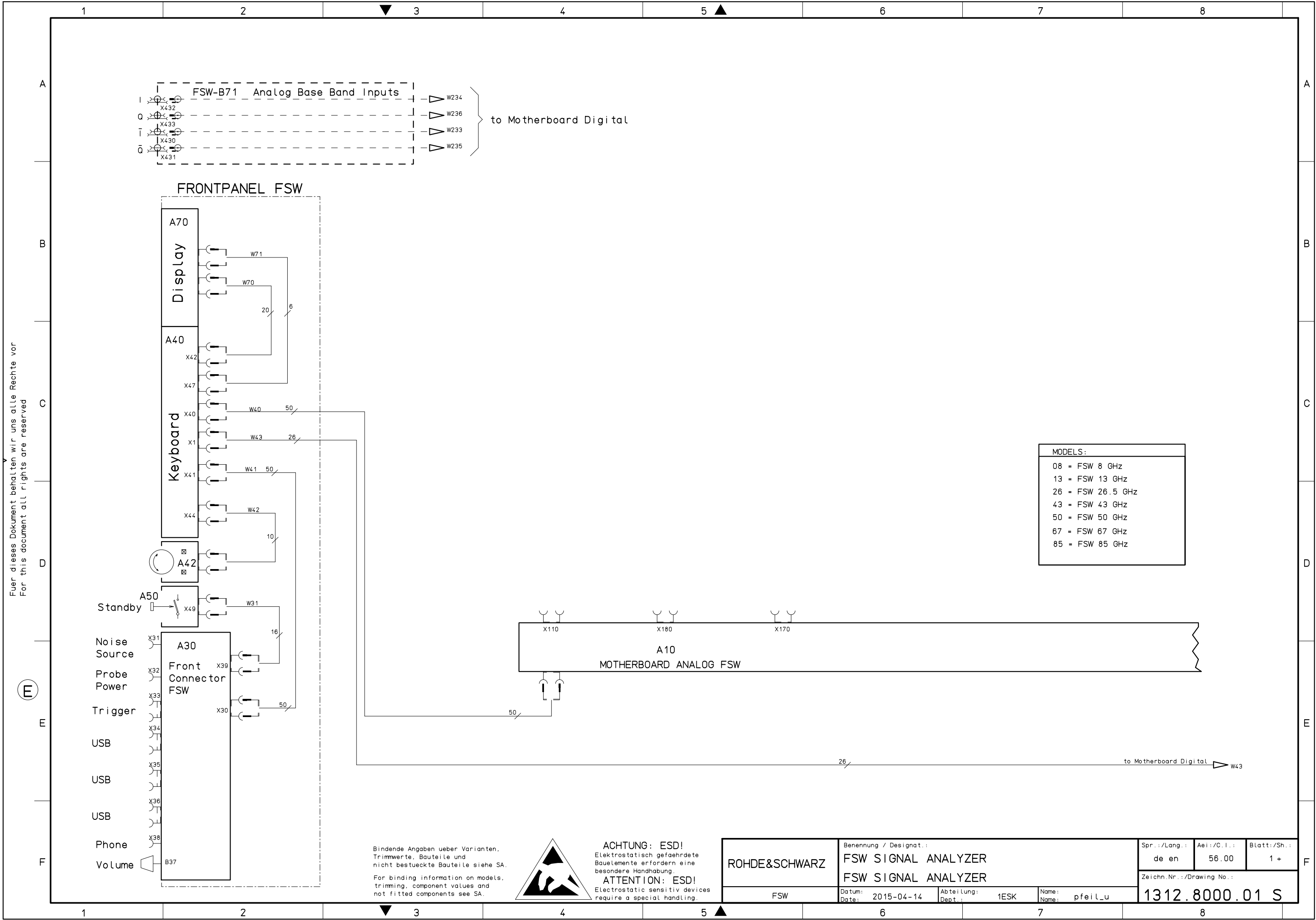


Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
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FSW	Datum Date	2015-05-26	Abteilung Dept.	1ESK	Name Name
				AN/bu	Zeichn.Nr. / Drawing No.
					1312.8000.01

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E

F



MODELS:	
08	= FSW 8 GHz
13	= FSW 13 GHz
26	= FSW 26.5 GHz
43	= FSW 43 GHz
50	= FSW 50 GHz
67	= FSW 67 GHz
85	= FSW 85 GHz

Bindende Angaben ueber Varianten,
Trimmwerte, Bauteile und
nicht bestueckte Bauteile siehe SA.
For binding information on models,
trimming, component values and
not fitted components see SA.

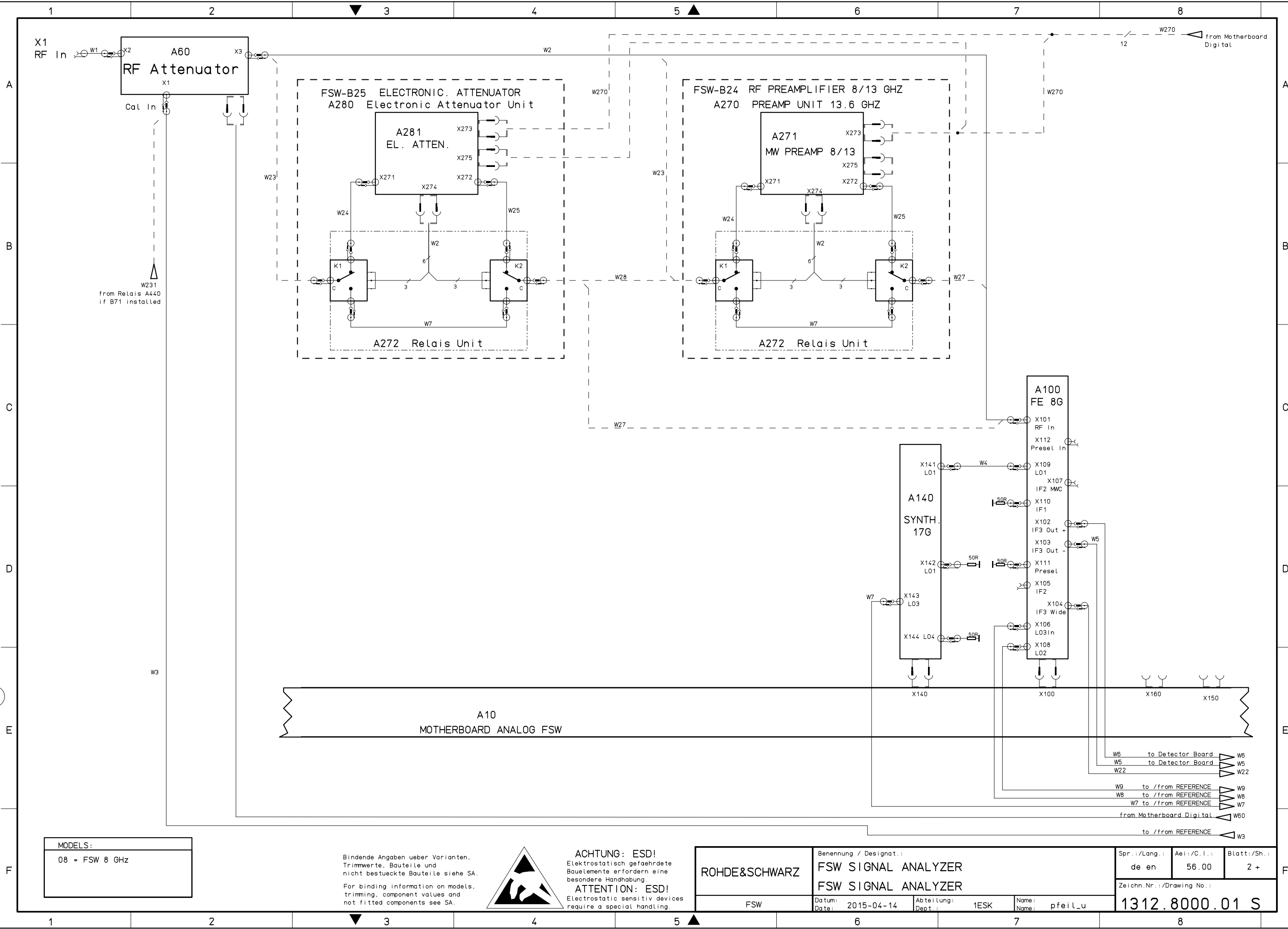


ACHTUNG: ESD!
Elektrostatisch gefaehrdete
Bauelemente erfordern eine
besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices
require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.: FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 56.00	Blatt:/Sh.: 1 +
	FSW	Datum: Date: 2015-04-14	Abteilung: Dept.: 1ESK	Name: Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S	

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E



MODELS:
08 = FSW 8 GHz

Bindende Angaben ueber Varianten,
Trimmwerte, Bauteile und
nicht bestueckte Bauteile siehe SA.

For binding information on models,
trimming, component values and
not fitted components see SA.



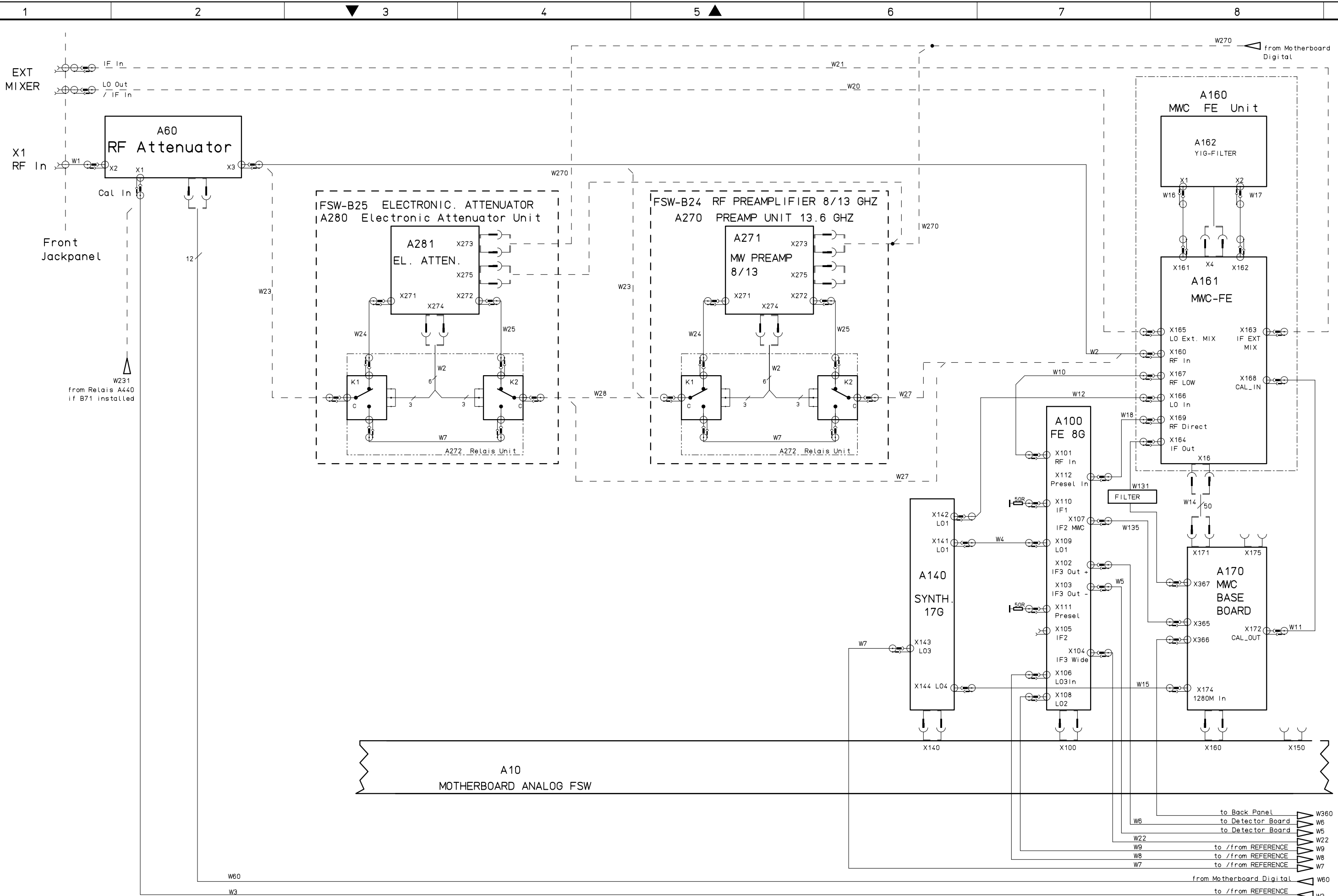
ACHTUNG: ESD!
Elektrostatisch gefaehrdete
Bauelemente erfordern eine
besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices
require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.:			Spr.:/Lang.:	Aei:/C.I.:	Blatt:/Sh.:
	FSW SIGNAL ANALYZER			de en	56.00	2 +
FSW			Datum: Date: 2015-04-14	Abteilung: Dept.: 1ESK	Name: Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S

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E

F



MODELS:

13 = FSW 13 GHZ
26 = FSW 26.5 GHZ

Bindende Angaben ueber Varianten,
Trimmwerte, Bauteile und
nicht bestueckte Bauteile siehe SA.
For binding information on models,
trimming, component values and
not fitted components see SA.



ACHTUNG: ESD!
Elektrostatisch gefaehrdete
Bauelemente erfordern eine
besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices
require a special handling.

ROHDE&SCHWARZ

FSW

Benennung / Designat.:

FSW SIGNAL ANALYZER
FSW SIGNAL ANALYZER

Datum:
Date: 2015-04-14

Abteilung:
Dept.: 1ESK

Name:
Name: pfeil_u

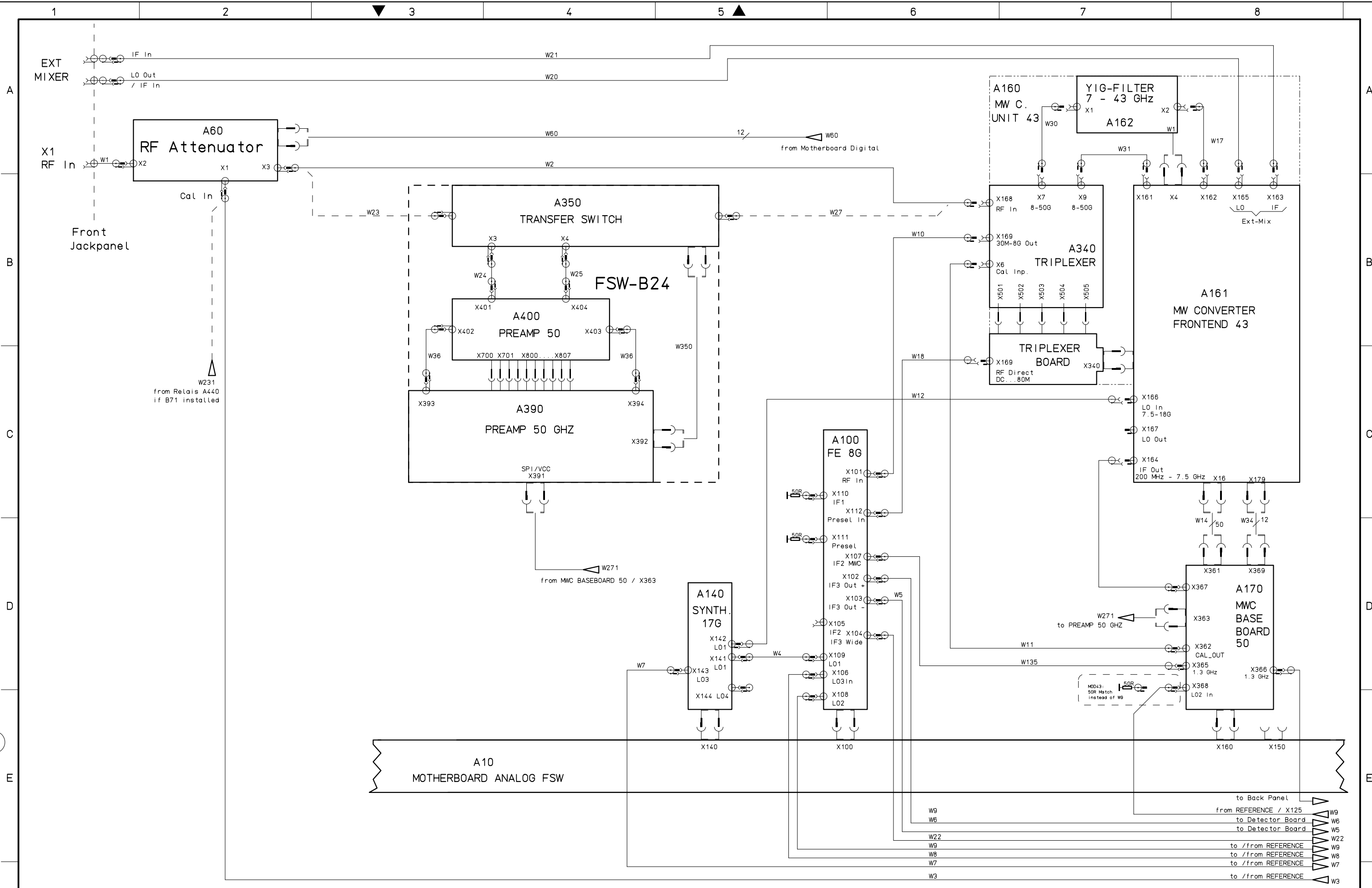
Spr.:/Lang.: Aei:/C.I.: Blatt:/Sh.:

de en 56.00 3 +

Zeichn.Nr.:/Drawing No.:

1312.8000.01 S

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MODELS:	
43	= FSW 43 GHz
50	= FSW 50 GHz

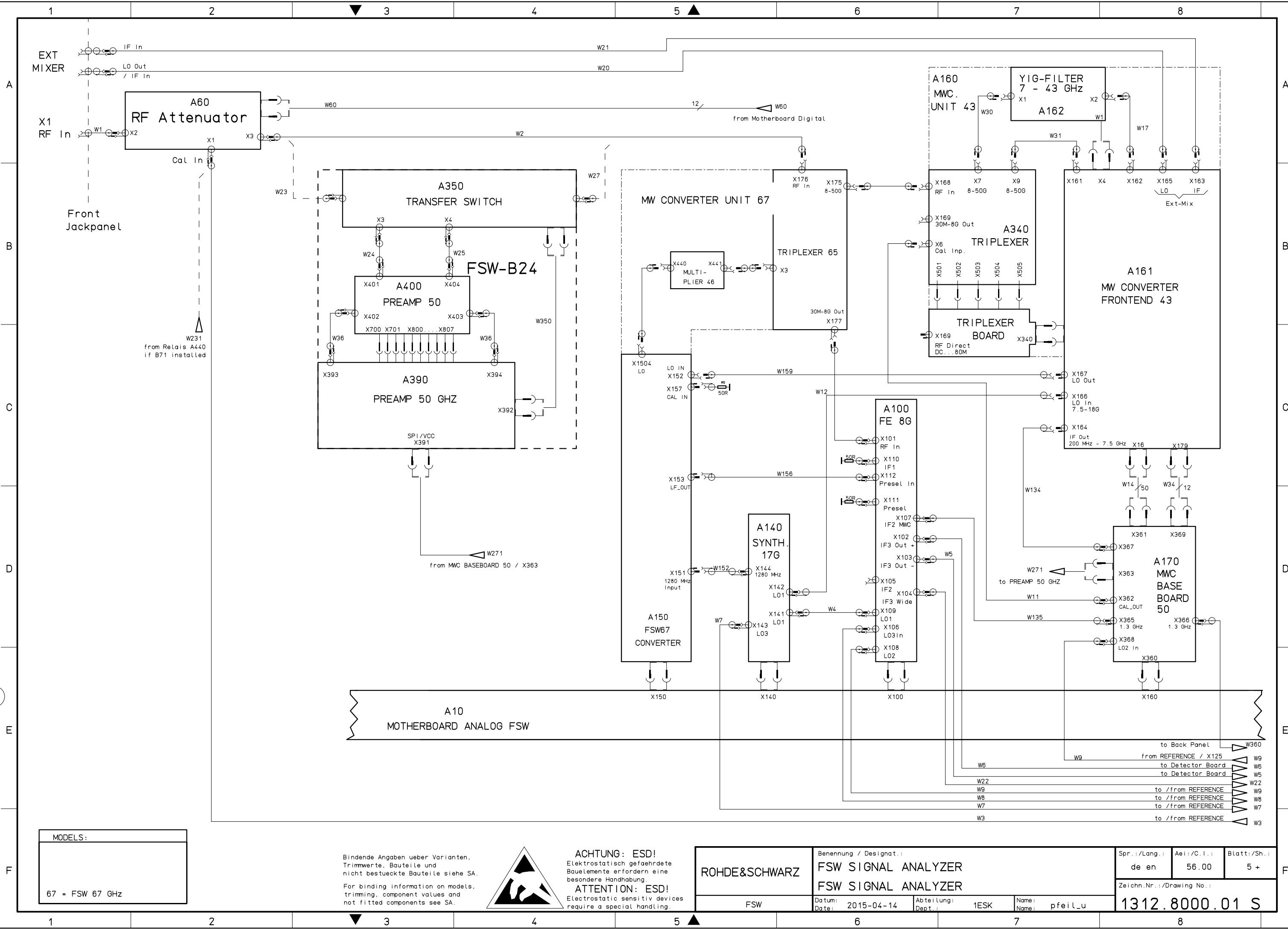
Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.
For binding information on models, trimming, component values and not fitted components see SA.



ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.: FSW SIGNAL ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 56.00	Blatt:/Sh.: 4 +
	FSW			Zeichn.Nr.:/Drawing No.: 1312.8000.01 S		
Datum: Date: 2015-04-14		Abteilung: Dept.: 1ESK	Name: Name: pfeil_u			

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MODELS:
67 = FSW 67 GHz

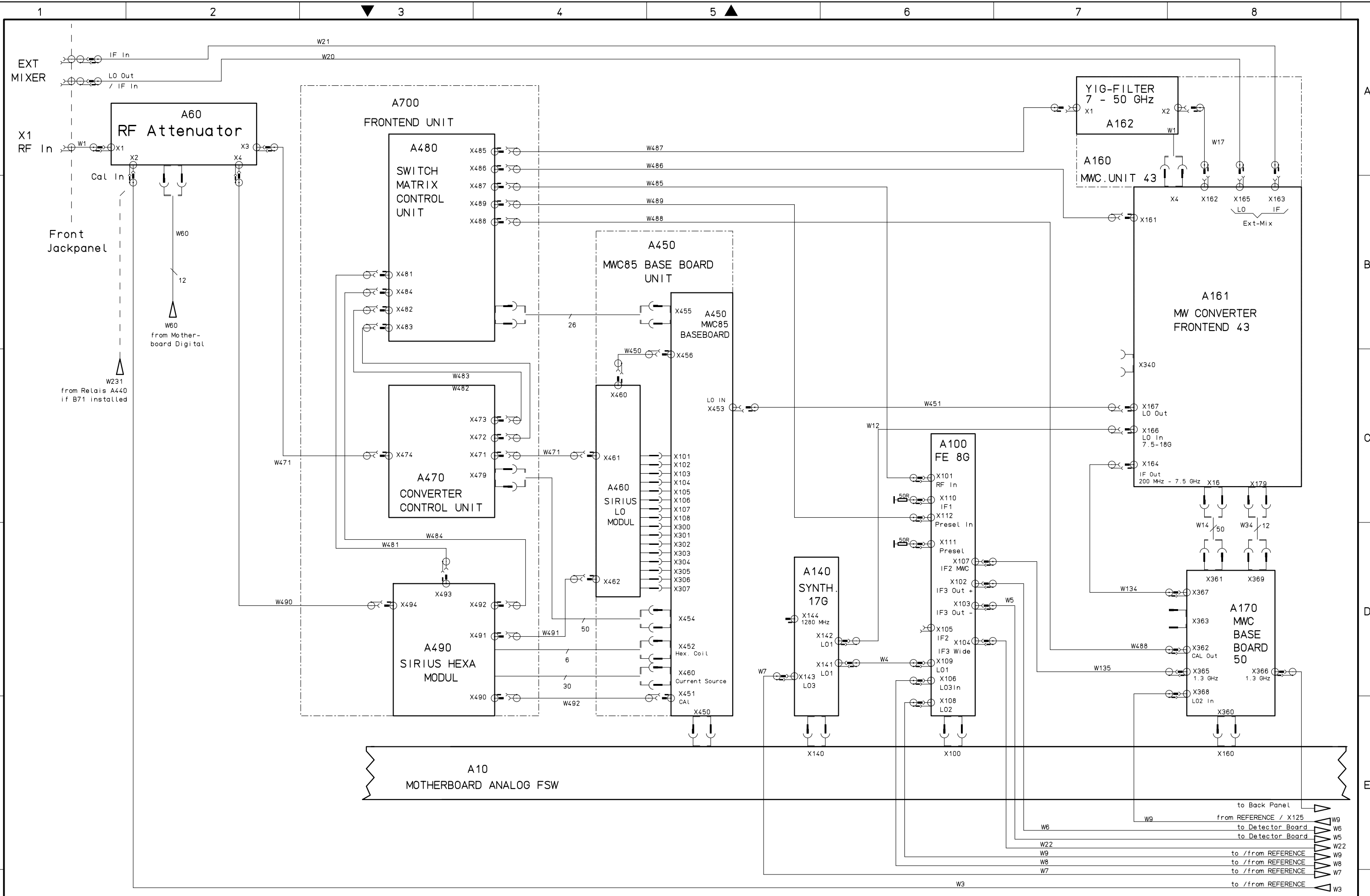
Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.
For binding information on models, trimming, component values and not fitted components see SA.



ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ	Benennung / Designat.: FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER			Spr.:/Lang.: de en	Aei:/C.I.: 56.00	Blatt:/Sh.: 5 +
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MODELS:
85 = FSW 85 GHz

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.
For binding information on models, trimming, component values and not fitted components see SA.



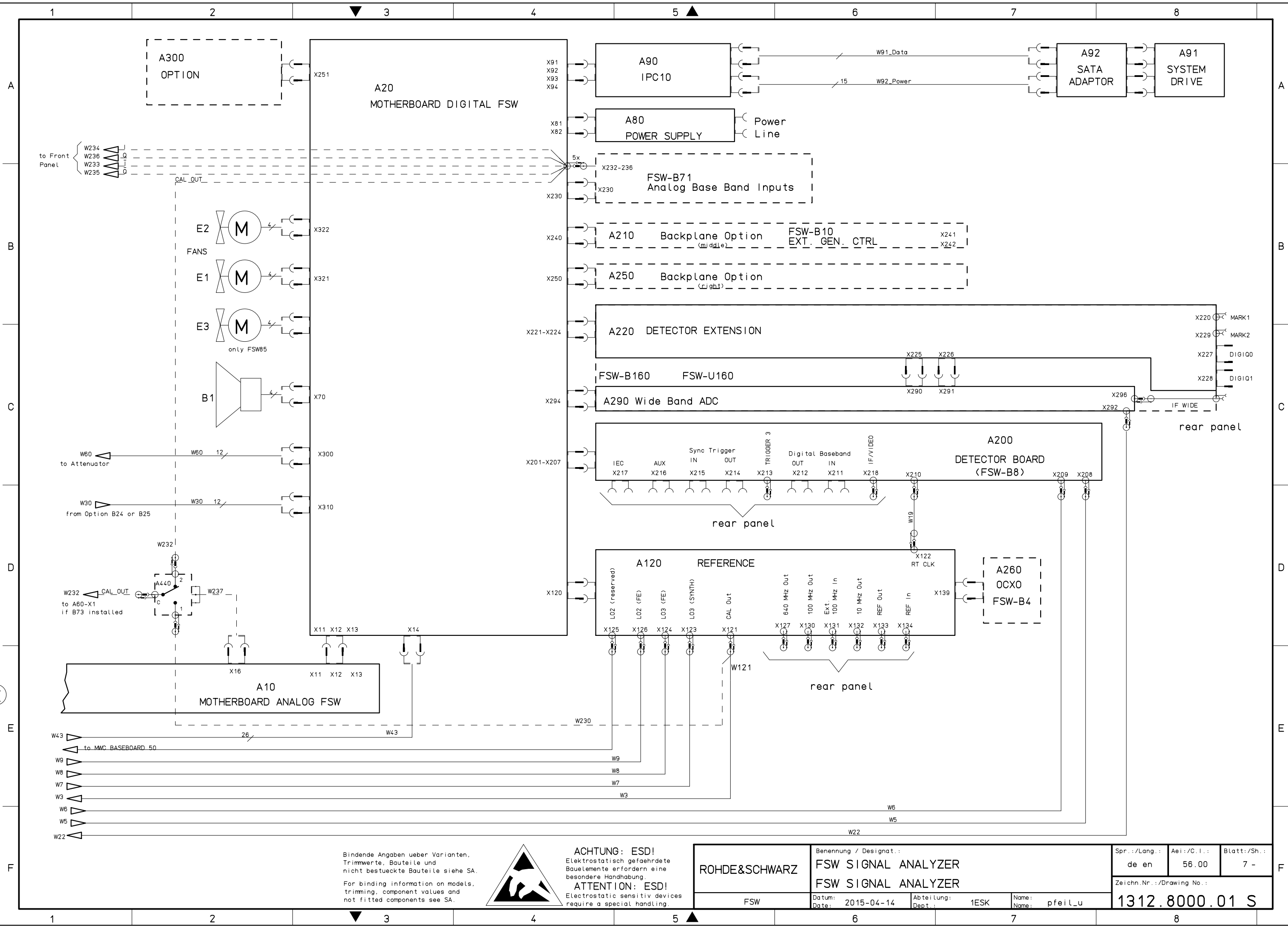
ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

ROHDE&SCHWARZ
FSW

Benennung / Designat.:
FSW SIGNAL ANALYZER
FSW SIGNAL ANALYZER
Datum: 2015-04-14
Abteilung: 1ESK
Name: pfeil_u

Spr.:/Lang.: de en
Aei:/C.I.: 56.00
Blatt:/Sh.: 6 +
Zeichn.Nr.:/Drawing No.: 1312.8000.01 S

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Bindende Angaben ueber Varianten,
Trimmwerte, Bauteile und
nicht bestueckte Bauteile siehe SA.
For binding information on models,
trimming, component values and
not fitted components see SA.



ACHTUNG: ESD!
Elektrostatisch gefaehrdete
Bauelemente erfordern eine
besondere Handhabung.
ATTENTION: ESD!
Electrostatic sensitiv devices
require a special handling.

ROHDE&SCHWARZ

FSW

Benennung / Designat.:

FSW SIGNAL ANALYZER
FSW SIGNAL ANALYZER

Datum:
Date: 2015-04-14

Abteilung:
Dept.: 1ESK

Name:
Name: pfeil_u

Spr.:/Lang.: de en

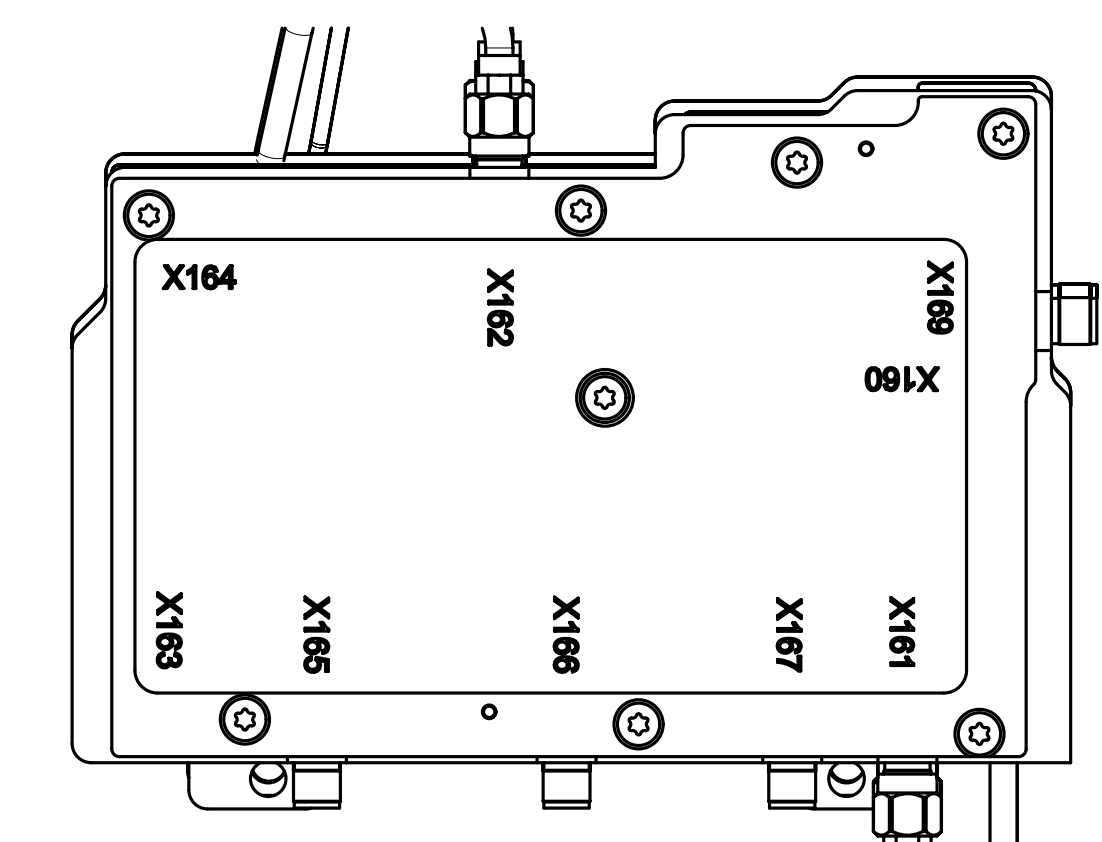
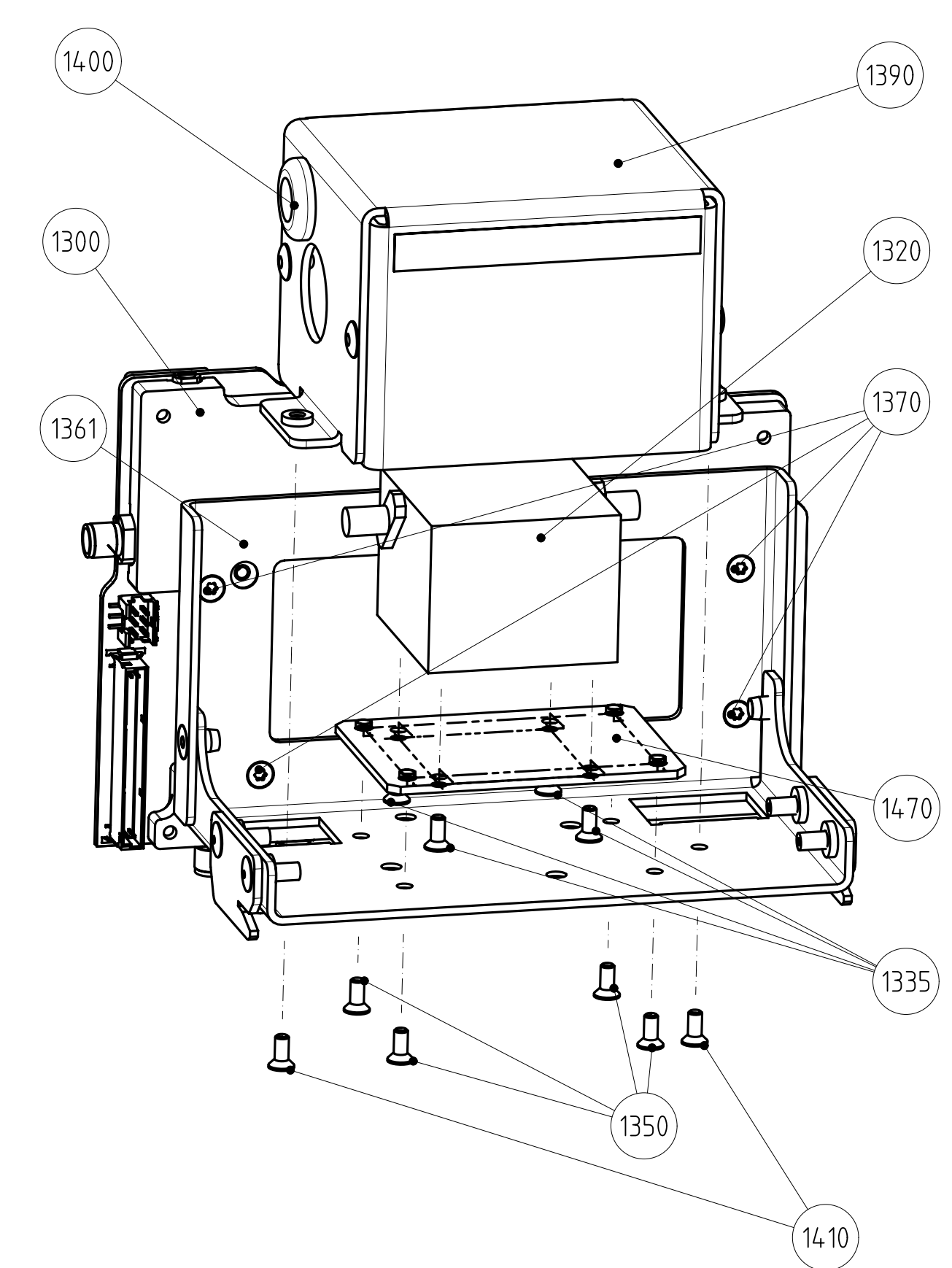
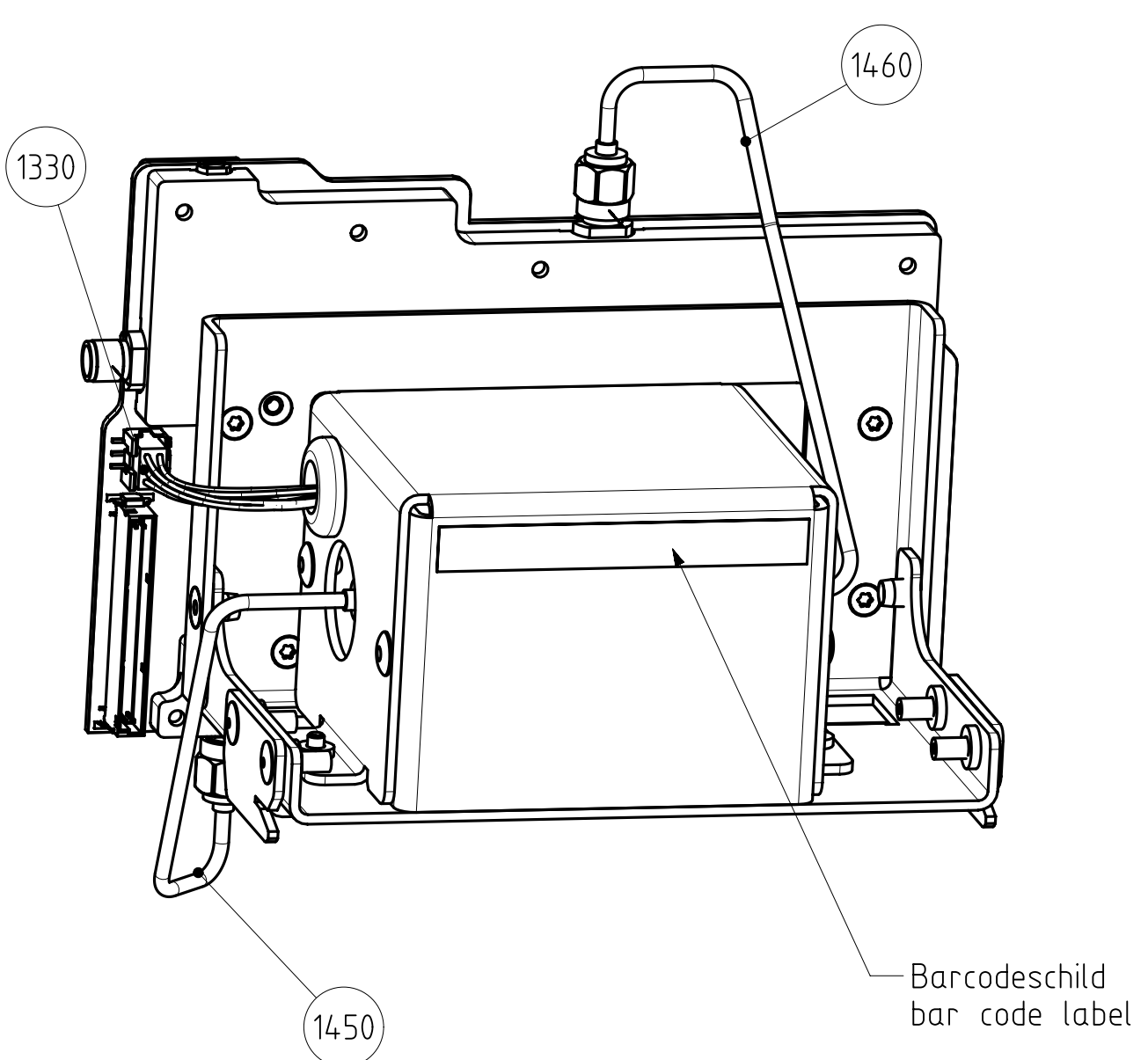
Aei:/C.I.: 56.00

Blatt:/Sh.: 7 -

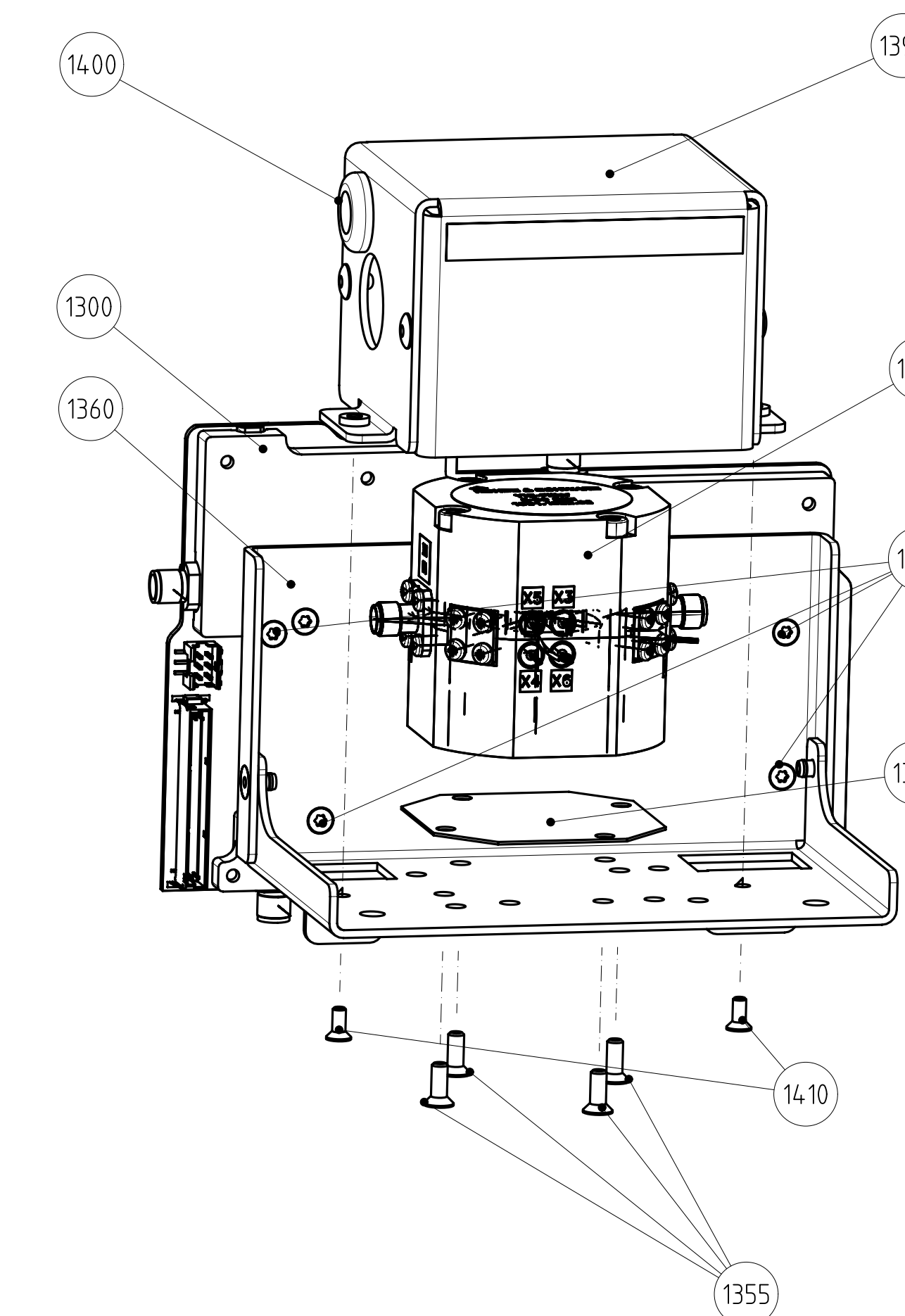
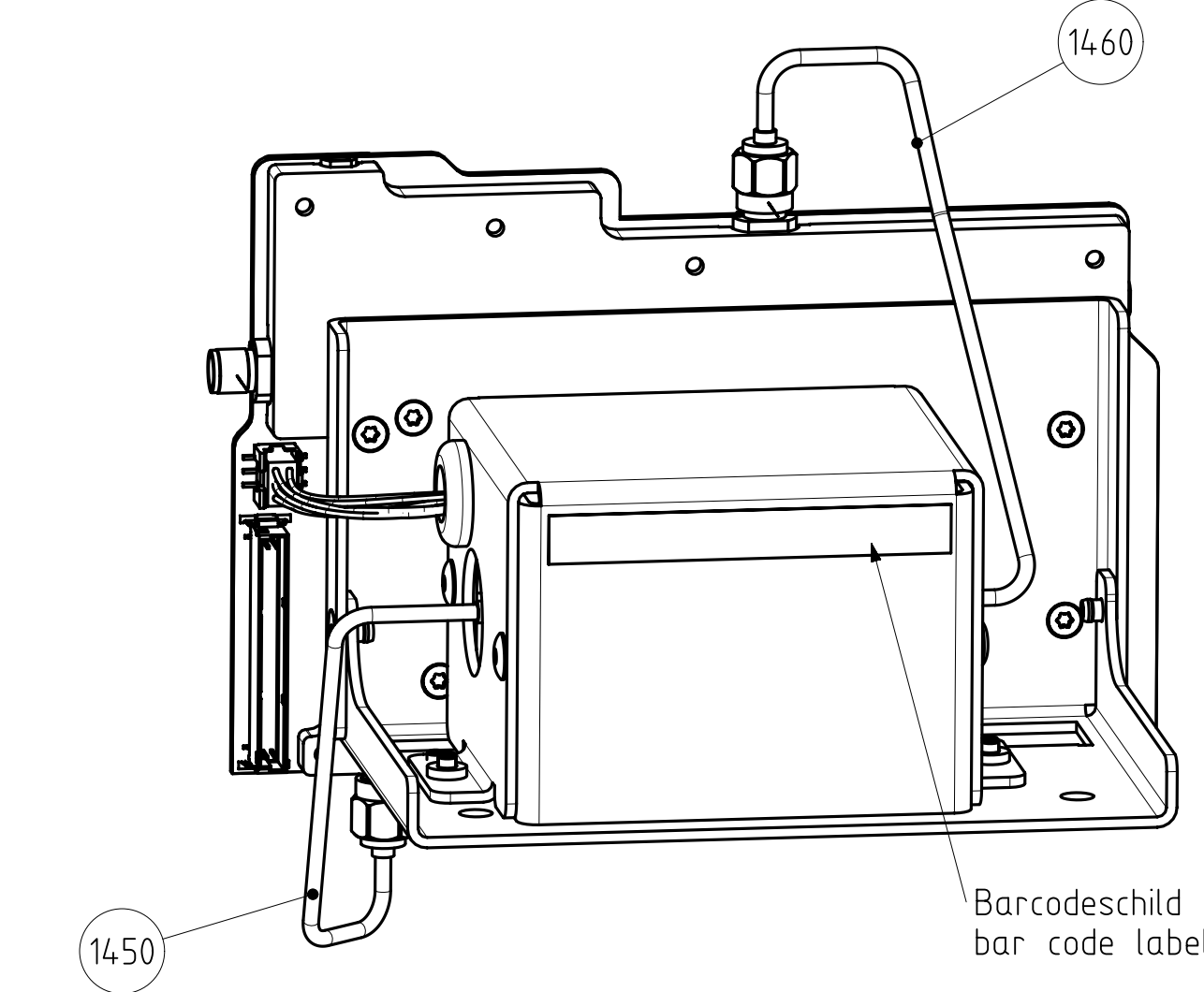
Zeichn.Nr./Drawing No.:

1312.8000.01 S

VAR12 (13,6GHz + neuer Rahmen)



VAR13 (13,6GHz + altem Rahmen)



- Kabel

W1

1 sw

2 rt

3 sw

4 rt

5 bl

6 ws

YIG-Filter

Filtronic

E2 GND

E1 +

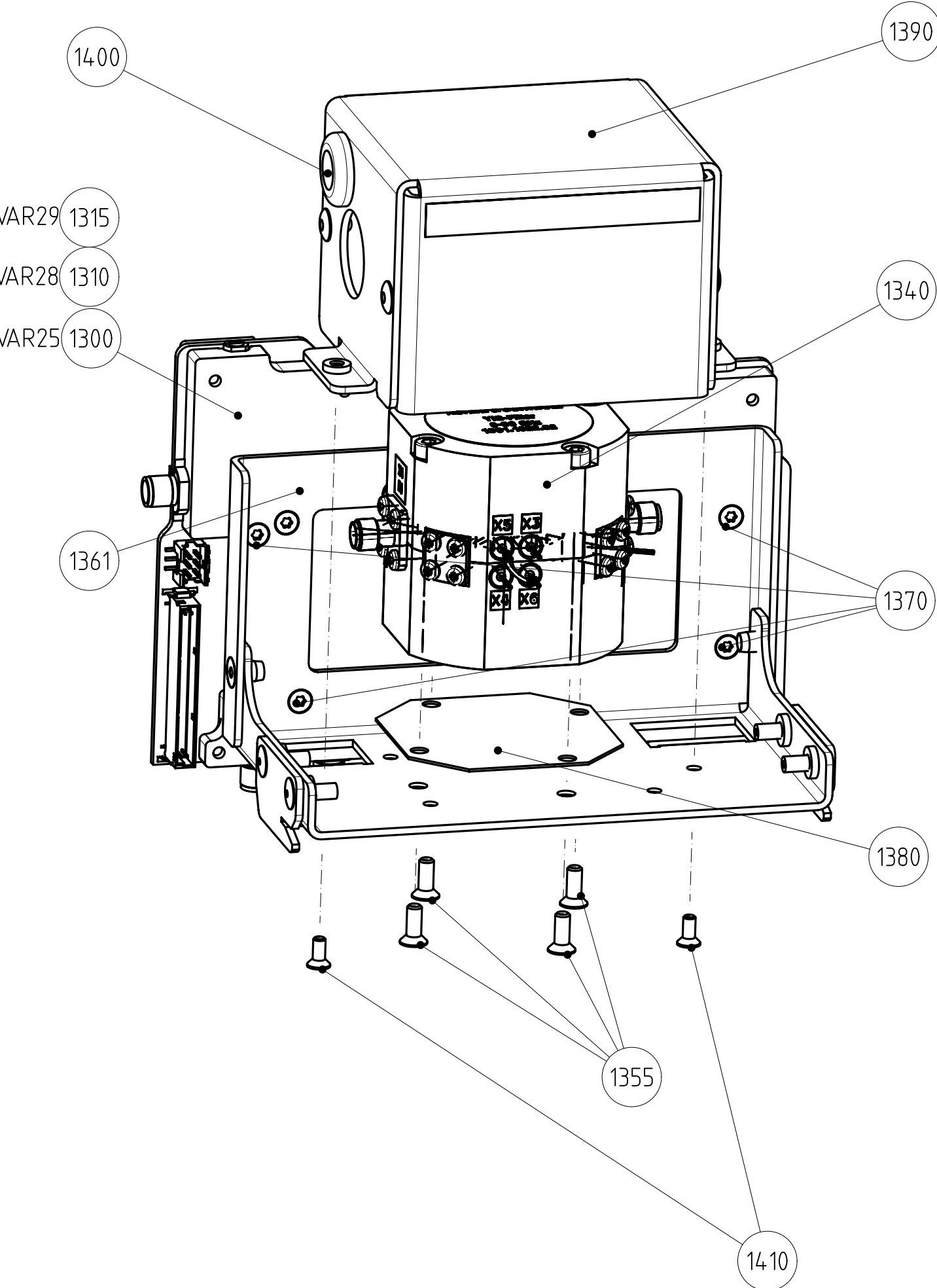
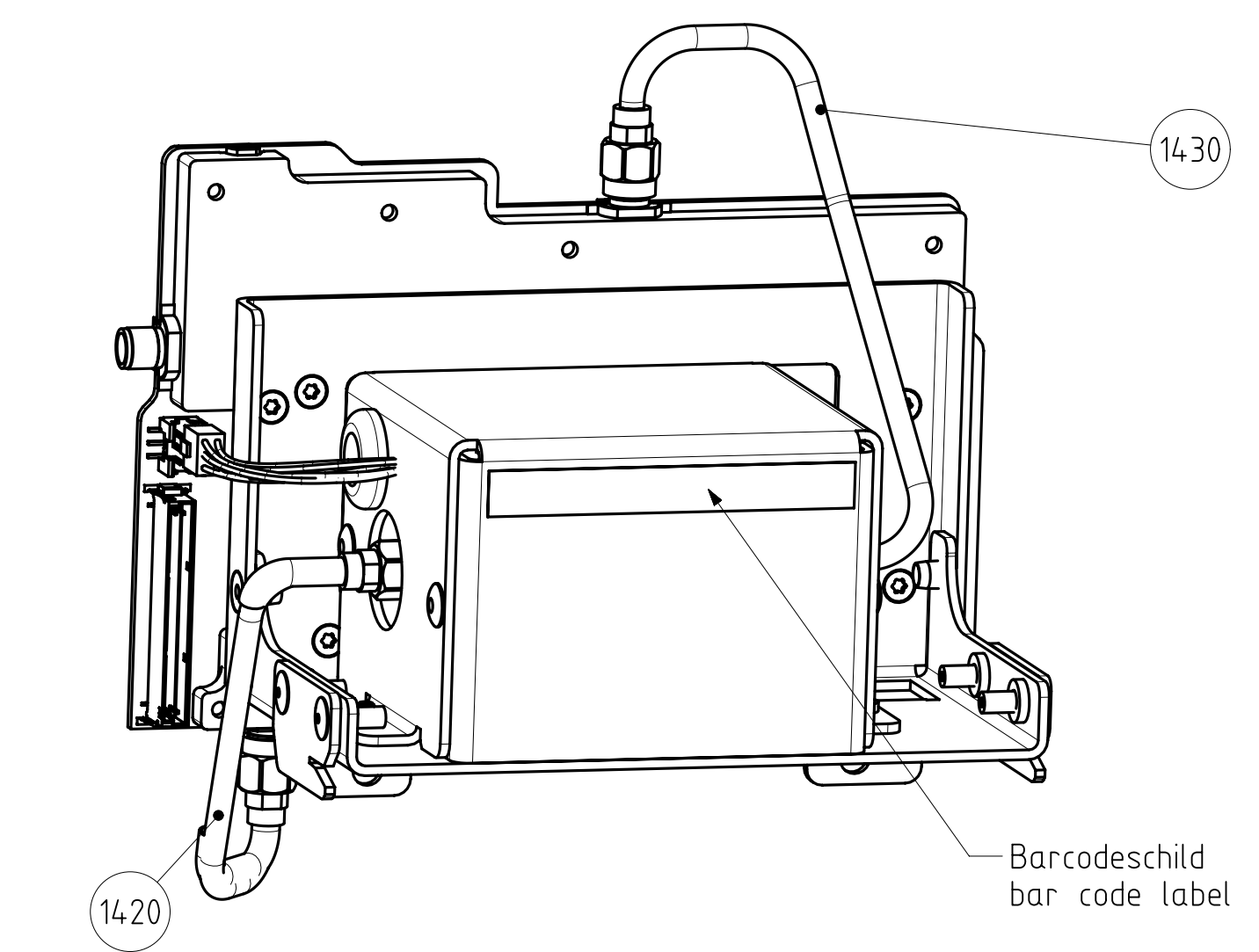
E2 GND

E1 +

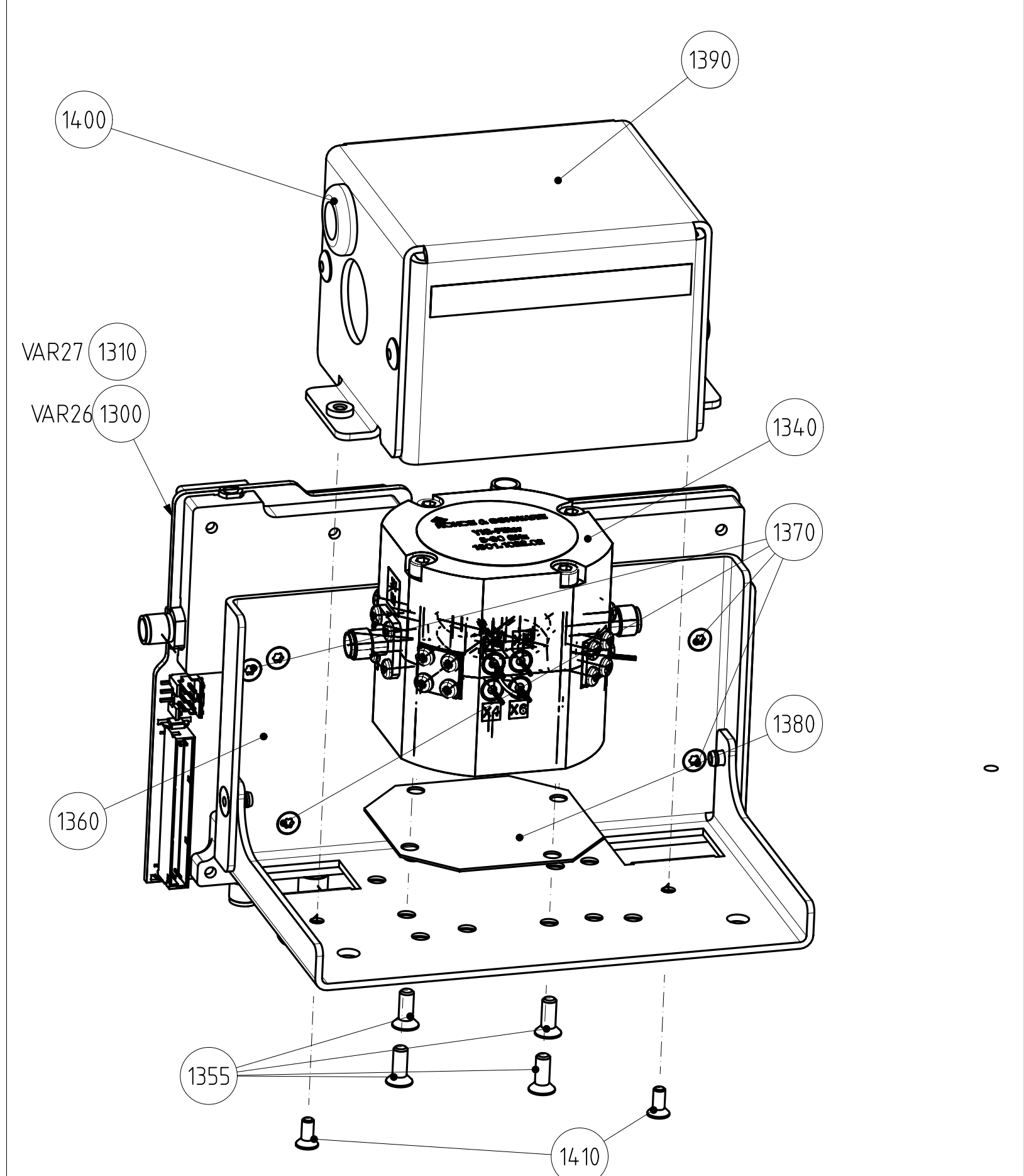
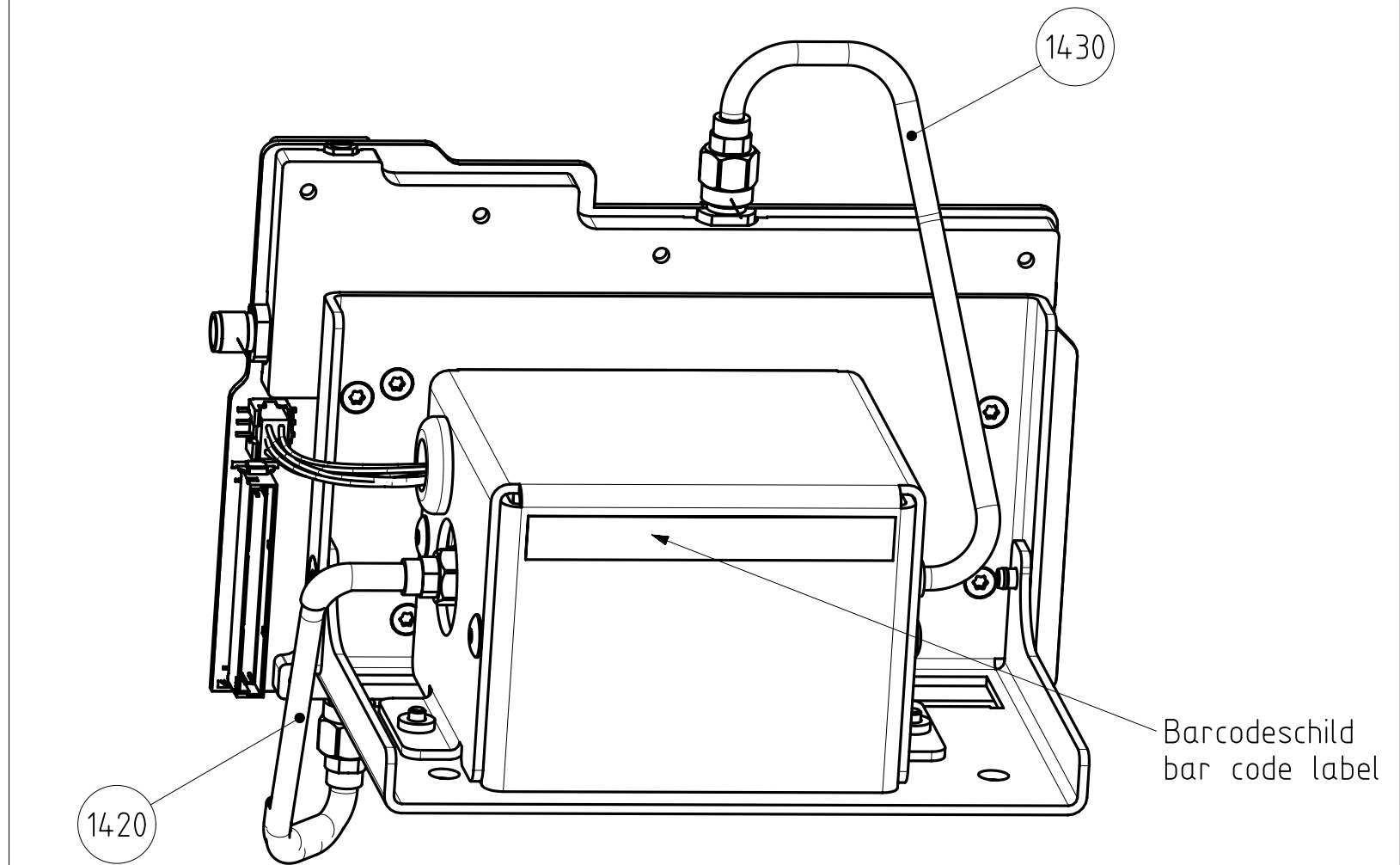
E3 HEATEN

E4 HEATEN

VAR25/28/29 (26,5GHz + neuem Rahmen) (26,5GHz+ext. Mix.+neuer Rahmen)



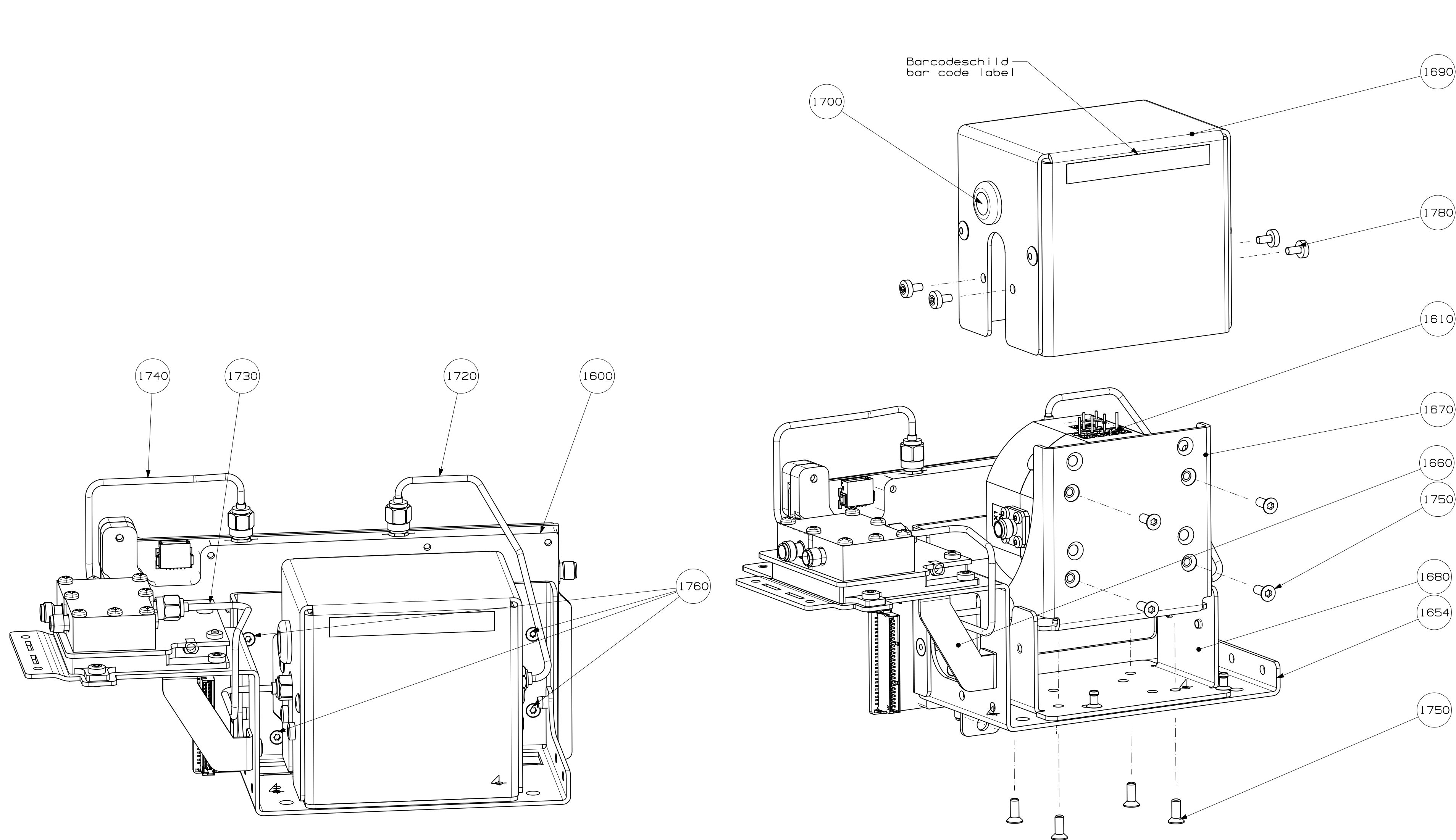
VAR26/27 (26.5GHz + altem Rahmen) (26.5GHz+ext. Mix.+altem Rahmen)



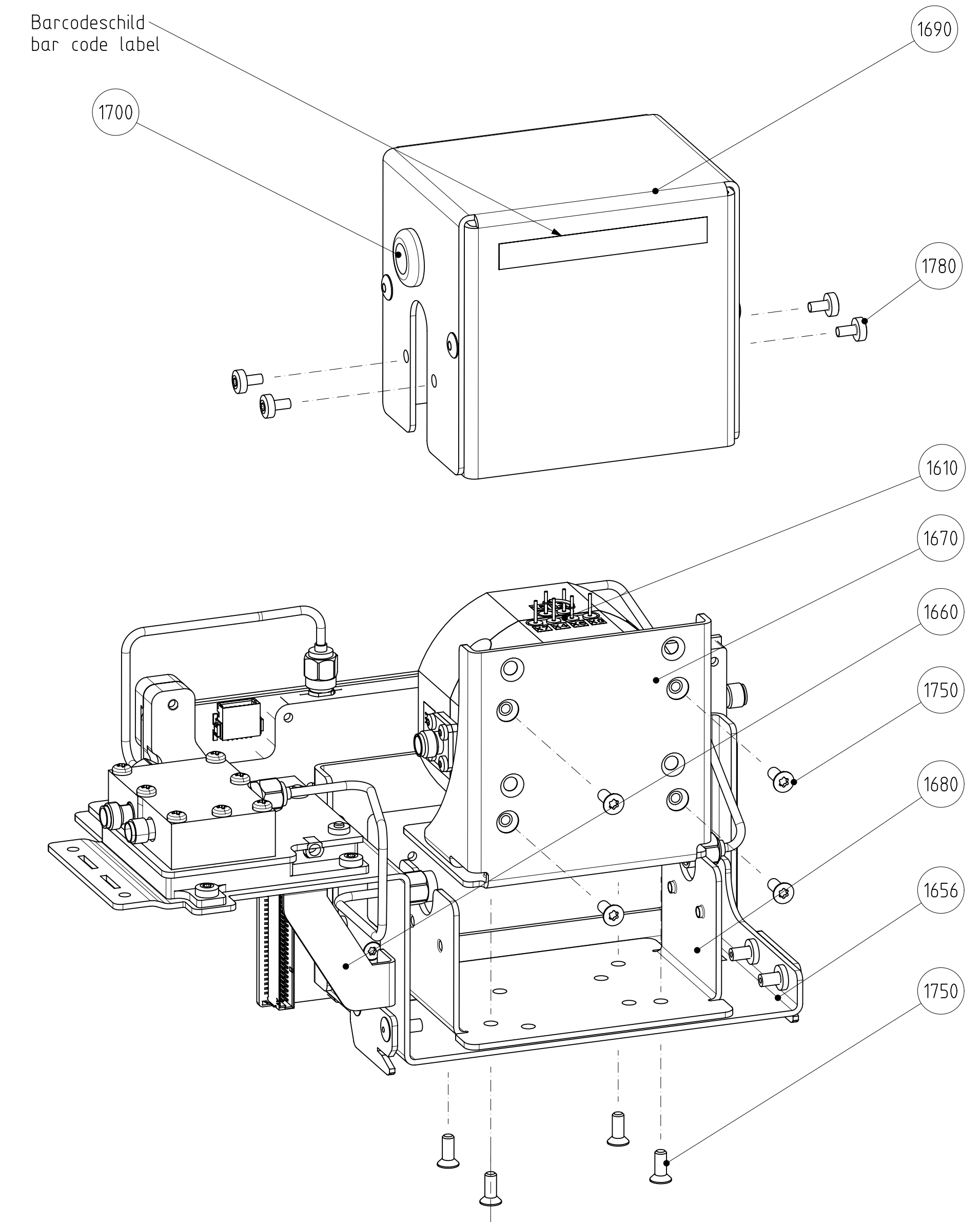
Zeichn. / Scale	1:1	Version / Revision		Werkstoff / Material		Größe / Size	in / in	Blatt / Page	1
Hersteller / Manufacturer	ROHDE&SCHWARZ	Bezeichnung / Designation	MW CONVERTER FRONTEND UNIT	de	en	10.00			
Teil / Part	SIRIUS	Datum / Date	2015-06-22	Änderung / Change	IESK	Version / Version	AN/bu	1312.8298.01	D

NX

VAR43



VAR42



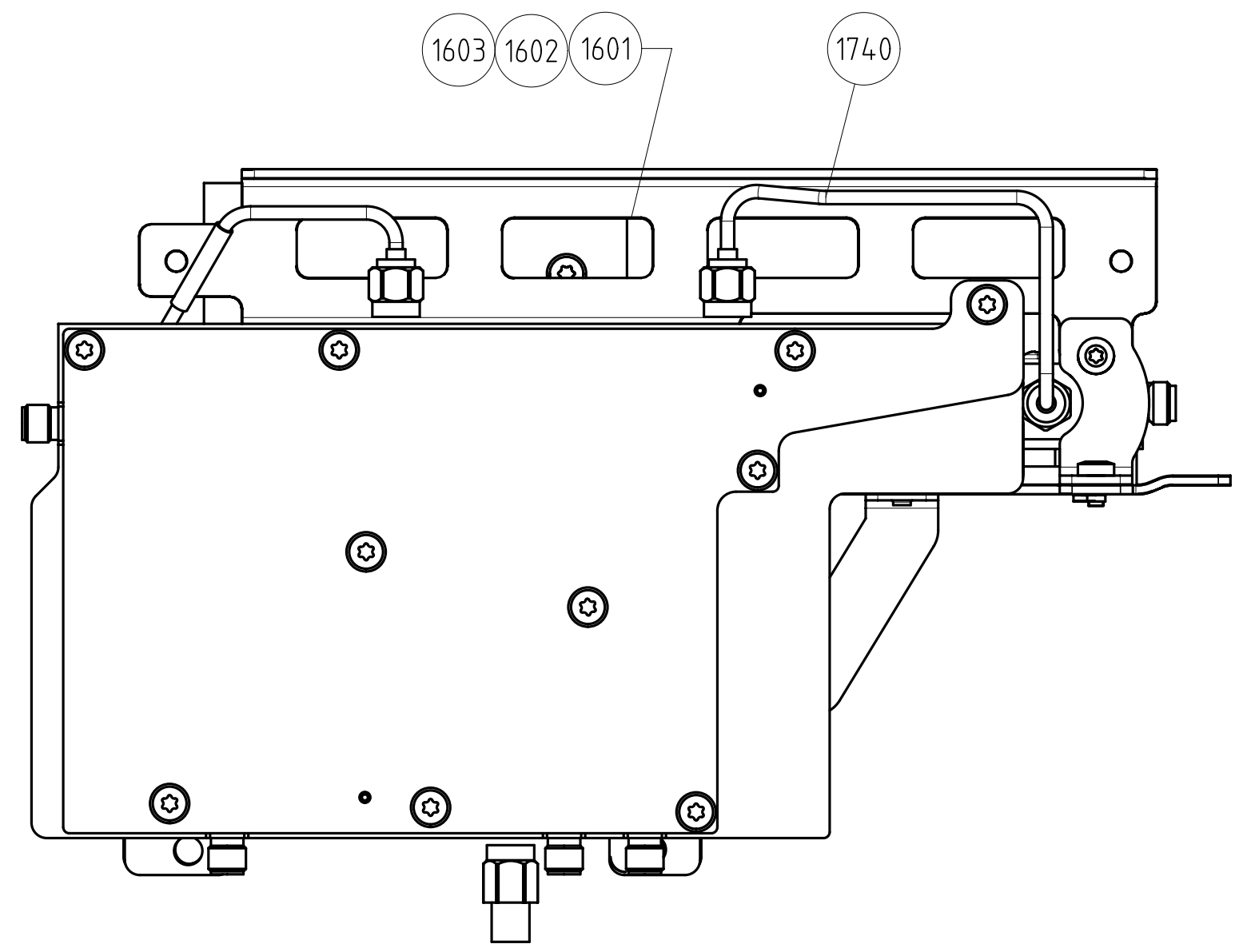
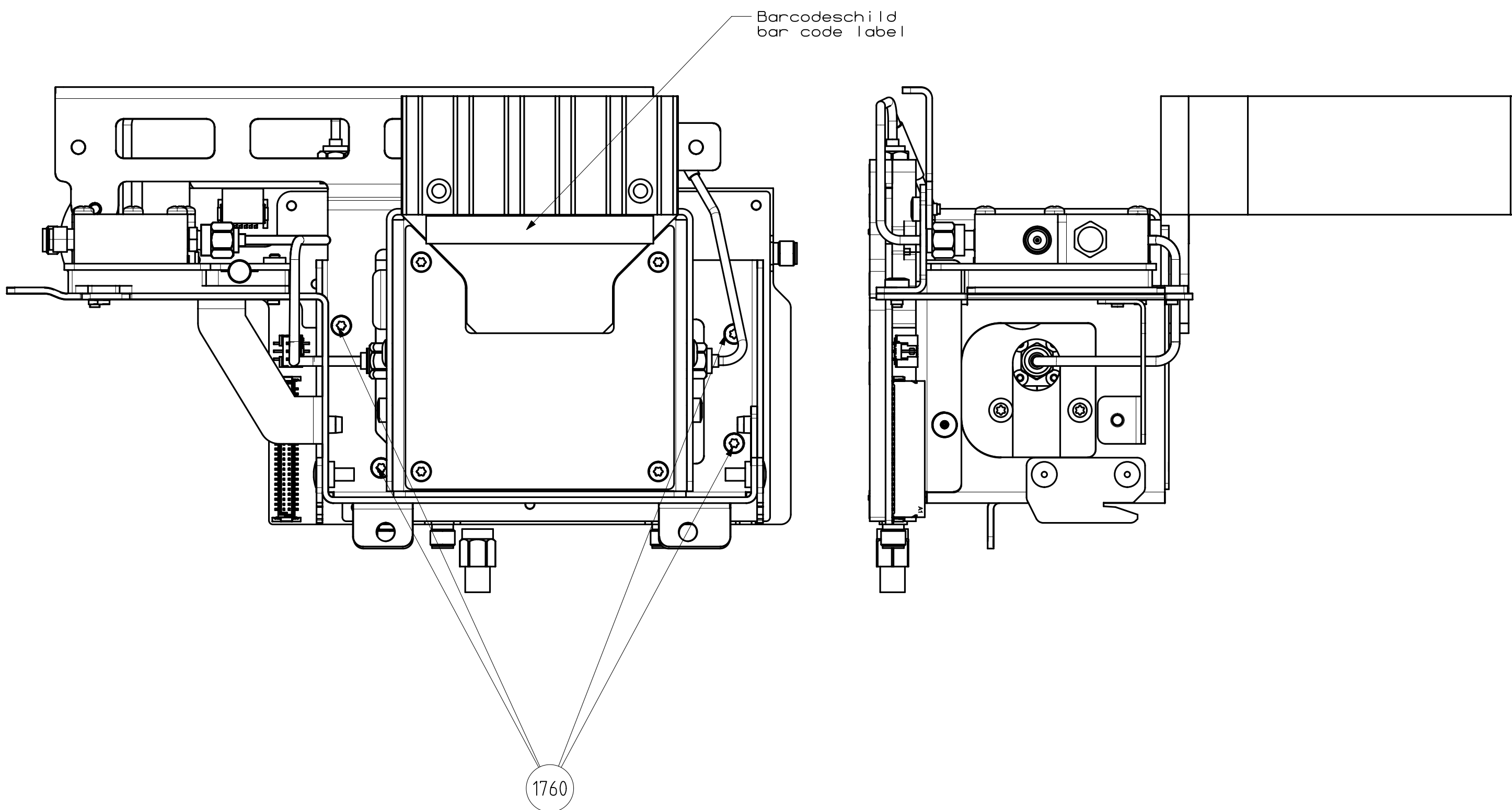
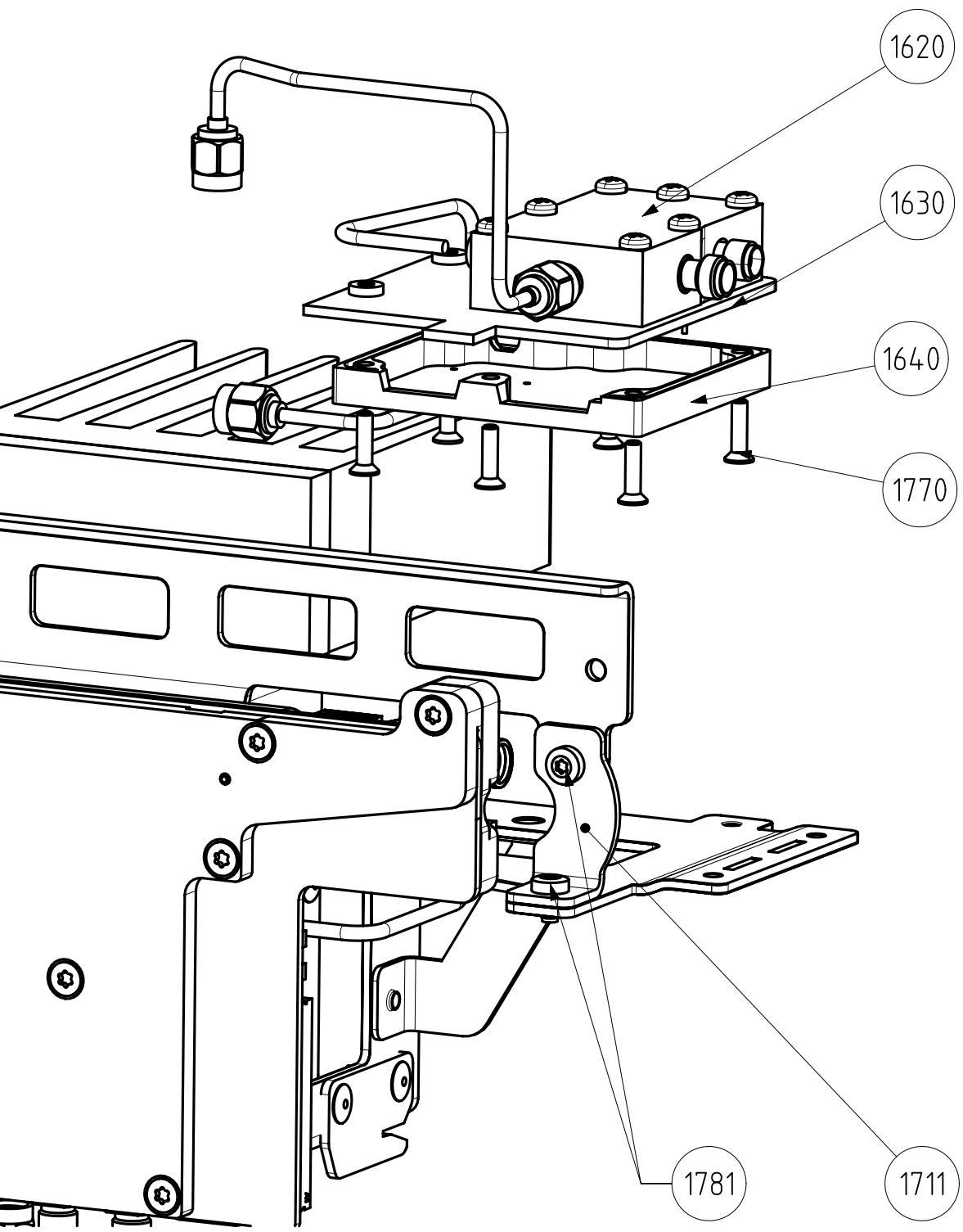
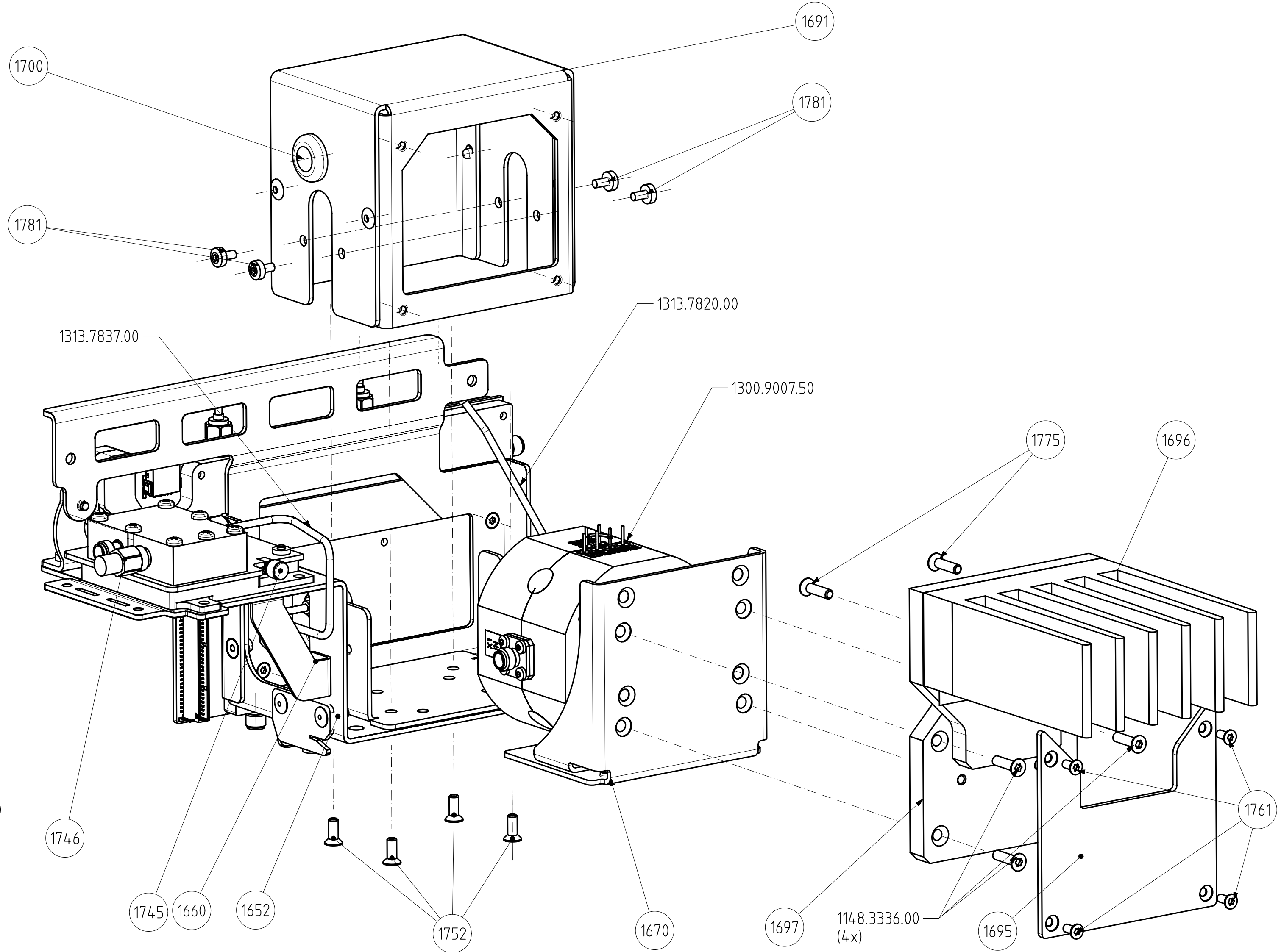
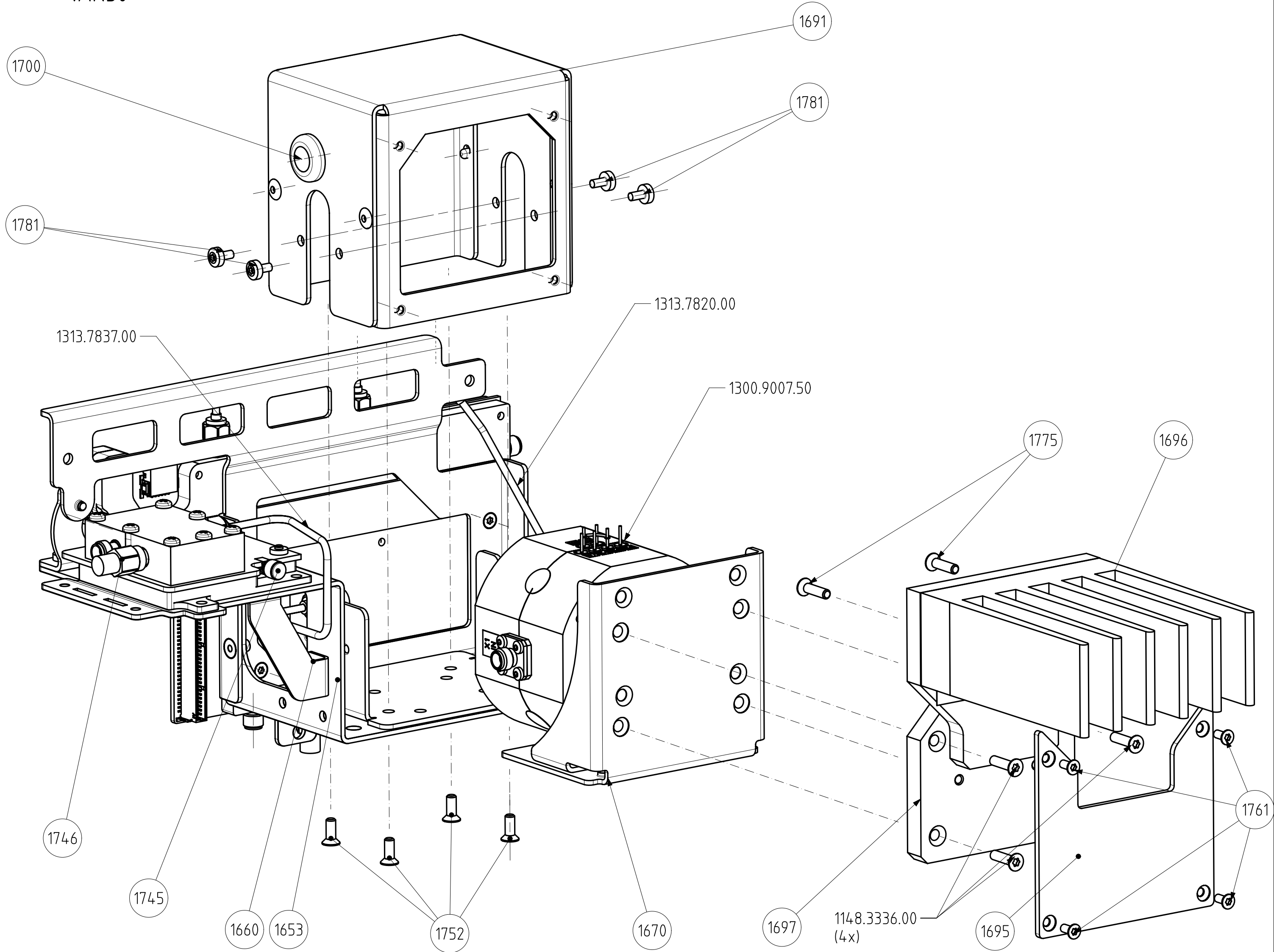
Bei der Montage als erstes Pos.1654 mit 1660 verschrauben
First step in mounting, connect Pos.1654 with 1660

Zeichn. / Scale	1:1	Version / Revision		Werkstoff / Material		Gezeichnet / Drawn	Am / On	Blatt / Sheet	1
ROHDE&SCHWARZ		MW CONVERTER UNIT 43GHZ		de en		04.00			
SIRIUS		2014-07-23		IESK		AN/BU		1312.8323.01	

YIG Filter R&S

VAR 49 / 67

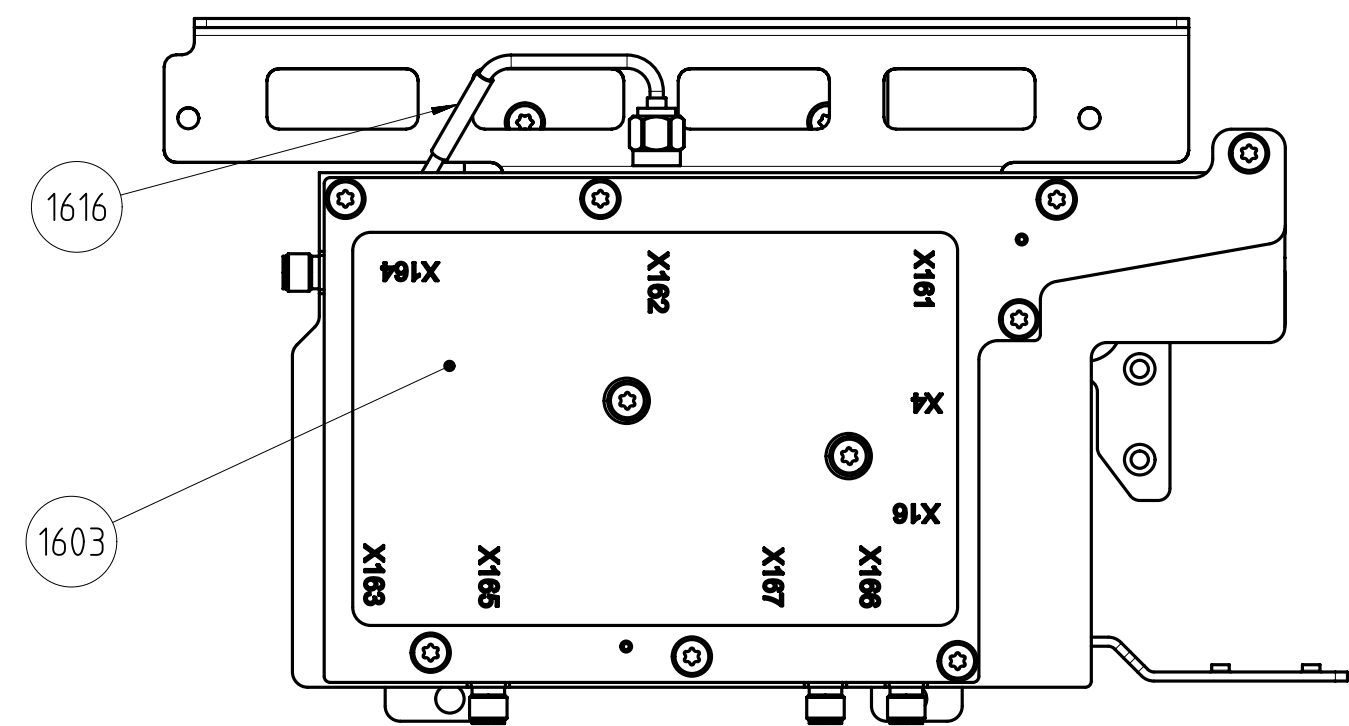
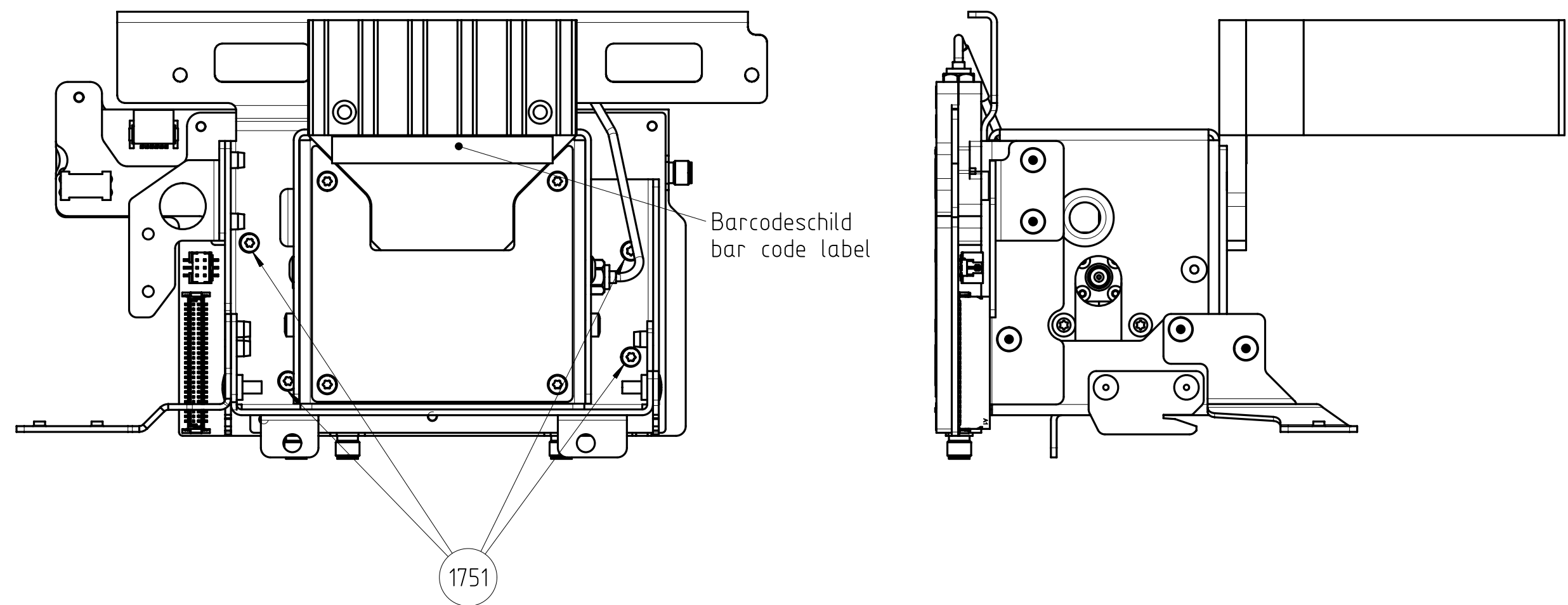
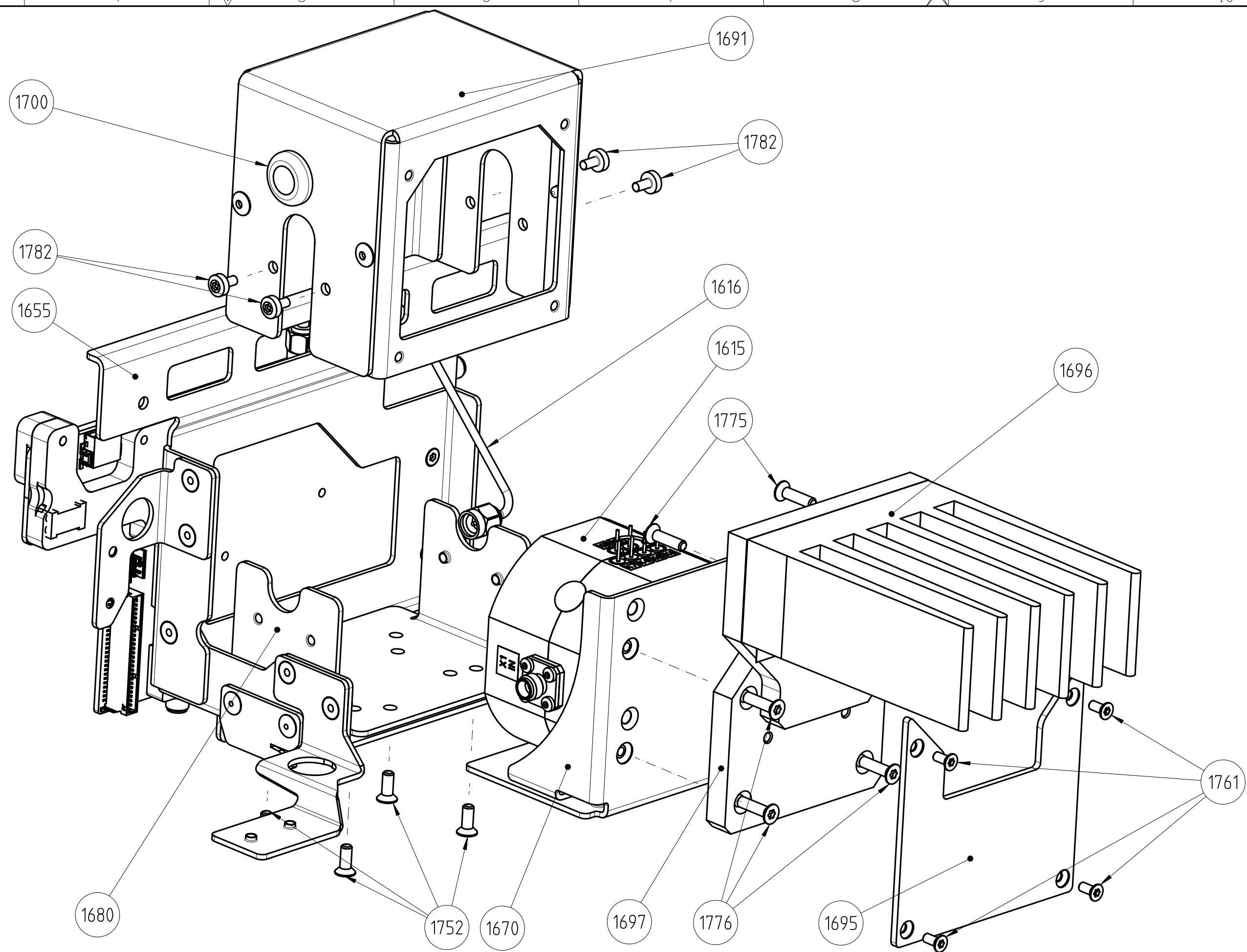
VAR50



Bei der Montage als erstes Pos.1650 mit 1660 verschrauben
First step in mounting, connect Pos.1650 with 1660

Rechts Name	Version Rev.	Werkstoff Material	Größe / Lsg. Size / Sol.	Anz. / Stk. Qty. / Pcs.	Blatt / Z. Stk. Sheet / Total
ROHDE&SCHWARZ	MW CONVERTER UNIT 43GHZ MW CONVERTER UNIT 43GHZ	de en	09.00	2	
SIRIUS	2015-05-27	1ESK	AN/BU	1312.8323.01	D

VAR85



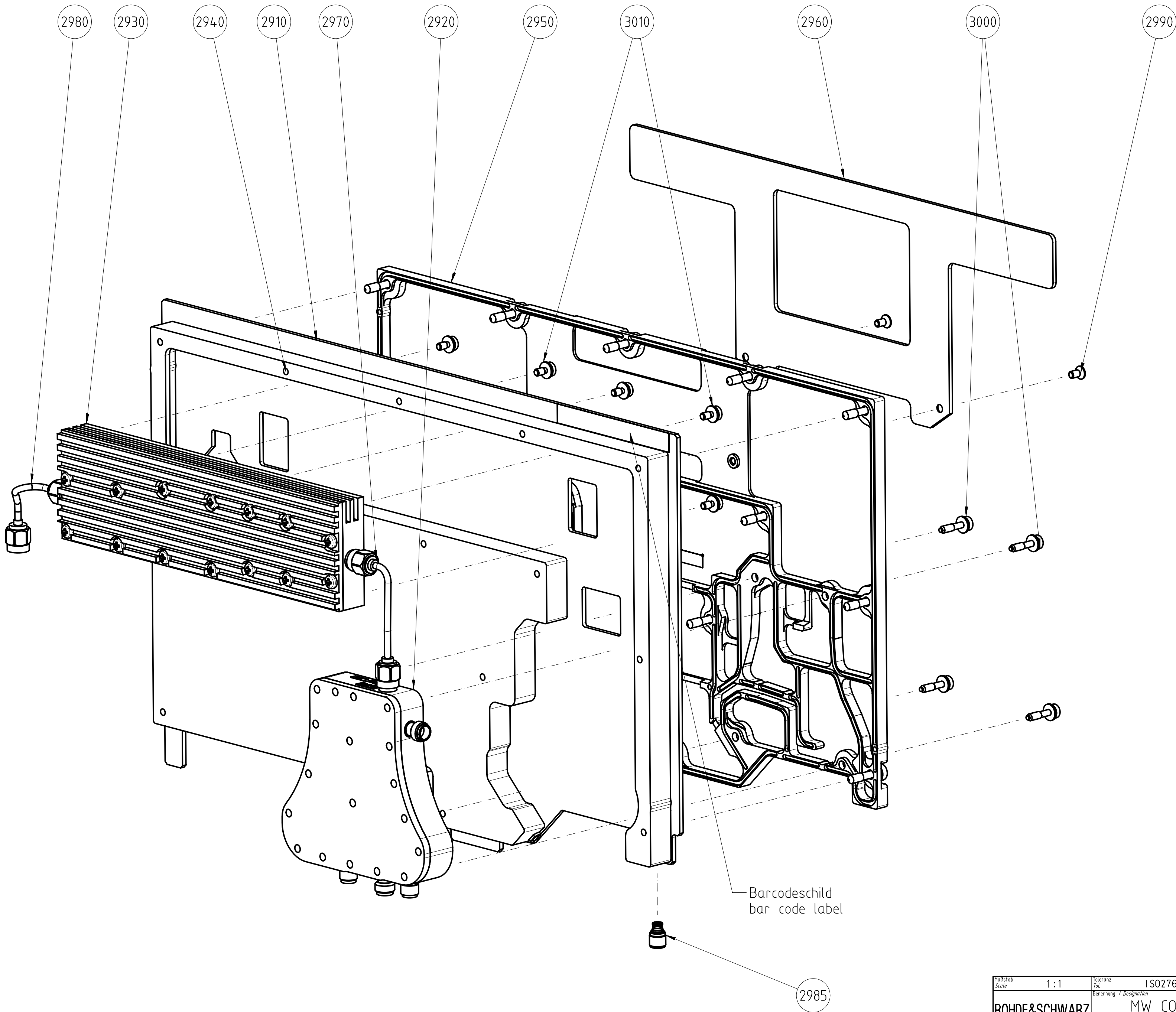
Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
ROHDE&SCHWARZ	Benennung / Designation	MW CONVERTER UNIT 43GHZ MW CONVERTER UNIT 43GHZ	de en	04.00	3
SIRIUS	Datum Date	2015-05-27	Abteilung Dept.	1ESK	Name Name
				BUAN	Zeichn.Nr. / Drawing No.
					1312.8323.01 D

NX

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Projektions-
methode
Projection
Method

A2

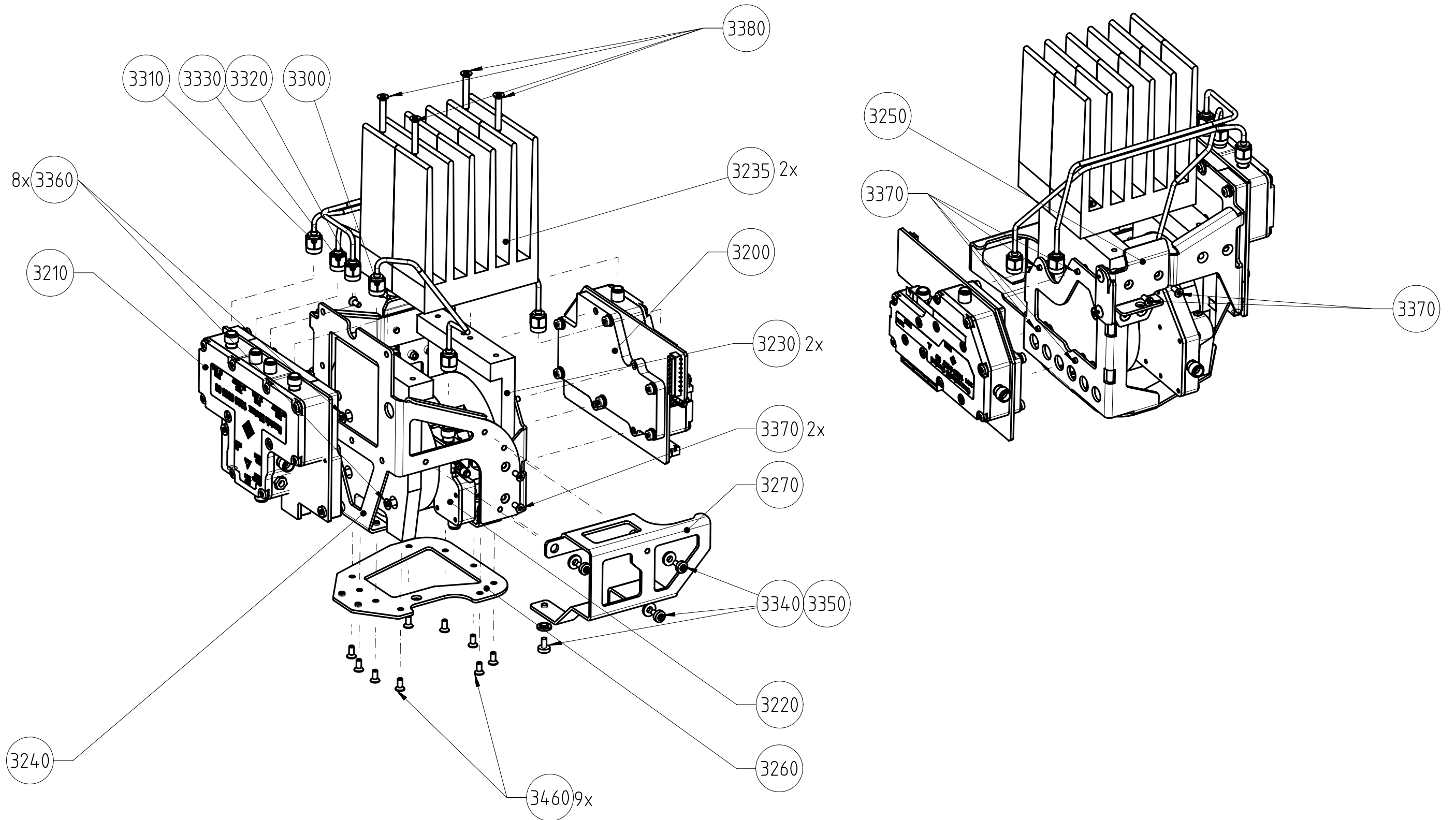


Maßstab Scale	1:1	Toleranz Tol.	ISO2768-m			Werkstoff Material			
ROHDE&SCHWARZ	Benennung / Designation					Sprache / Lang.		Aes. / C.I.	Blatt / Sh.
	MW CONVERTER UNIT 67GHZ MW CONVERTER UNIT 67GHZ					de en		03.00	1
FSW67	Datum Date	2014-03-16	Abteilung Dept.	1ESK	Name Name	AN		Zeichn.Nr. / Drawing No.	
								1321.5300.01	D

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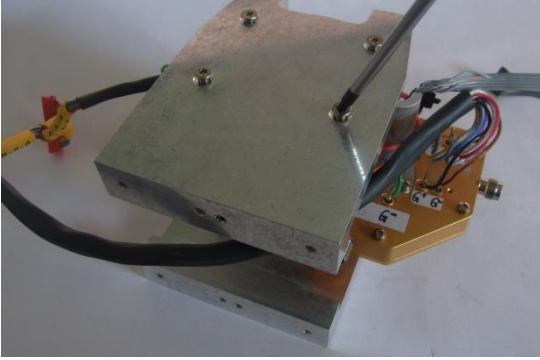
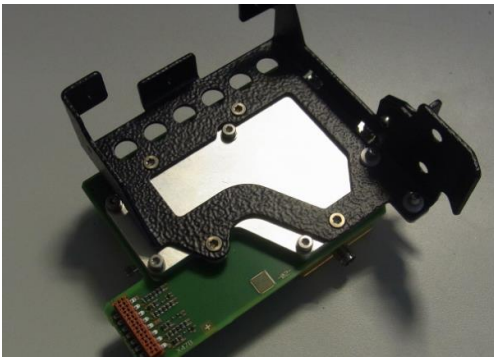
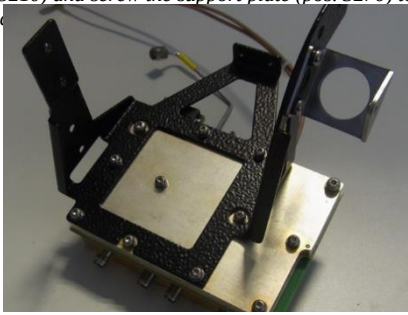
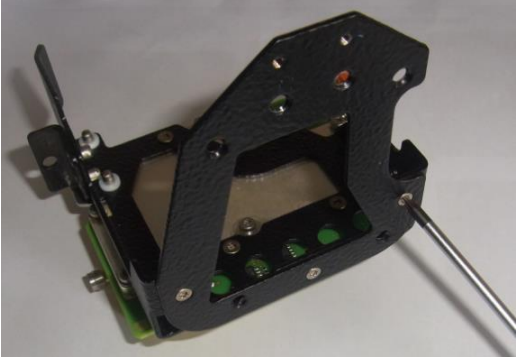
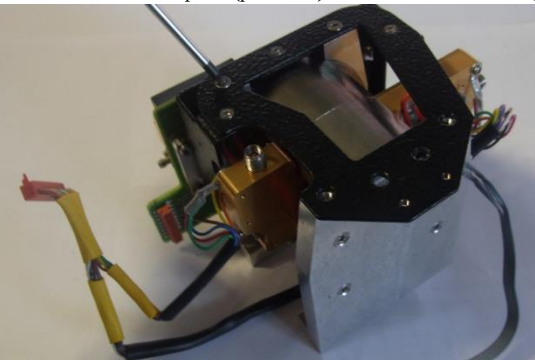
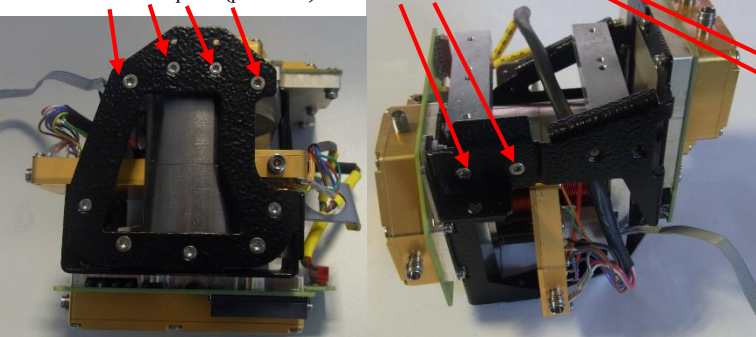
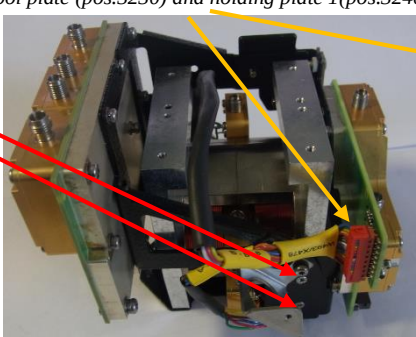
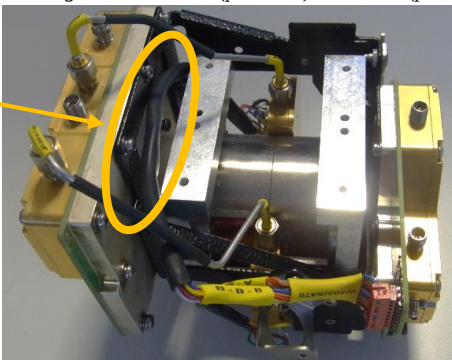
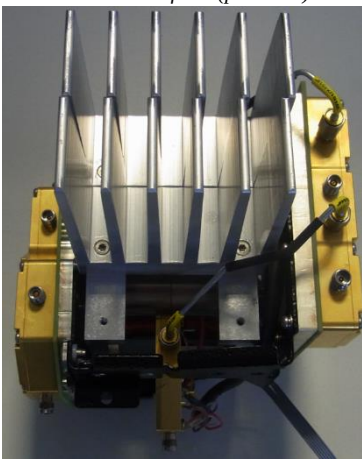
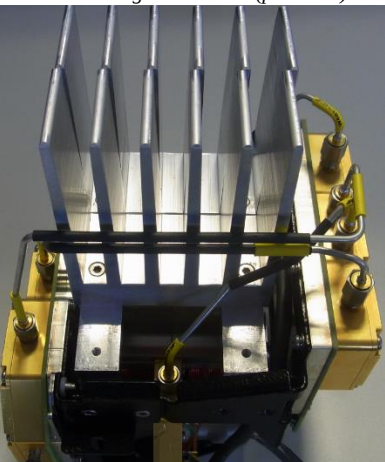
Projektions-
methode
Projection
Method

A3



Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material						
ROHDE&SCHWARZ		Benennung / Designation FSW85 FRONTEND UNIT 85GHZ FSW85 FRONTEND UNIT 85GHZ			Sprache / Lang.		Ael. / C.I.	Blatt / Sh.	
					de en		03.00	1	
		FSW85	Datum Date	2014-10-29	Abteilung Dept.	1ESK	Name Name	BU/AN	
					Zeichn.Nr. / Drawing No. 1321.5469.01				D

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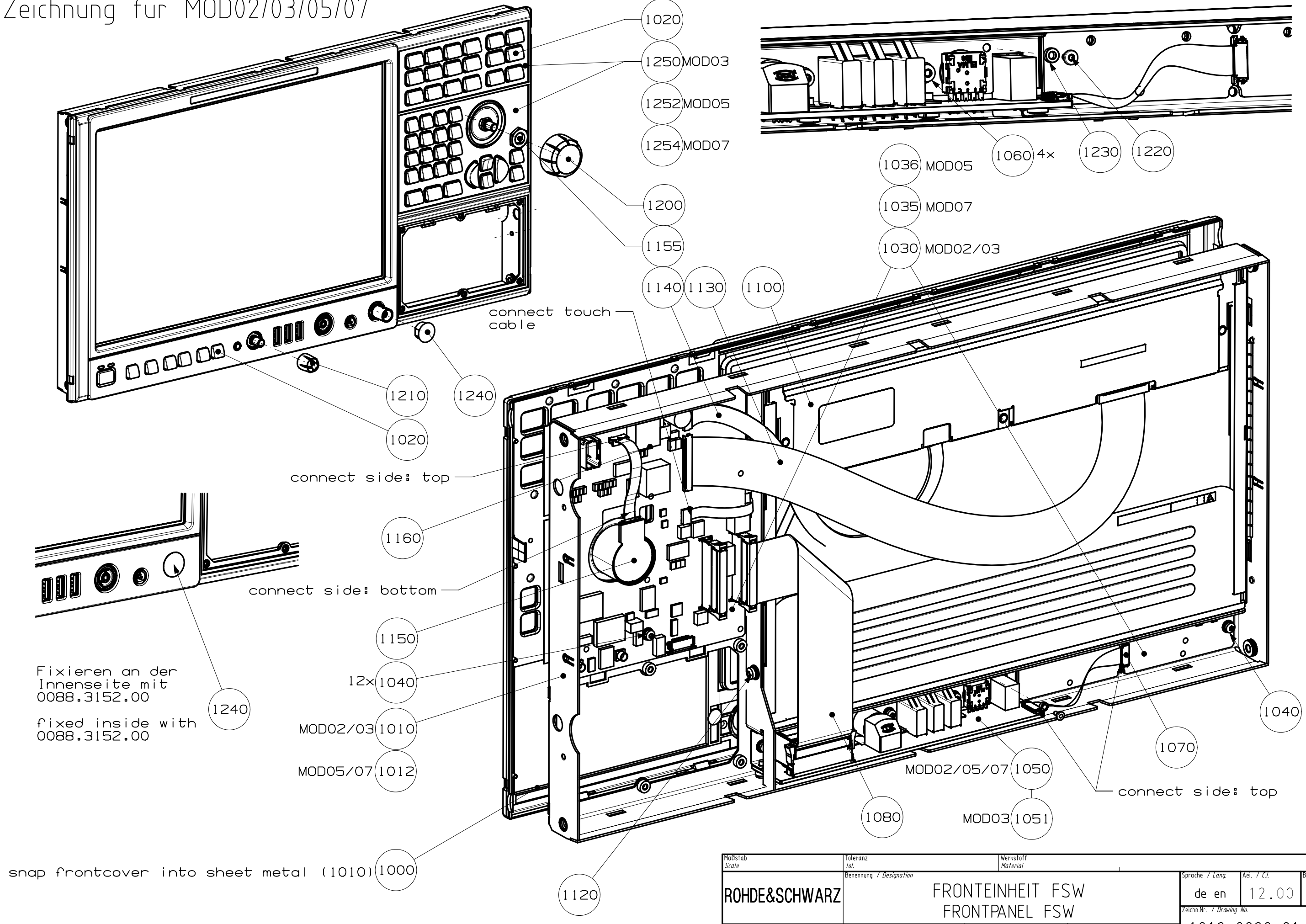
1. Hexa-Modul-Unit (Pos. 3220) mit den beiden Kühlplatten (Pos.3230) verschrauben. <i>Screw both cool plates (pos.3230) to the hexa-modul-unit (pos.3220).</i> 	2. Halteblech 2 (Pos.3250) an die Converter85 Control Unit (Pos. 3200) anschrauben. <i>Screw the holding plate 2 (pos.3250) to the Converter85 Control Unit (pos.3200).</i> 	3. Halteblech 1 (Pos.3240) an Switch Matrix Controller Unit (Pos.3210) anschrauben und Stützblech (Pos.3270) an Halteblech 1 schrauben. <i>Screw the holding plate 1 (pos.3240) to the Switch Matrix Controller Unit (pos.3210) and screw the support plate (pos. 3270) to the holding plate 1.</i> 	4. Bodenblech (Pos.3260) an Halteblech 2 (Pos.3250) anschrauben. <i>Screw the bottom plate (pos.3260) to the holding plate 2 (pos.3250).</i> 
5. Hexa-Modul-Unit (Pos.3220) an das Bodenblech (Pos.3260) anschrauben. <i>Screw the bottom plate (pos.3260) to the hexa-modul-unit (pos.3220)</i> 	6. Halteblech 1 (Pos.3240) ans Halteblech 2 (Pos.3250) und Bodenblech (Pos.3260) anschrauben. <i>Screw the holding plate 1 (pos.3240) to the holding plate 2 (pos.3250) and the bottom plate (pos.3260)</i> 	7. Kabel W493 anstecken und darauf achten, dass es zwischen Kühlplatte (Pos. 3230) und Halteblech 1 (Pos. 3240) verlegt wird. Clip the Cable W493 and make sure that cable is between cool plate (pos.3230) and holding plate 1(pos.3240). 	8. Kabel W484 (Pos. 3330) und W481 (Pos.3300) montieren. <i>Mounting the cable W484 (pos.3330) and W481 (pos.3300)</i> 
9. Beide Kühlkörper YIG Filter (Pos.3235) montieren. <i>Mounting both heat sink YIG filter (pos.3235).</i> 	10. Kabel W482 (Pos.3310) und W483 (Pos.3320) montieren. <i>Mounting cable W482 (pos.3310) and W483 (pos.3320)</i> 		

 FSW85	Benennung/Designation FSW85 FRONTEND UNIT 85GHZ FSW85 FRONTEND UNIT 85GHZ			Sprach./Lang de en	Ä.1. / C.1 01.00	Blatt/Sheet 2
	Datum/ Date	2014-08-13	Abt. / Dept.	1ESK	Name / Name	AN/BU
	Zeichn. Nr. / Drawing No. 1321.5469.01					D

Zeichnung für MOD02/03/05/07

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Projektions-
methode
Projection
Method



Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Ael. / C.I.	Blatt / Sh.
ROHDE&SCHWARZ	Benennung / Designation	FRONTEINHEIT FSW FRONTANEL FSW	de en	12.00	1
FSW	Datum Date	2015-04-20	Abteilung Dept.	1ESK	Name Name
				AN/BU	Zeichn.Nr. / Drawing No.
					1312.8023.01

Die OCXO-Baugruppe 1313.0703.XX kann nachträglich vom Kunden als Option B4 eingebaut werden.

- Gerät ausschalten und Netzstecker ziehen
- Rückwandblech lösen und die Option B4 einschieben
- Beim Einschieben darauf achten das die seitlichen Führungen getroffen werden

Ansonsten kann es passieren, dass von der offenen Lötseite der Optionsbaugruppe Bauteile abgesichert werden.

- Nach dem Einschieben die Baugruppe mit den vier Rückwandschrauben festschrauben
 - Das Gerät einschalten und warten bis die Firmware gestartet ist
 - In der Hardwareliste (SETUP - SYSTEM CONFIG - HARDWARE INFO) nach dem Eintrag OCXO suchen
 - Sicherstellen, dass im Einstellmenü für die Referenzbaugruppe (SETUP REFERENCE) auf "Internal Referenz" geschaltet ist
- In der Statusleiste (Display links unten) darf keine Meldung "LO UNLOCK", "REF UNLOCK" oder "NO REF" angezeigt werden.

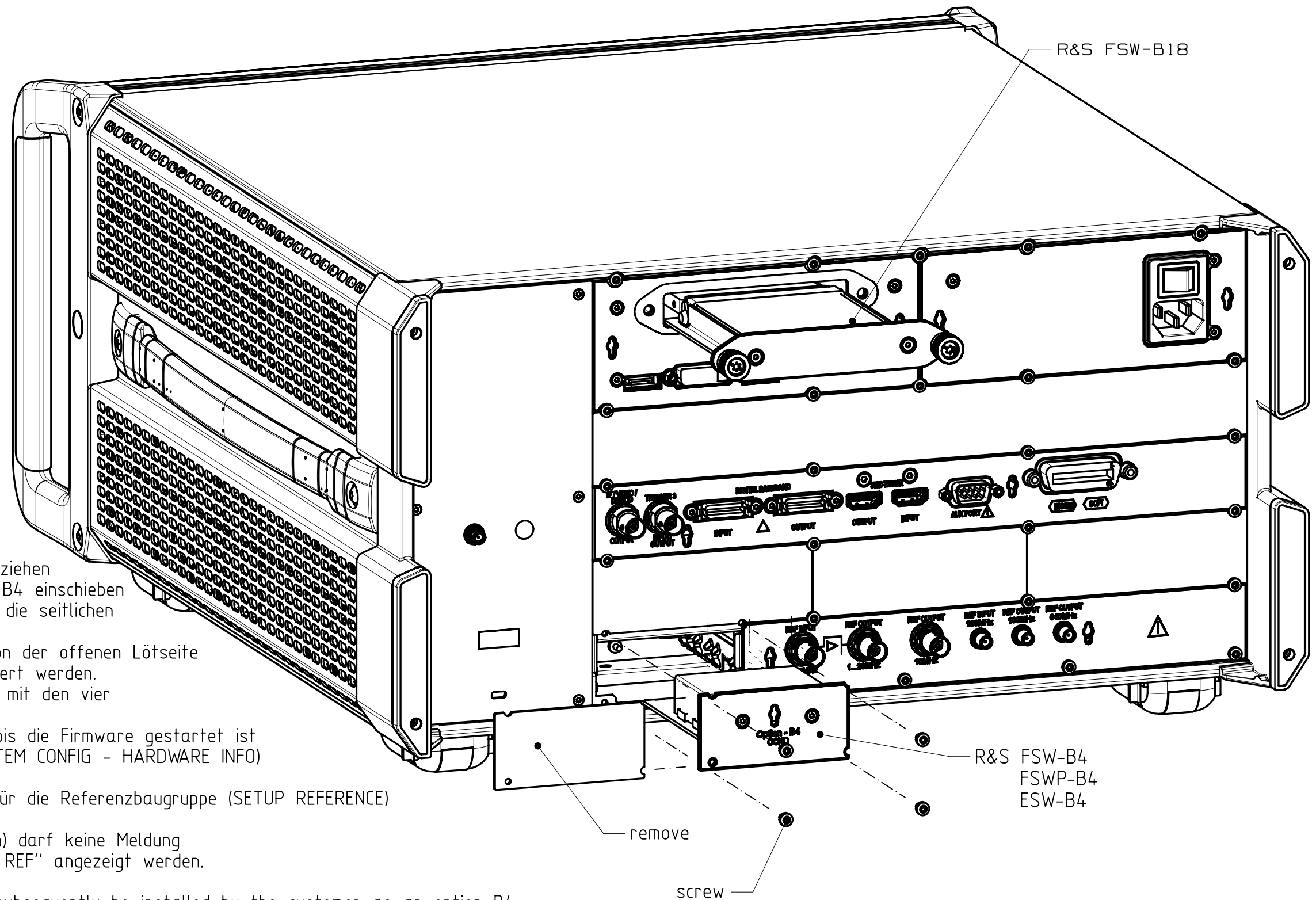
The OCXO assembly 1313.0703.XX can subsequently be installed by the customer as an option B4.

- switch off the instrument and disconnected the power plug
- unscrew the rear panel and insert the option B4
- when pushing in make sure that the slides are met

Otherwise there is a risk that assembly components are sheared off from the open solder side of the option.

- after inserting, fix the module with the four rear screws
- switch on the instrument and wait until the firmware is started
- search in the hardware list (SETUP - SYSTEM CONFIG - HARDWARE INFO) for the entry OCXO
- make sure that the setting of the reference module (SETUP REFERENCE) is set to "Internal Reference"

In the statusbar (on the left bottom side of the display), check that the messages "LO UNLOCK", "REF UNLOCK" and "NO REF" are not displayed.

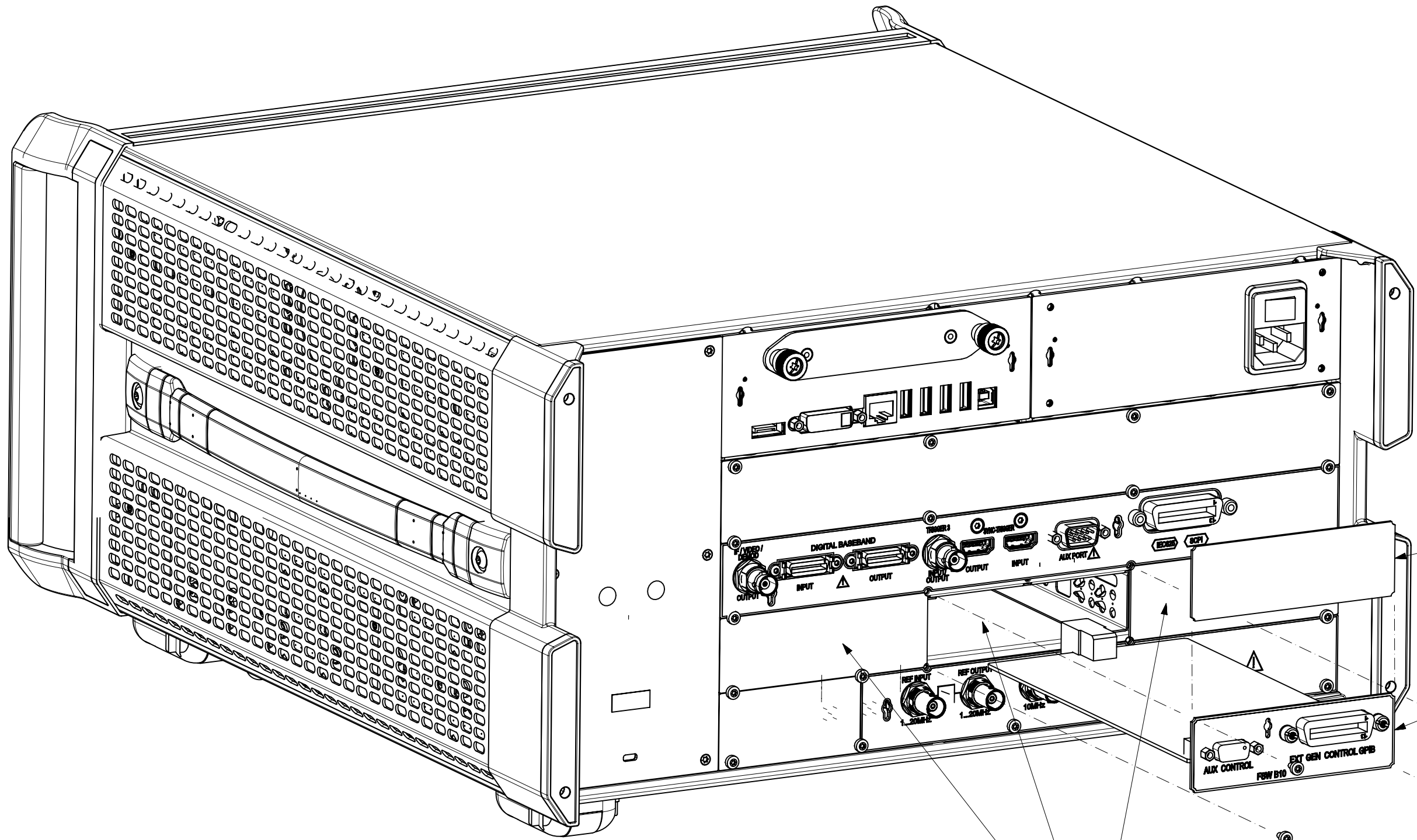


Maßstab Scale	-	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Ael. / C.I.	Blatt / Sh.
Benennung / Designation	ROHDE&SCHWARZ EINBAUANWEISUNG OPTION B4 ASSEMBLY INSTRUCTION OPTION B4			de en	03.00	1
Datum Date	2015-01-29	Abteilung Dept.	1ESK	Name Name	BU/AN	1313.2758.00 D
Zeichn.Nr. / Drawing No.				1313.2758.00 D		

NX

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Projektions-
methode
Projection
Method



entfernen /
remove

Option B10

Schrauben /
screws

3x Schaumstoff beim Einbau
der B10 entfernen

remove 3x foam during
installation of B10

Installation

- switch off the instrument and disconnected the power plug
- unscrew the rear panel, foam remove and insert the option B10
- when pushing in make sure that the slides are met
- after inserting, fix the module with the 4 rear screws

Firmware

- Option FSW-B10 requires Firmware version 1.61 or higher.

Verification

- press the following keys:

SETUP: System Config: Versions+Options

- check the option list for B10 Ext. GEN.Control

No more functional tests necessary !

Installation

- Gerät ausschalten und Netzstecker ziehen.
- Rückwandblech lösen, Schaumstoff herausziehen und die Option B10 einschieben.
- Beim Einschieben darauf achten, dass die seitlichen Führungen getroffen werden.
- Nach dem Einschieben die Baugruppe mit den 4 Rückwandschrauben festschrauben.

Firmware

- Option FSW-B10 erfordert die Firmware version 1.61 oder höher.

Überprüfung

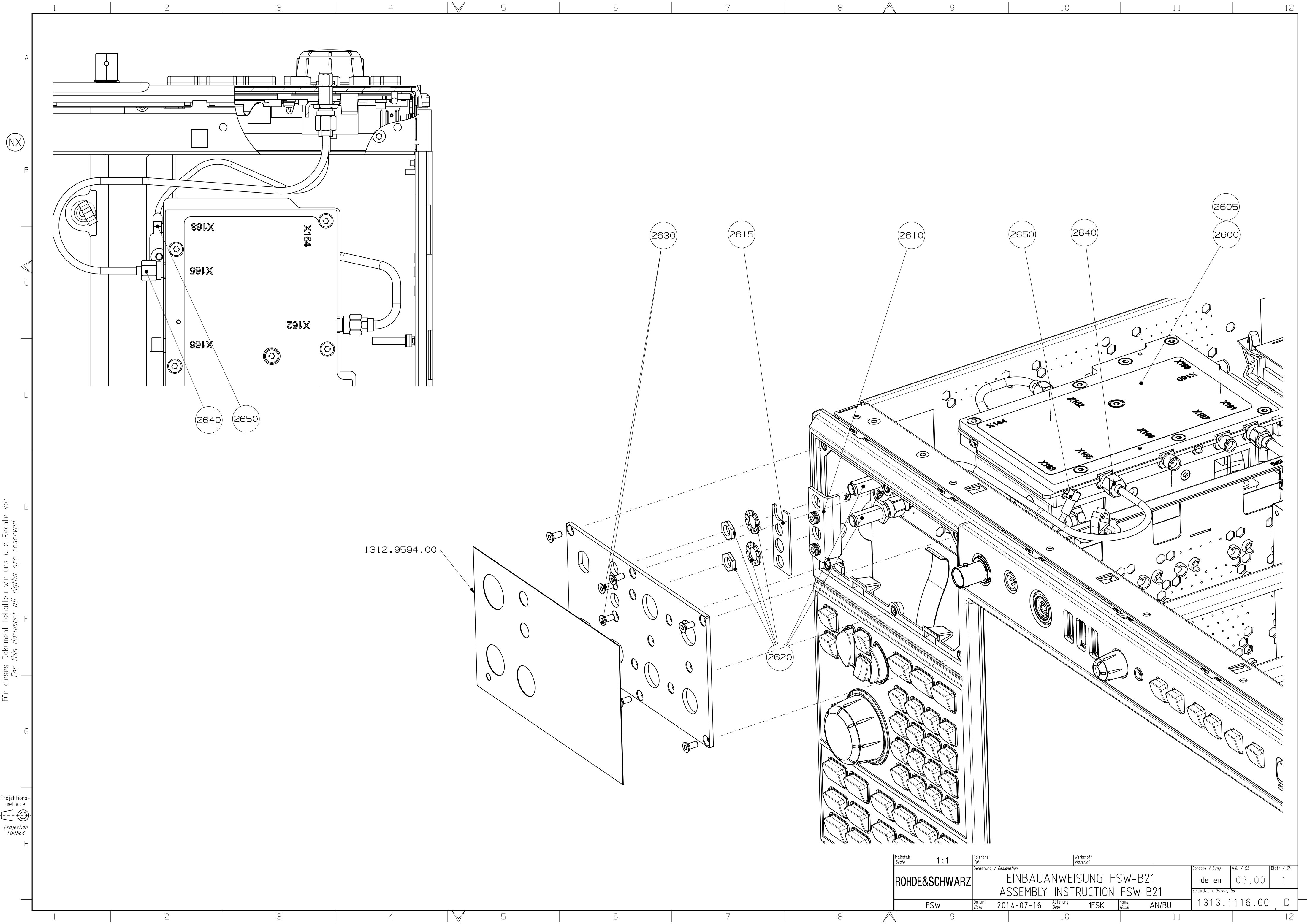
- Drücken Sie die folgenden Tasten:

SETUP: System Config: Versions+Options

- Prüfen ob die Optionsliste den Eintrag "B10 Ext. GEN.Control" enthält.

Keine weiteren Funktionstest erforderlich!

Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material		Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
ROHDE&SCHWARZ		EINBAUANWEISUNG FSW - B10 ASSEMBLY INSTRUCTION FSW - B10		de en	02.00	1	
FSW-B10	Datum Date	2013-02-05	Abteilung Dept.	1ESK	Name Name	AN	Zeichn.Nr. / Drawing No. 1313.7489.00 D



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Projektions-
methode
Projection
Method

Maßstab Scale	1:1	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
ROHDE&SCHWARZ		EINBAUANWEISUNG FSW-B21 ASSEMBLY INSTRUCTION FSW-B21		de en	03.00	1
FSW	Datum Date	2014-07-16	Abteilung Dept.	1ESK	Name Name	AN/BU
		Zeichn.Nr. / Drawing No.		1313.1116.00		D

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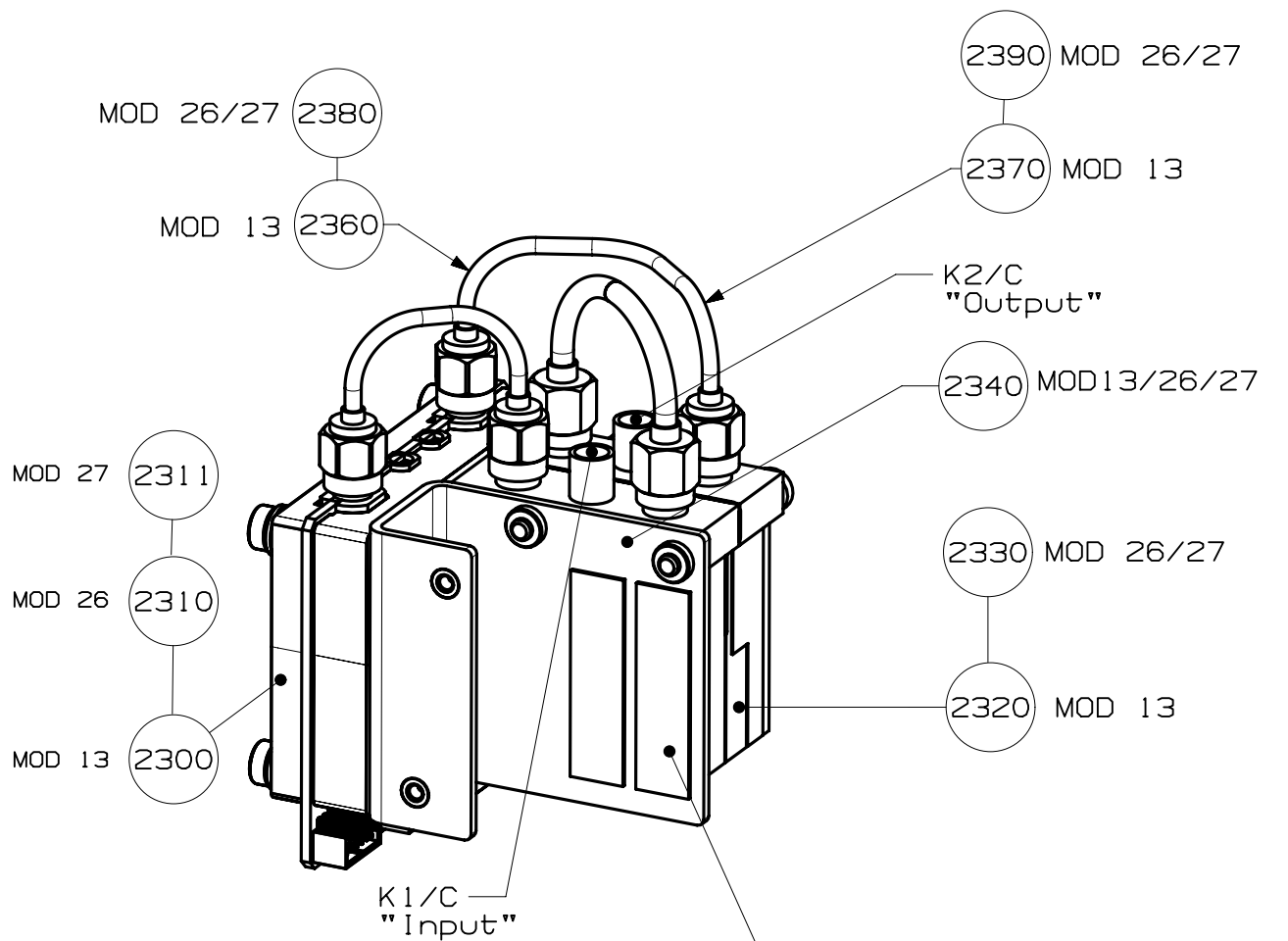
Maßeinheit
Measuring
Unit
[mm]

Projektions-
methode

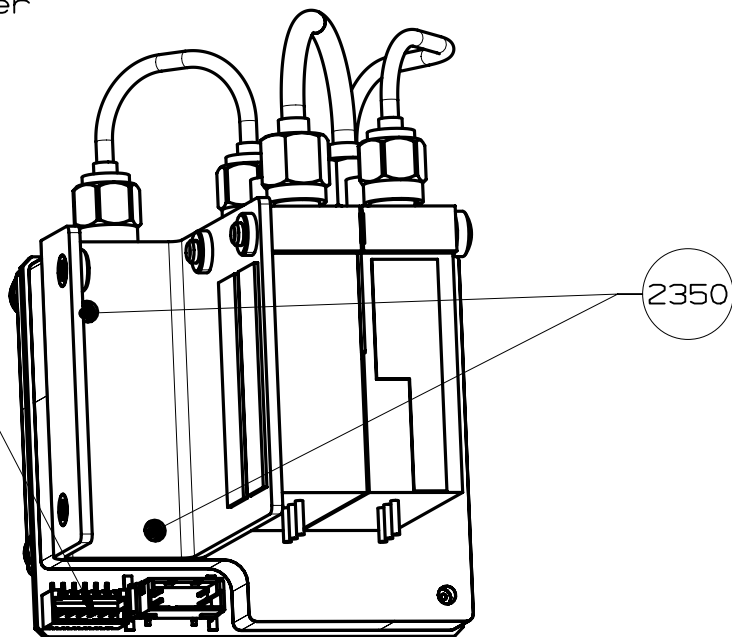
Projection
Method

A4

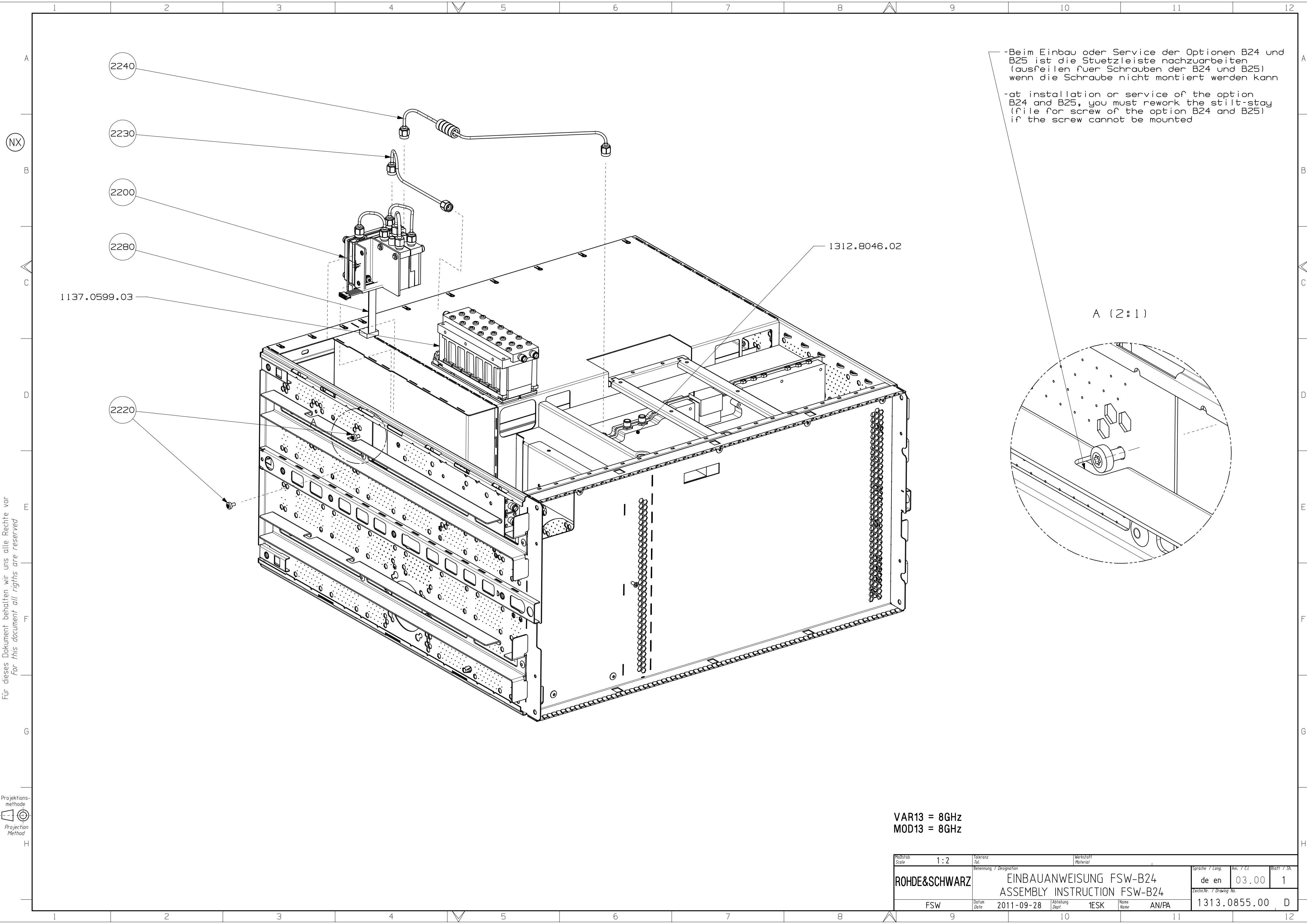
MOD/VAR 13 = 13.6 GHz Unit
MOD/VAR 26/27 = 26.5 GHz Unit



Relaiskabel 1308.2199.00
nicht dargestellt
W2/X1503 in Stecker
X274



Maßstab Scale	1:1	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Aei. / C.I.	Blatt / Sh.
ROHDE&SCHWARZ	VORVERSTAERKER EINHEIT PREAMP UNIT			de en	08.00	1
FSW	Datum Date	2015-03-30	Abteilung Dept.	1ESK	Name Name	AN/Bu
1313.0903.01					D	

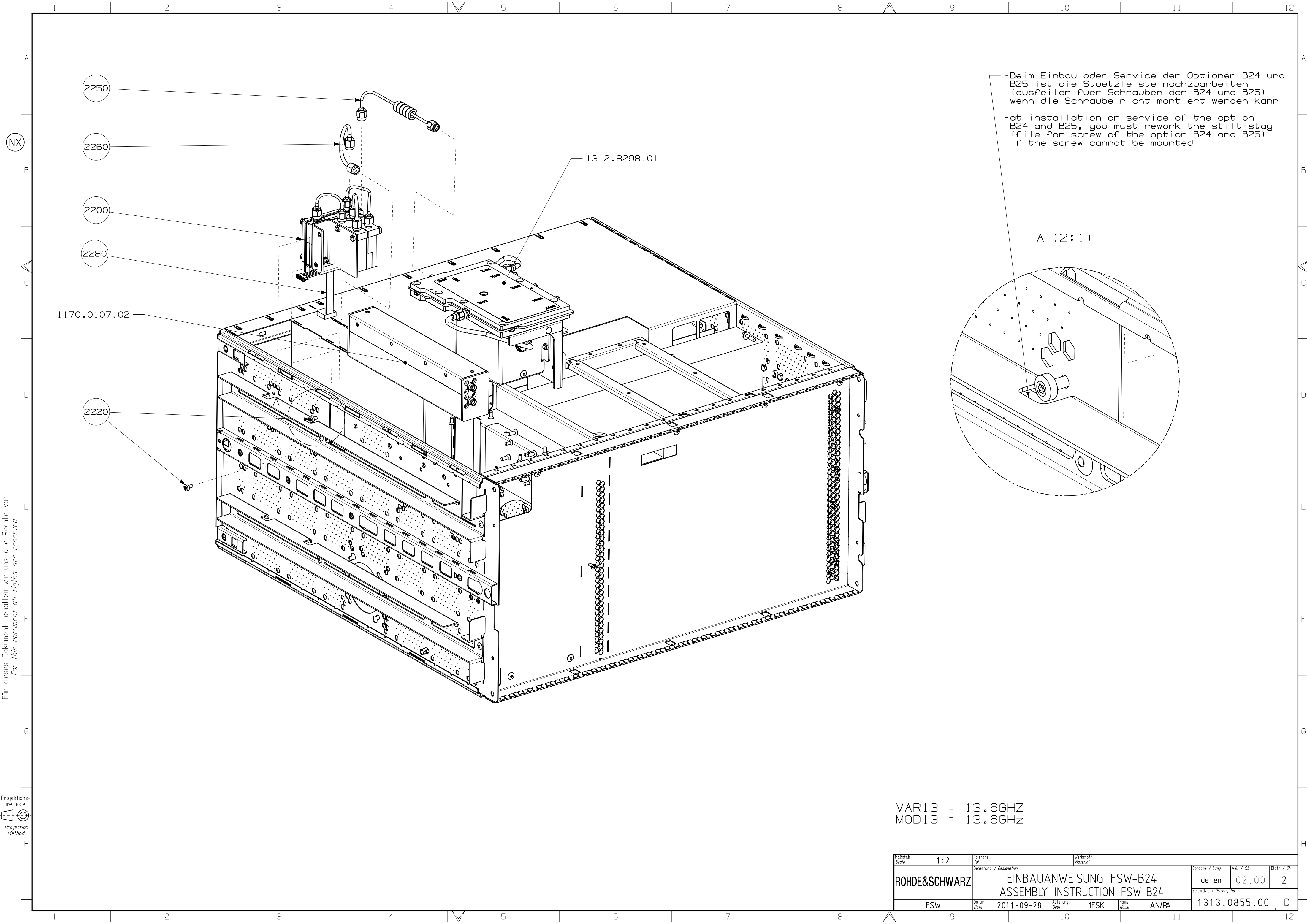


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Projektions-
methode
Projection
Method

VAR13 = 8GHz
MOD13 = 8GHz

Maßstab Scale	1:2	Toleranz Tol.		Werkstoff Material	
ROHDE&SCHWARZ		Benennung / Designation			
		EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24			
FSW		Datum Date	2011-09-28	Abteilung Dept.	1ESK
		Name	AN/PA		
		Zeichn.Nr. / Drawing No.			
		1313.0855.00			
		Blatt / Sh.			
		1			
		D			



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Projektions-
methode
Projection
Method

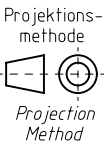
-Beim Einbau oder Service der Optionen B24 und B25 ist die Stuetzleiste nachzuarbeiten (ausfeilen fuer Schrauben der B24 und B25) wenn die Schraube nicht montiert werden kann
-at installation or service of the option B24 and B25, you must rework the stilt-stay (file for screw of the option B24 and B25) if the screw cannot be mounted

A (2:1)

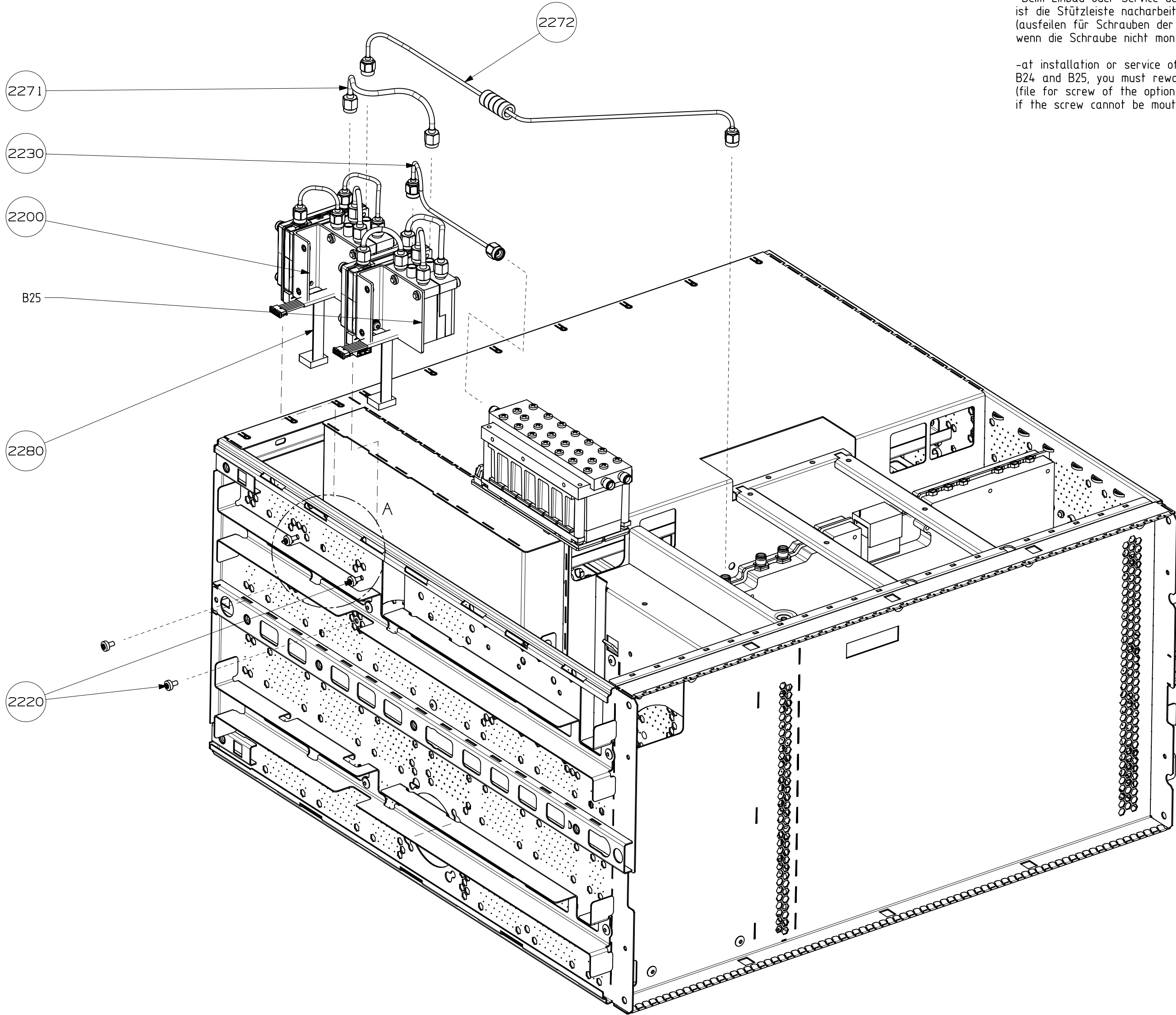
VAR13 = 13.6GHZ
MOD13 = 13.6GHZ

Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
ROHDE&SCHWARZ		EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24			de en 02.00	2
FSW	Datum Date	2011-09-28	Abteilung Dept.	1ESK	Name Name	AN/PA
					Zeichn.Nr. / Drawing No.	1313.0855.00 D

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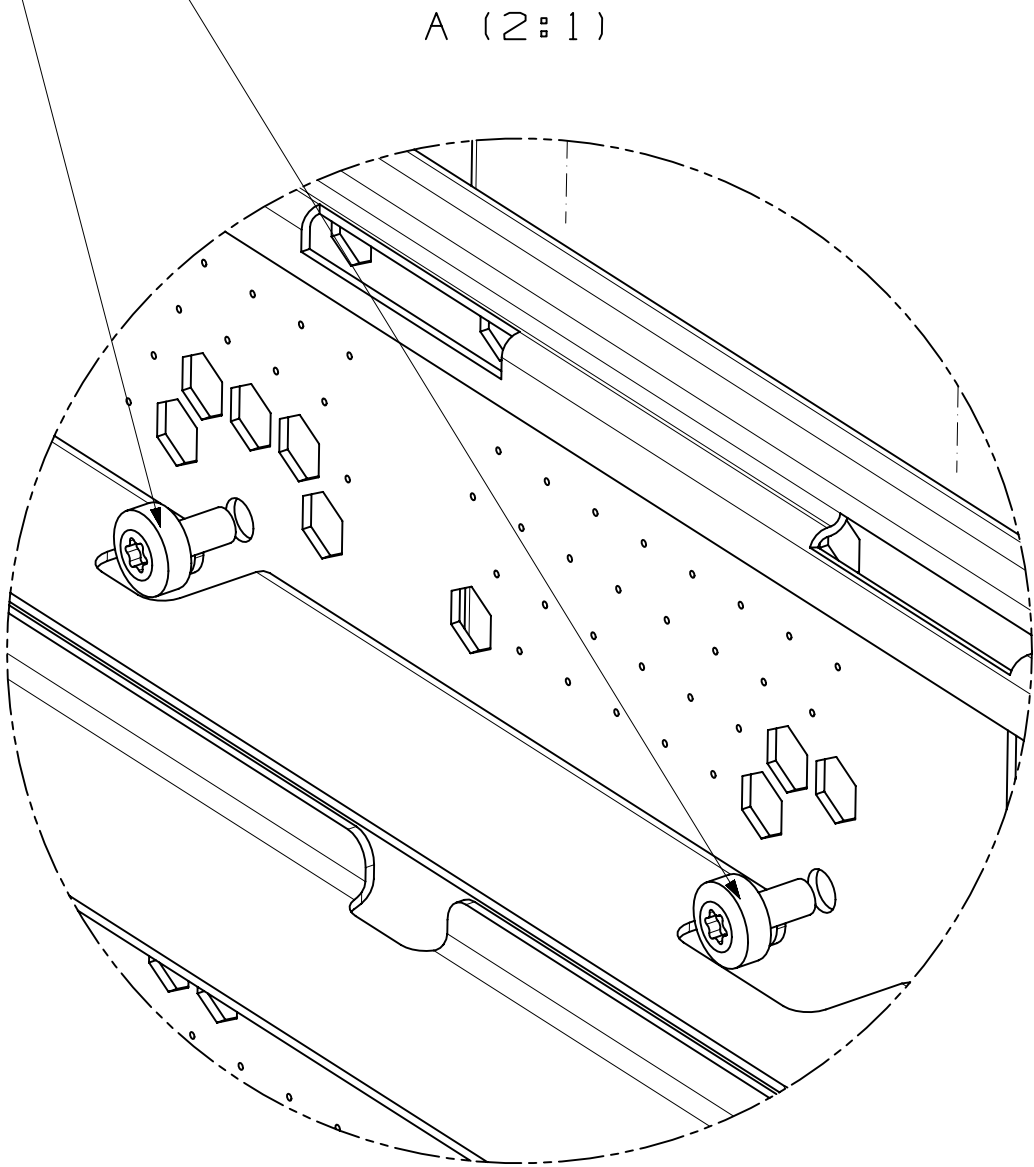


Projection Method



-Beim Einbau oder Service der Optionen B25
ist die Stützleiste nacharbeiten
(ausfeilen für Schrauben der B25)
wenn die Schraube nicht montiert werden kann

-at installation or service of the option
B24 and B25, you must rework the stilt-stay
(file for screw of the option B24 and B25)
if the screw cannot be mouted



B25 with B24

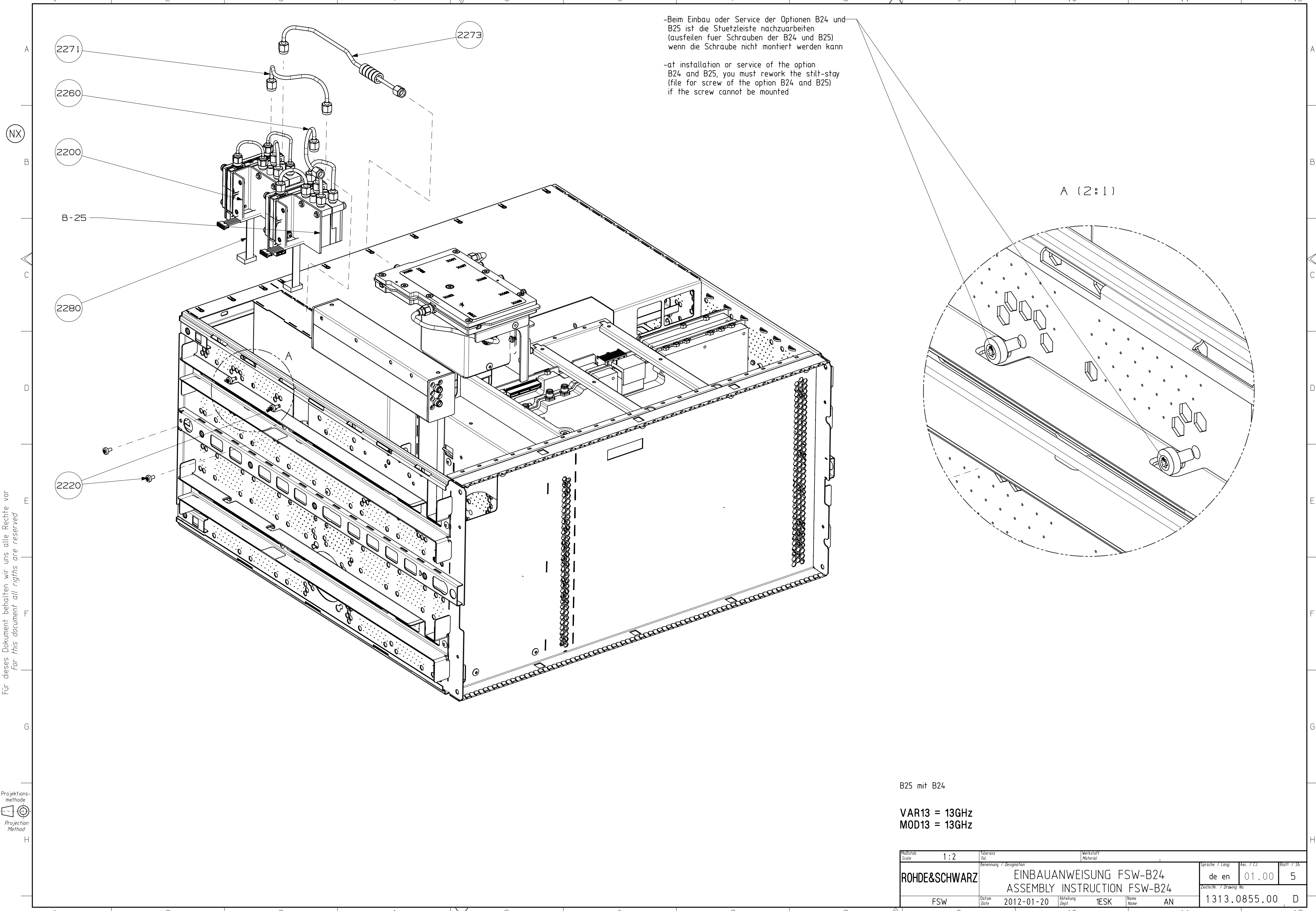
VAR13 = 8GHz
MOD13 = 8GHz

Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
ROHDE&SCHWARZ		EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24		de en	01.00	4
FSW	Datum Date	2012-01-20	Abteilung Dept.	1ESK	Name Name	AN
		1313.0855.00		D		

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Projektions-
methode
Projection
Method

(NX)



-Beim Einbau oder Service der Optionen B24 und B25 ist die Stuetzleiste nachzuarbeiten (ausfeilen fuer Schrauben der B24 und B25) wenn die Schraube nicht montiert werden kann
-at installation or service of the option B24 and B25, you must rework the stilt-stay (file for screw of the option B24 and B25) if the screw cannot be mounted

A (2:1)

B25 mit B24

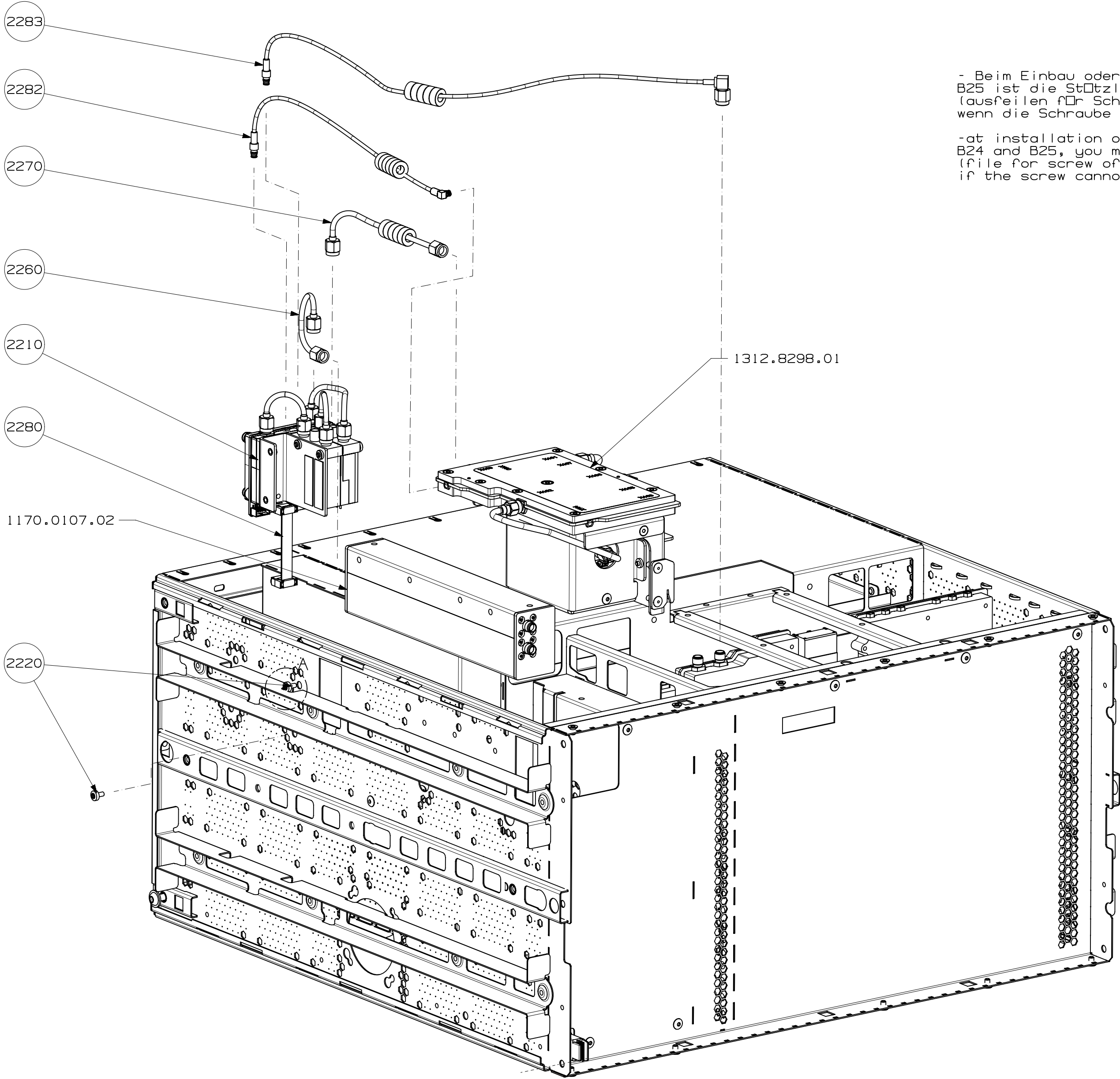
VAR13 = 13GHz
MOD13 = 13GHz

Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
ROHDE&SCHWARZ		EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24		de en	01.00	5
FSW	Datum Date	2012-01-20	Abteilung Dept.	1ESK	Name Name	AN
		Zeichn.Nr. / Drawing No.		1313.0855.00		D

(NX)

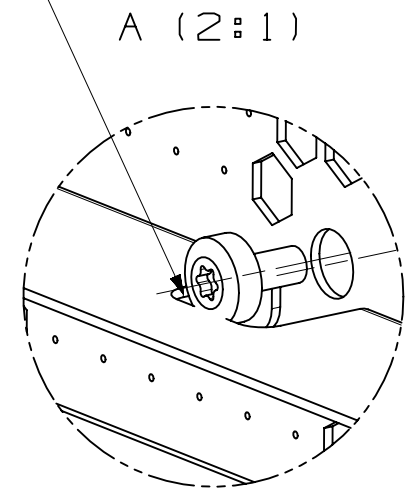
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Projektions-
methode
Projection
Method



- Beim Einbau oder Service der Optionen B24 und B25 ist die Stützleiste nachzufeilen (ausfeilen für Schrauben der B24 und B25) wenn die Schraube nicht montiert werden kann

- at installation or service of the option B24 and B25, you must rework the stilt-stay (file for screw of the option B24 and B25) if the screw cannot be mounted



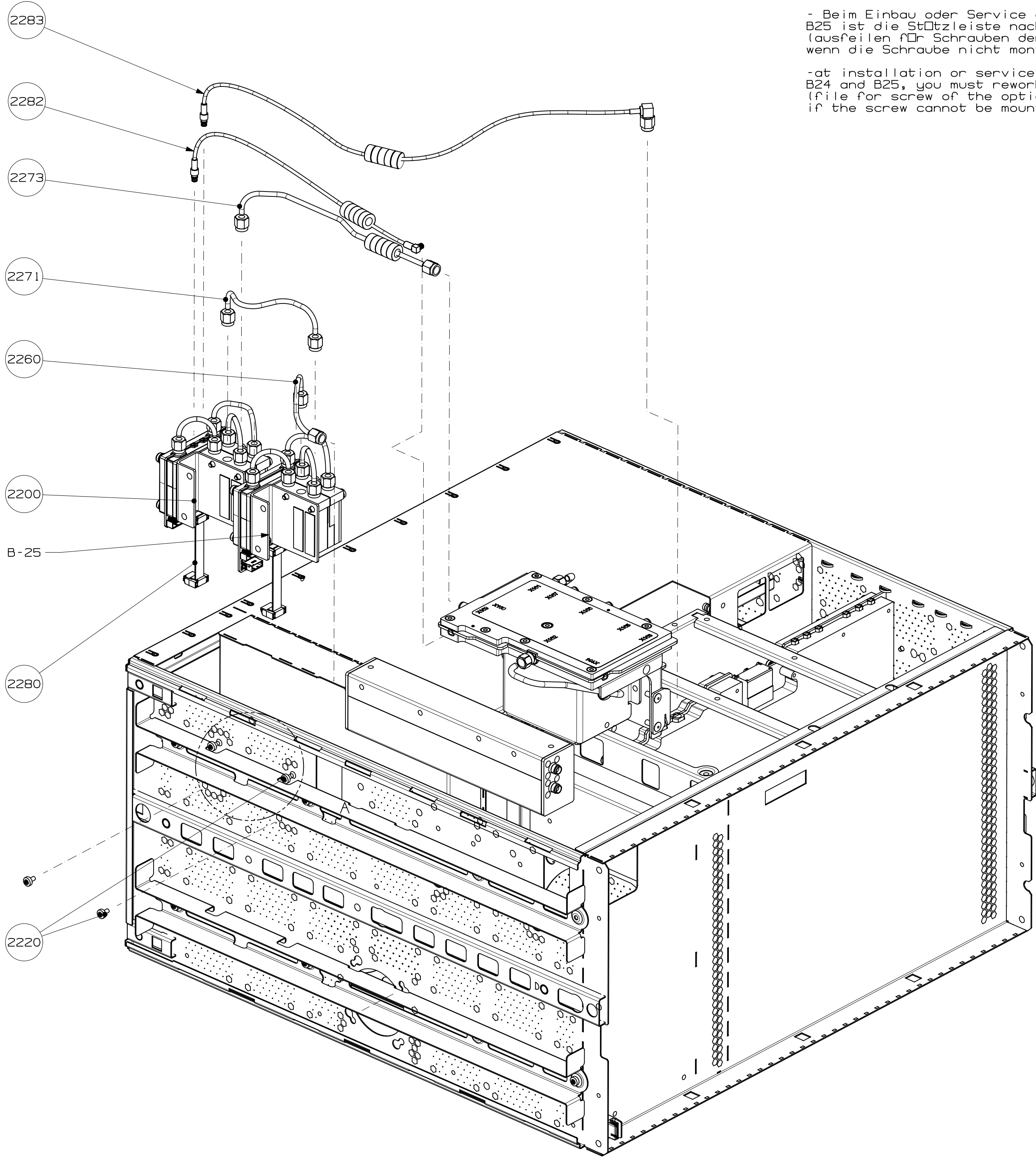
VAR26 = 26,5GHz
MOD26 = 26,5GHz

Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
ROHDE&SCHWARZ		EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24			de en 03.00	3
FSW	Datum Date	2014-05-27	Abteilung Dept.	1ESK	Name Name	AN/Ba
					Zeichn.Nr. / Drawing No.	1313.0855.00 D

(NX)

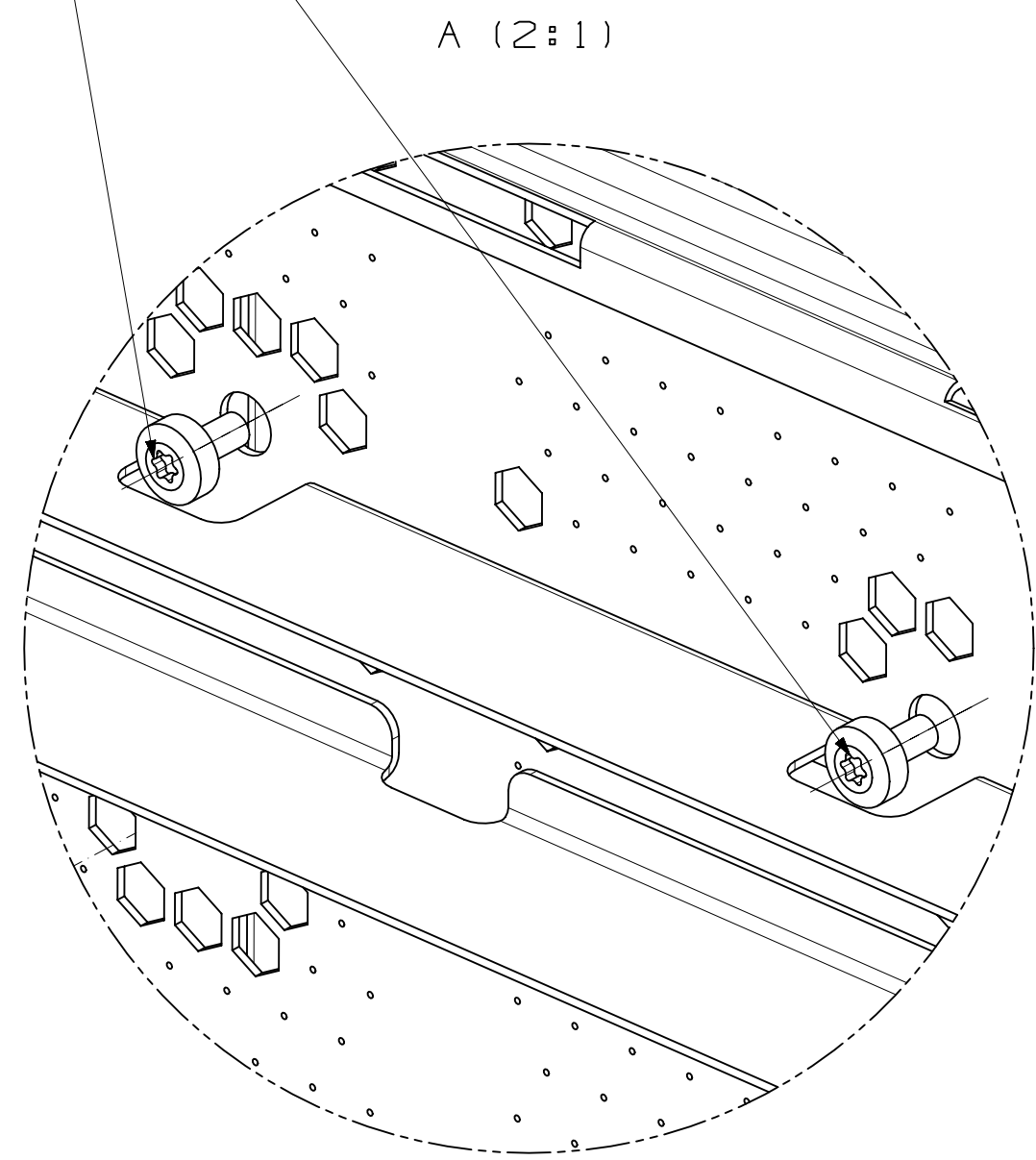
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Projektions-
methode
Projection
Method



- Beim Einbau oder Service der Optionen B24 und B25 ist die Stützleiste nachzufeilen (ausfeilen für Schrauben der B24 und B25) wenn die Schraube nicht montiert werden kann

- at installation or service of the option B24 and B25, you must rework the stilt-stay (file for screw of the option B24 and B25) if the screw cannot be mounted



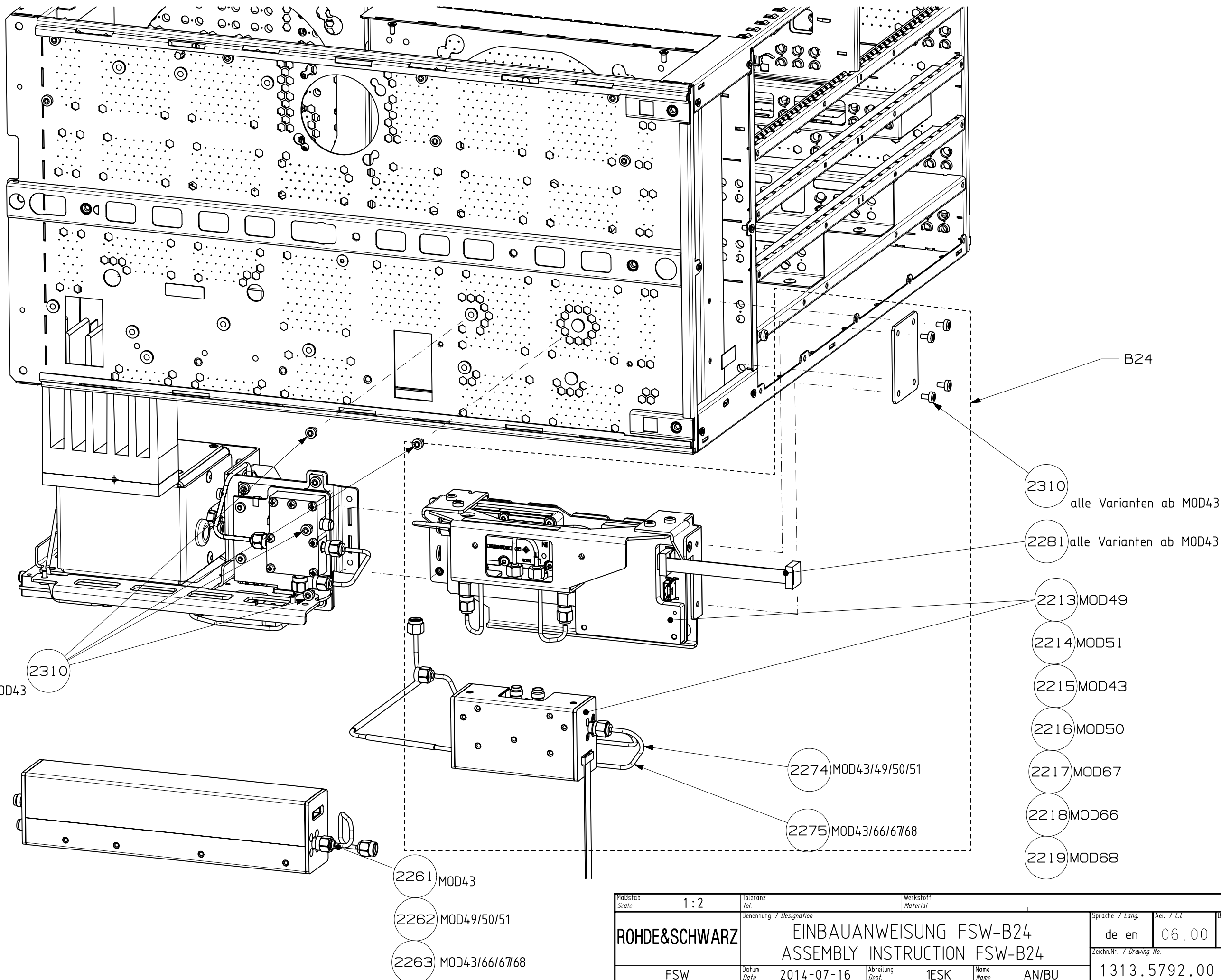
B25 mit B24

VAR26 = 26,5GHz
MOD26 = 26,5GHz

Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
ROHDE&SCHWARZ		EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24		de en	02.00	6
FSW	Datum Date	2014-05-27	Abteilung Dept.	1ESK	Name Name	AN/Ba
		Zeichn.Nr. / Drawing No.		1313.0855.00 D		

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Projektions-
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Method

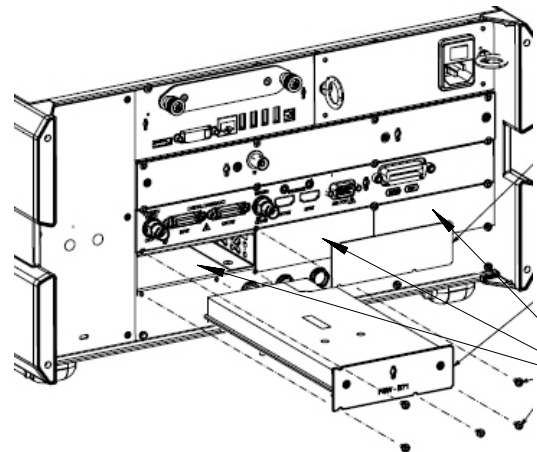


Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Ael. / C.I.	Blatt / Sh.
Benennung / Designation				de en	06.00	1
ROHDE&SCHWARZ				Zeichn.Nr. / Drawing No.		
EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24				1313.5792.00		
FSW	Datum Date	2014-07-16	Abteilung Dept.	1ESK	Name Name	AN/BU

1. Als erstes alle Kabel an das digitale Motherboard anschließen
2. Kabel durch Öffnung im Schweißrahmen stecken
3. Digitales Motherboard ein Schweißrahmen einschieben
4. Kabel nach Zeichnung D 1313.6082.00 D 3

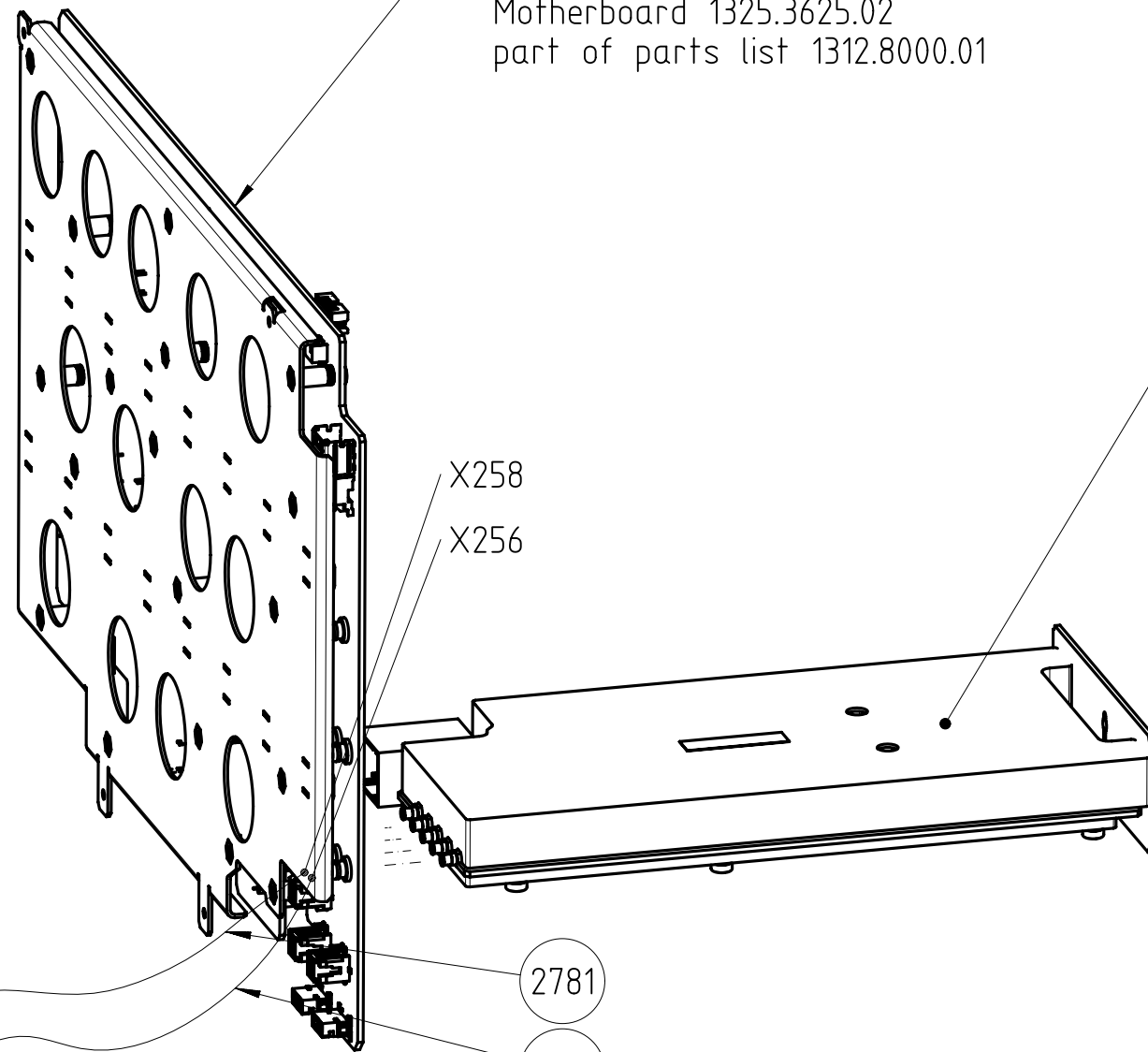
1. All cables must be mounted first on the digital motherboard
2. Put all cables through to the opening
3. Put the motherboard in the weld frame and fix it with screws
4. Lay cables according drawing D 1313.6082.00 D 3

VAR85



3x Schaumstoff beim Einbau der B71 entfernen

remove 3x foam during installation of B71



Motherboard 1325.3625.02
Teil der Stückliste 1312.8000.01

Motherboard 1325.3625.02
part of parts list 1312.8000.01

2710

X258

X256

2732

2836

X562

X561

2781

2801

Flexkabel auf Keyboard X48
flex cable to keyboard X48

RF-Connectorboard 1322.9651.02
Teil der Stückliste 1312.8000.01

RF-Connectorboard 1313.9651.02
part of parts list 1312.8000.01

1314.3429.00 Flex Strip
Teil der Stückliste 1312.8000.01

1314.3429.00 Flex Strip
part of parts list 1312.8000.01

Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Ael. / C.I.	Blatt / Sh.
ROHDE&SCHWARZ		FSW-B71 ANALOG BASE BAND INPUTS			de en	02.00
FSW-B71		FSW-B71 ANALOG BASE BAND INPUTS			1313.1651.01	
Datum Date	2015-06-23	Abteilung Dept.	1ESK	Name Name	AN/bu	D

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Maßeinheit
Measuring Unit
[mm]

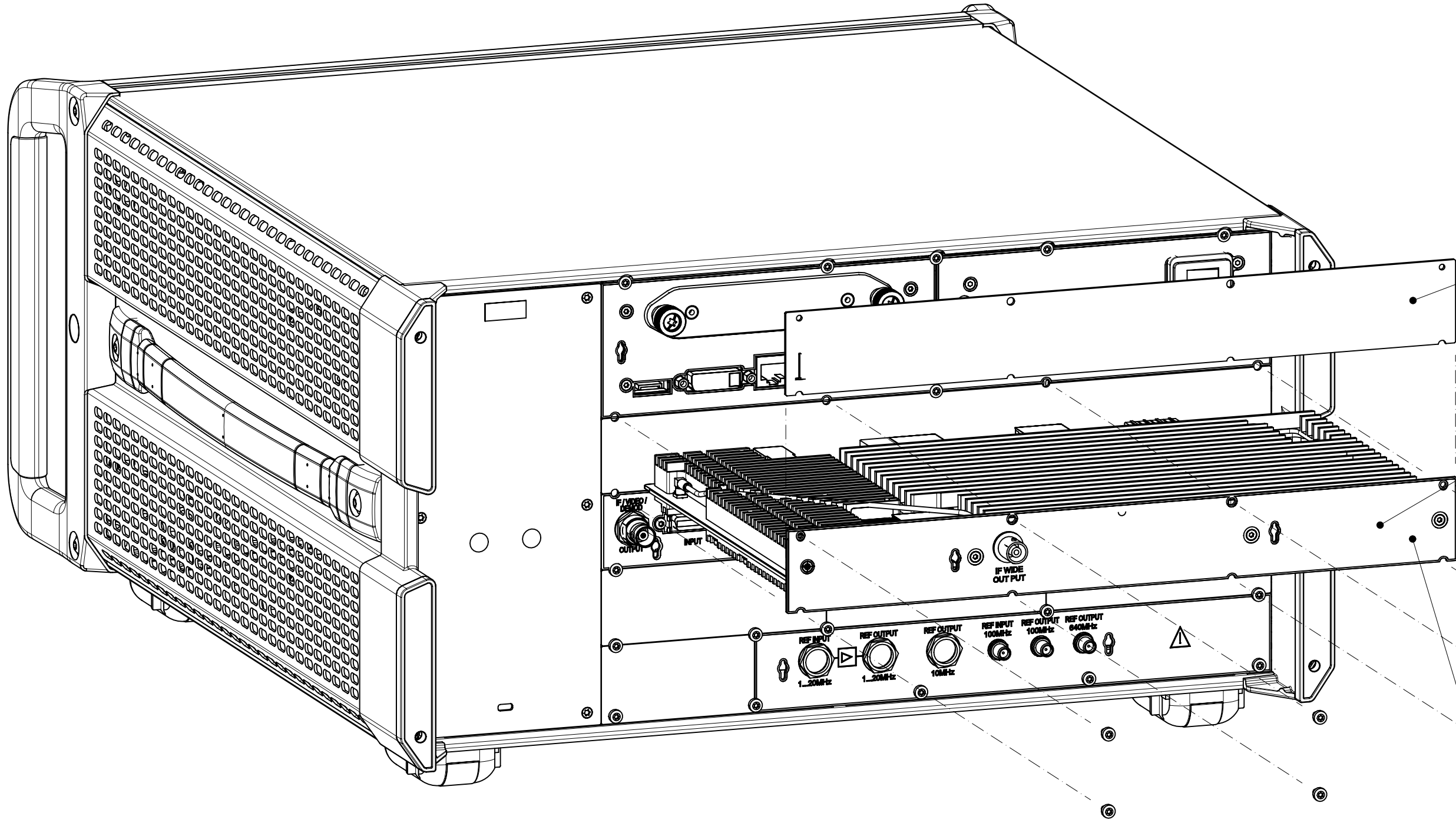
Projektions-
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A3

NX

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Projektions-
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entfernen
remove

Option R&S B160

Schrauben
screws

- Installation
- switch off the instrument and disconnected the power plug
 - unscrew the rear panel and insert the option B160
 - when pushing in make sure that the slides are met
 - after inserting, fix the module with the 8 rear screws

- Firmware
- Option FSW-B160 requires Firmware version 1.30 or higher.

- License Key
- switch on the instrument, wait until analyzer firmware is running
 - press the following keys:

- SETUP: System Config: Versions+Options: Install Option
- enter the option license key, press ENTER to terminate
 - reboot the instrument

- Verification
- press the following keys:

- SETUP: System Config: Versions+Options
- check entry 'B160' in option column

- Selfstest
- run selftest
 - press: SETUP: Service+Support: Selftest: Start selftest
 - wait until selftest has finished
 - check for Selftest state = PASSED (in the text box)

- Alignment
- run selfalignment, mandatory !
 - press: SETUP: Alignment: Start self alignment
 - wait until self alignment has finished
 - check for Alignment state = PASSED (in the text box)

No more functional tests necessary !

- Installation
- Gerät ausschalten und Netzstecker ziehen.
 - Rückwandblech lösen und die Option B160 einschieben.
 - Beim Einschieben darauf achten, dass die seitlichen Führungen getroffen werden.
 - Nach dem Einschieben die Baugruppe mit den 8 Rückwandschrauben festschrauben.

- Firmware
- Option R&S FSW-B160 erfordert die Firmware version 1.30 oder höher.

- License Key
- Gerät einschalten und warten bis die Firmware läuft.
 - Drücken Sie die folgenden Tasten

- SETUP: System Config: Versions+Options: Install option
- Geben Sie den Options-Lizenzcode ein und bestätigen mit Enter
 - Gerät neu starten

- Überprüfung
- Drücken Sie die folgenden Tasten:

- SETUP: System Config: Versions+Options
- Prüfen Sie den Eingang 'B160' in der Optionsspalte

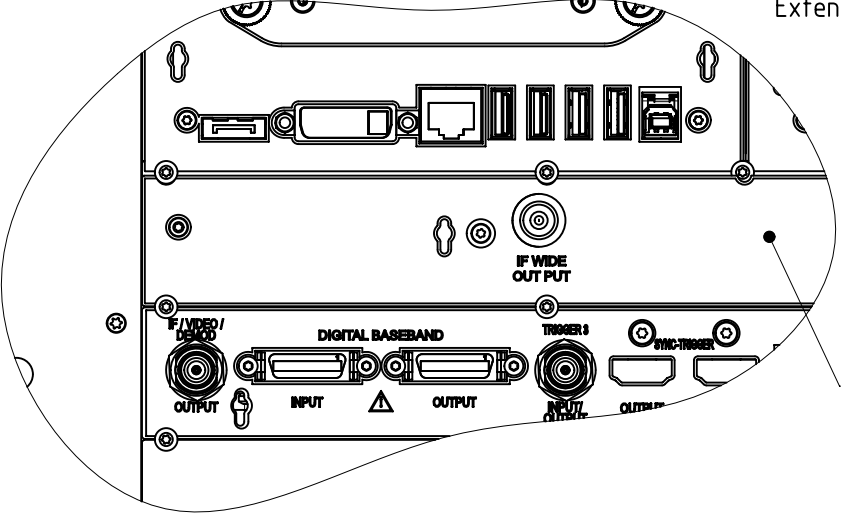
- Selbsttest
- Selbsttest starten
 - Drücken: SETUP: Service+Support: Selftest: Start Selftest
 - Warten bis der Selbsttest beendet ist
 - Kontrollieren ob "selftest state = PASSED" im Textfeld steht

- Abgleich
- Selbstabgleich durchführen, ist verpflichtend !
 - Drücken Sie: SETUP: Alignment: Start self alignment
 - Warten bis der Selbstabgleich beendet ist.
 - Kontrollieren ob "Alignment state = PASSED" im Textfeld steht

Keine weiteren Funktionstest erforderlich!

Beim Einbau in den neuen
Schweißrahmen 1313.6999.00
muss von der Detector Extension 1312.8200.02
das Rückwandblech getauscht werden.

When mounting in the new
welding frame 1313.6999.00,
the rear panel from the Detector
Extension 1312.8200.02 have to be changed.



neues Rückwandblech: 1322.7542.00
new rear panel: 1322.7542.00

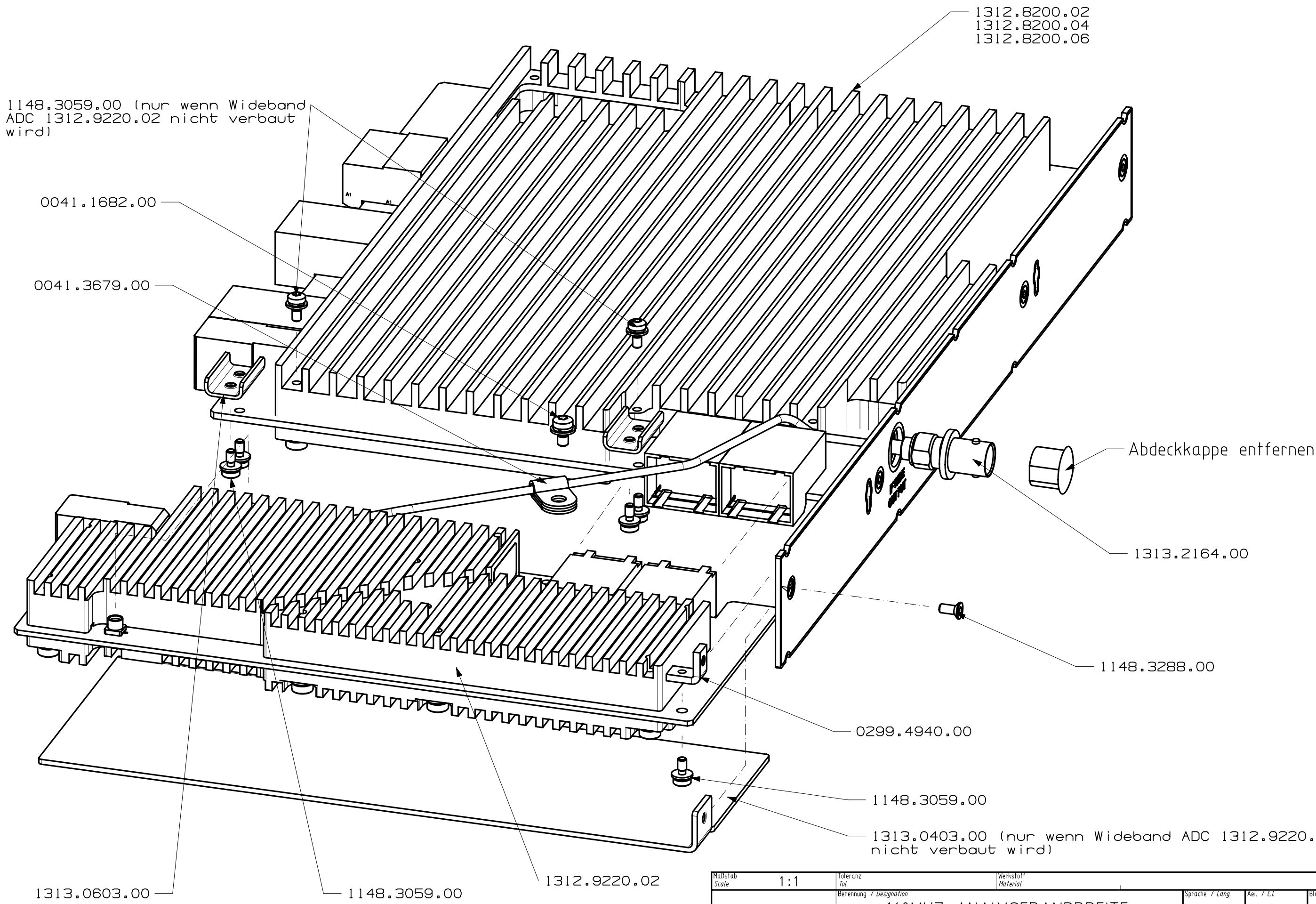
Maßstab Scale	1:2	Toleranz Tol.	ISO2768-m		Werkstoff Material						
ROHDE&SCHWARZ	Benennung / Designation					Sprache / Lang.		Aes. / C.C.		Blatt / Sh.	
	ASSEMBLY INSTRUCTION FSW OPTION B160					de en		05.00		1	
	ASSEMBLY INSTRUCTION FSW OPTION B160					Zeichn.Nr. / Drawing No.					
FSW-B160	Datum Date	2013-10-08		Abteilung Dept.	IESK	Name Name	AN/BU		1313.3777.00		D

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Maßeinheit
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Maßstab Scale	1:1	Toleranz Tol.	Werkstoff Material			
Benennung / Designation				Sprache / Lang.	Ael. / C.I.	Blatt / Sh.
ROHDE&SCHWARZ				de en	06.00	1
160MHZ ANALYSEBANDBREITE 160MHZ ANALYSIS BANDWIDTH				Zeichn.Nr. / Drawing No.		
FSW-B160				1313.1668.01		
Datum Date		2015-01-27	Abteilung Dept.	1ESK	Name Name	Wn

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Projektions-
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A3

Option FSW-B500 Requirements for FSW-U500 and FSW-B500 upgrade:

Motherboard:
Motherboard 1313.4180.02 (old chassis) or 1313.7698.02 (new chassis)
If Motherboard 1313.2070.02 is installed, update to 1313.4180.02 is necessary.

Referenz:
1312.8075.06 is necessary

Options:
Minimum FSW-B80 or FSW-U80 (needed for FSU-U500)

Existing FSW-B160 or FSW-B320 will be replaced by FSW-U500
FSW-B160R will not function after upgrade.

Installation

- switch off the instrument and disconnected the power plug
- unscrew left rear wall and remove it against the new one
- fix it with the two screws on the bottom side
- unscrew the rear panel or option R&S FSW-B160 and remove it
- Insert the Option to the instrument, when pushing in make sure that the slides are met
- after inserting, fix the module with all the rear screws

Firmware

- Option R&S FSW-U500 or FSW-B500 requires Firmware version 1.90 or higher.

License Key

- switch on the instrument, wait until analyzer firmware is running
- First uninstall option keys B160/U160/B320/U320 if existing
- Install license key by pressing the following keys:
SETUP: System Config: Versions+Options: Install Option
- enter the option license key, press ENTER to terminate
- reboot the instrument

Verification

- press the following keys:
SETUP: System Config: Versions+Options
- check entry 'U500' or "B500" in option column

Perform frequency response correction

- with program FSW-Service version minimum 4.25

Functional check

- run selftest
- press: SETUP: Service+Support: Selftest: Start selftest
- wait until selftest has finished
- check for Selftest state = PASSED (in the text box)

Alignment

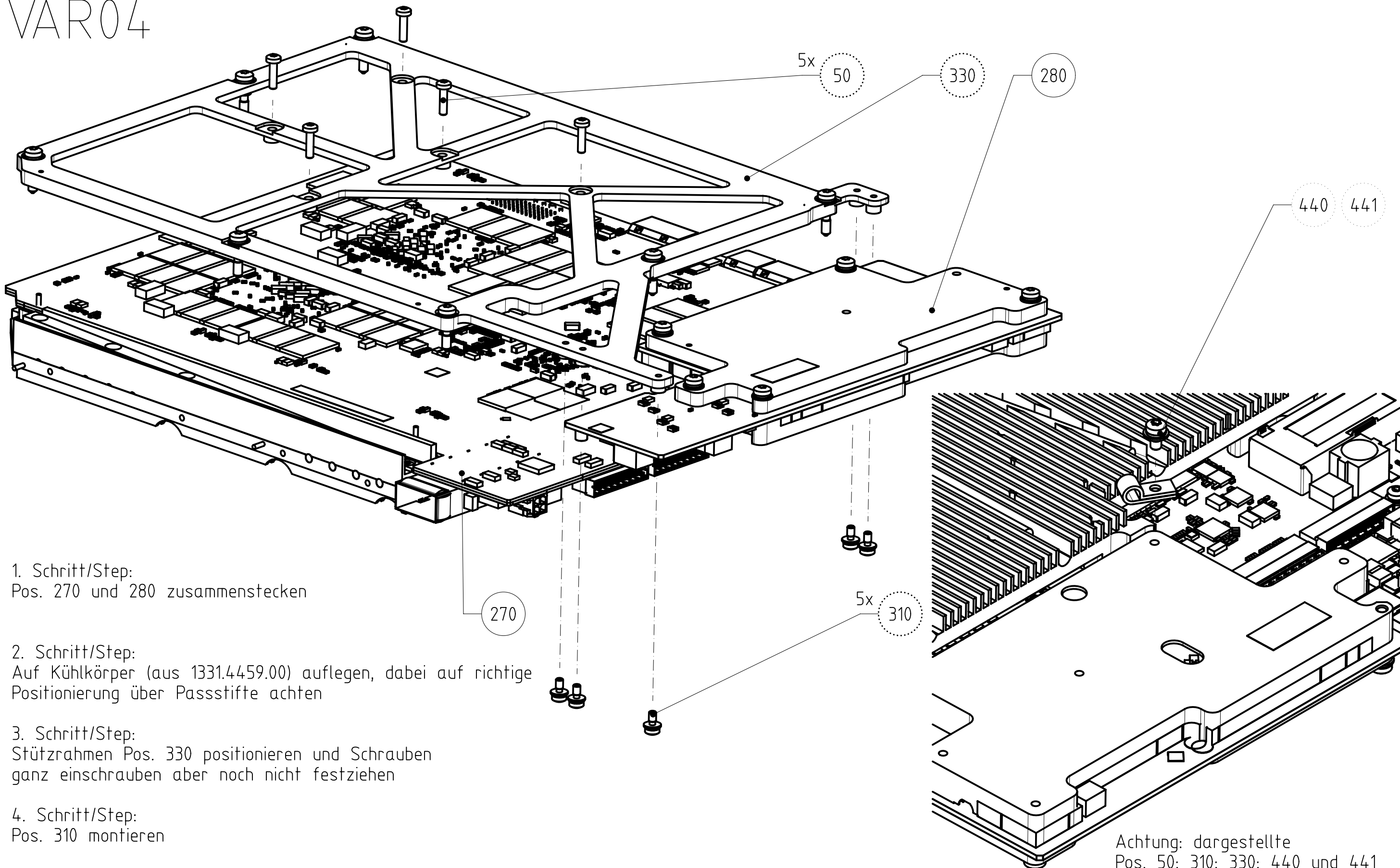
- run selfalignment, mandatory !
- press: SETUP: Alignment: Start self alignment
- wait until self alignment has finished
- check for Alignment state = PASSED (in the text box)

No further functional tests necessary !



Maßstab Scale	Toleranz Tol.	Werkstoff Material			
ROHDE&SCHWARZ	Benennung / Designation		Sprache / Lang.	Ael. / C.I.	Blatt / Sh.
	MONTAGEANWEISUNG FSW-U500/B500 ASSEMBLY INSTRUCTION FSW-U500/B500		de en	02.00	1
FSW-B500	Datum Date	2013-12-12	Abteilung Dept.	1ESK	Name Name BC
			Zeichn.Nr. / Drawing No. 1325.1700.00 D		

VAR04



1. Schritt/Step:
Pos. 270 und 280 zusammenstecken

2. Schritt/Step:
Auf Kühlkörper (aus 1331.4459.00) auflegen, dabei auf richtige
Positionierung über Passstifte achten

3. Schritt/Step:
Stützrahmen Pos. 330 positionieren und Schrauben
ganz einschrauben aber noch nicht festziehen

4. Schritt/Step:
Pos. 310 montieren

5. Schritt/Step:
Pos. 50 montieren und Schrauben von Pos. 330 festziehen.

6. Schritt/Step:
Pos. 440 und Pos. 441 montieren

Achtung: dargestellte
Pos. 50; 310; 330; 440 und 441
aus 1331.4459.00 !

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Maßeinheit
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[mm]

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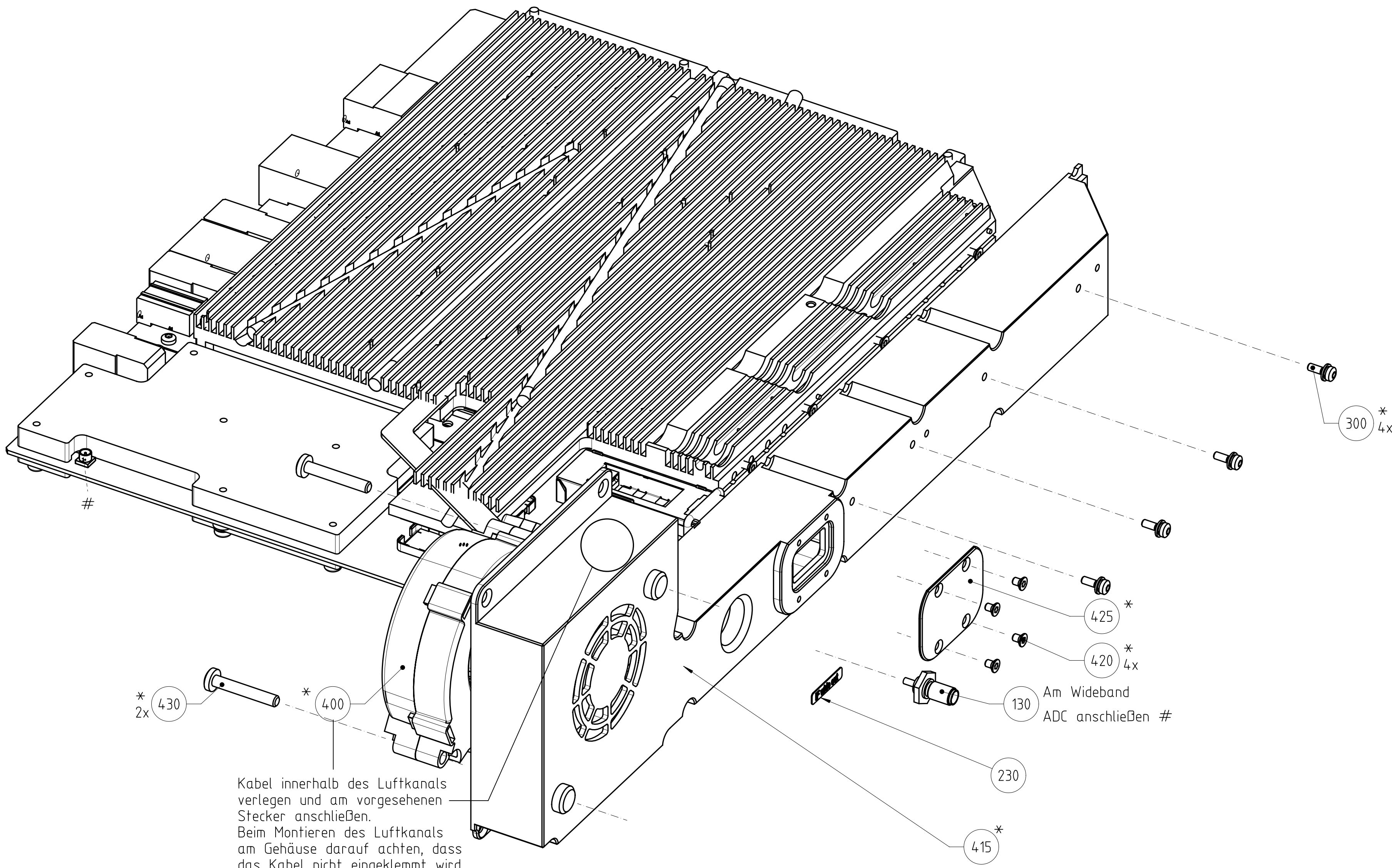
Maßstab Scale	Toleranz Tol.	ISO2768-m	Werkstoff Material	
Benennung / Designation	FSW-B500 ANALYSIS BANDW. 500MHZ			Sprache / Lang.
FSW-B500	FSW-B500 ANALYSIS BANDW. 500MHZ			de en
Datum Date	2015-06-29	Abteilung Dept.	1ESK	Name Name
				AN/GP
				Zeichn.Nr. / Drawing No.
				1313.4296.01
				Blatt / Sh.
				1
				D

(NX)

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Projektions-
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A2



* Positionsnummern aus 1322.8610.00
order positions from 1322.8610.00

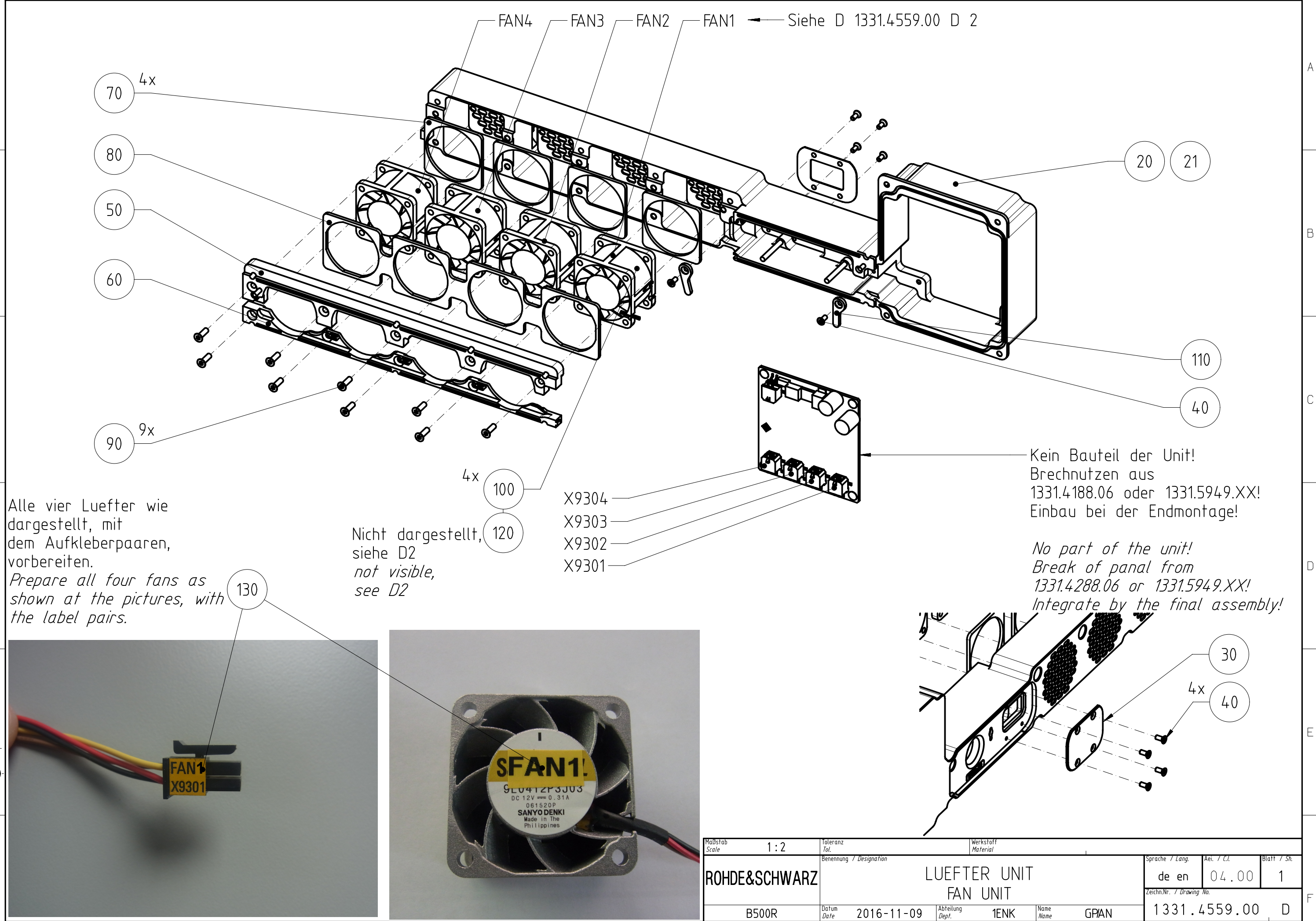
Maßstab Scale	1:1	Toleranz Tol.		Werkstoff Material		Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
Benennung / Designation	ROHDE&SCHWARZ FSW-B500 ANALYSIS BANDW. 500MHZ						de en	03.00
Datum Date	2014-05-14	Abteilung Dept.	1ESK	Name Name	BC/BU	Zeichn.Nr. / Drawing No. 1313.4296.01		
FSW-B500						2		

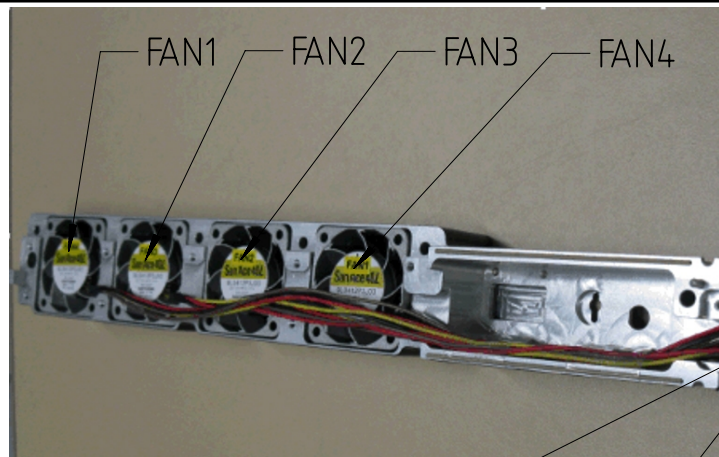
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Maßeinheit
Measuring
Unit
[mm]

Projektions-
methode
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A3





Einbau der Luefter incl. der Aufkleber
Pos. 130
Mounting of the fans incl. the
labels Pos. 130.

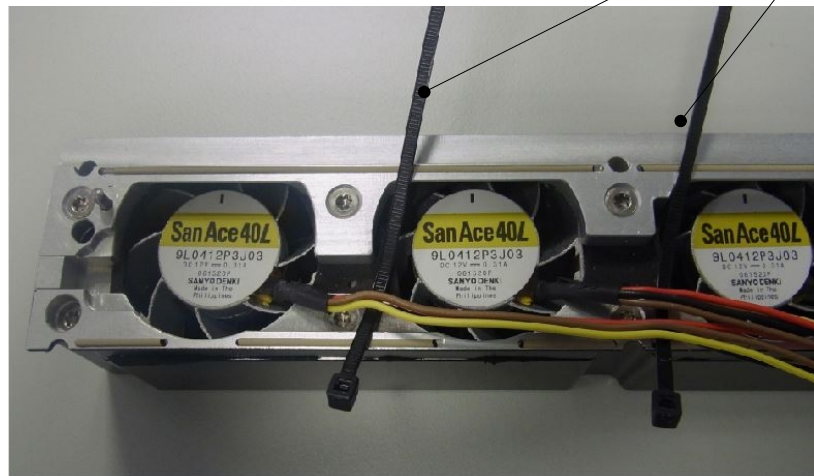
120

Schritt 1:

Kabel der linken beiden Luefter
mit Pos.120 zusammenbinden und
nach unten legen. Pos. 120
durch die Durchbrueche stecken.
Ueberstehenden Kabelbinder
abschneiden.

step 1:

Put cable of both fans on the
left side (Pos.120) together and
put them downstairs through
the cut-outs. Cut the overlaying
binder.



Schritt 2:

Kabel der rechten beiden
Luefter in der Mitte
entlangfuehren.

step 2:

Put the cables of both fans
on the right side through the
middle.



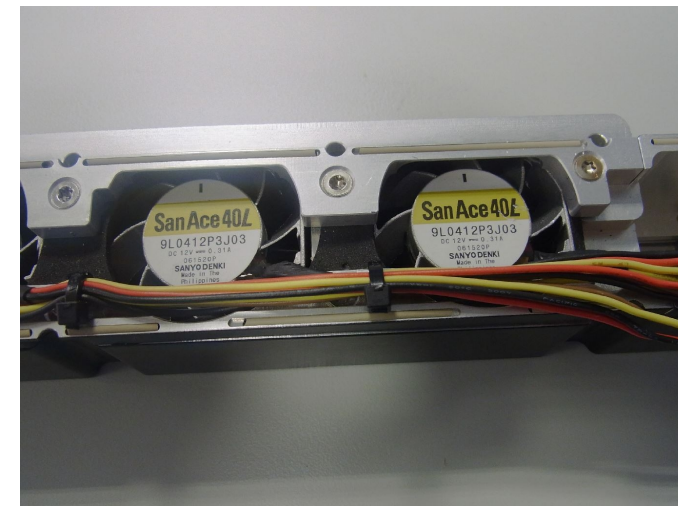
120

Schritt 3:

Die unteren Kabel mit Pos. 120
zusammenbinden. Dabei Pos. 120
durch die Durchbrueche stecken.
Ueberstehenden Kabelbinder
abschneiden.

step 3:

Put the cables on the
bottom with pos. 120 together
and put them through the cut-outs.
Cut overlaying binder.

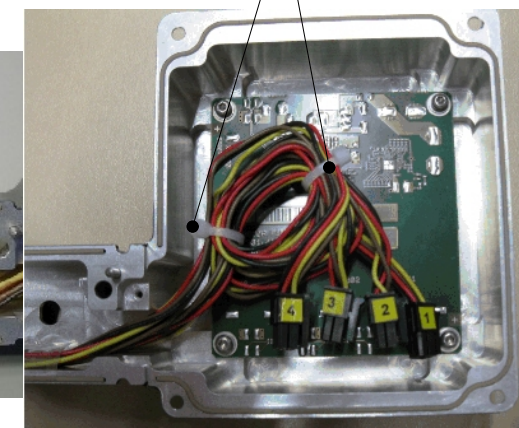
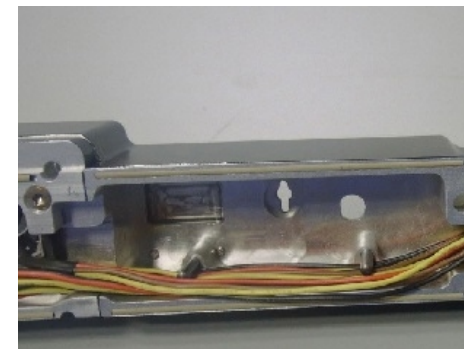


Schritt 4:

Kabel unterhalb der
Passtifte verlegen
(siehe Schritt 5)

step 4:

Put the cable below
the fixing pin (see step 5)



120

Schritt 5:

Kabel zusammenrollen,
und 2x mit Pos. 120
zusammenbinden.
Ueberstehende
Kabelbinder abschneiden.
Stecker nach Aufkleber
und Steckplatz-
beschriftung anstecken.

Step 5:

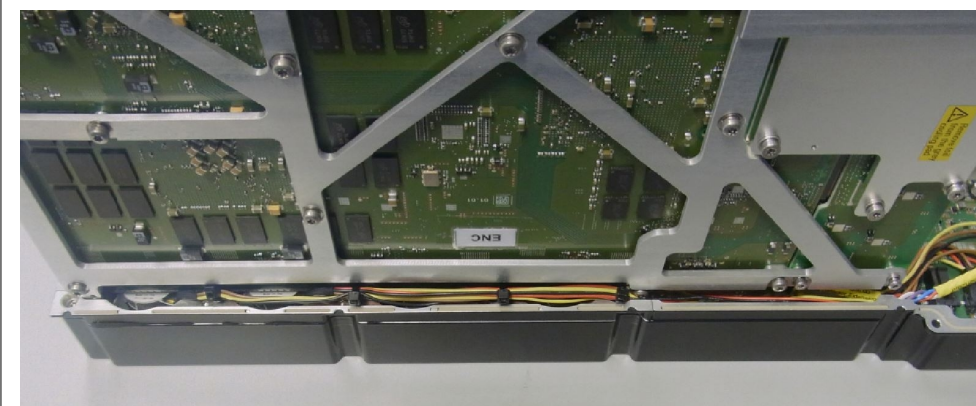
Roll up the cable
and put it 2x with
Pos. 120 together.
Cut the overlaying
binders. Connect the
connectors like the
label and the slot-
lettering on the
board is showing.

Schritt 6:

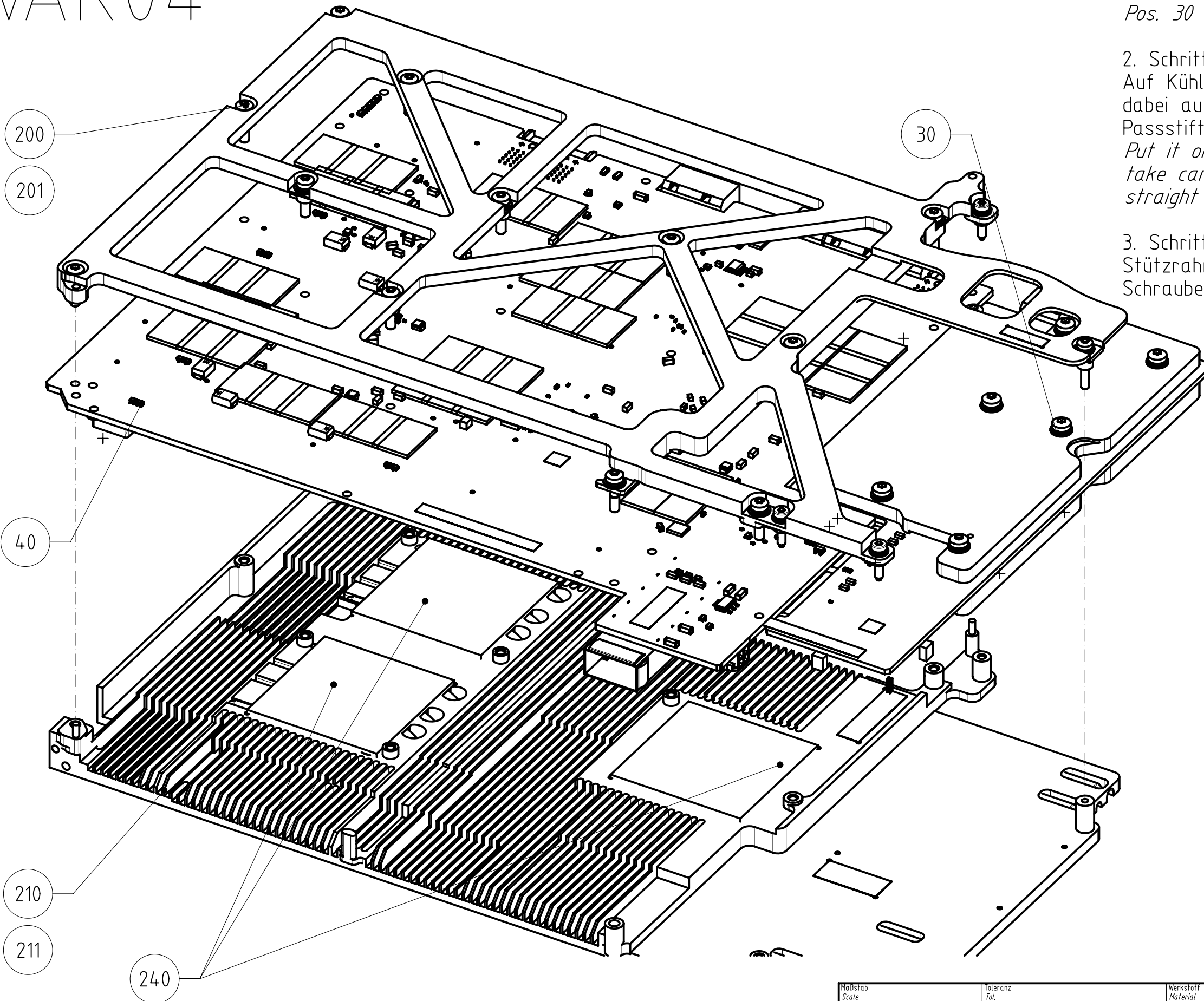
Montieren des Bleches
Pos. 110 mit Pos. 40.
Kabel zuvor unter
Pos. 110 verlegen.
(siehe 1331.4559.01 D1)

step 6:

At first lay the cable
under pos. 110.
(see D 1331.4559.01 D 1)
Mounting of the sheet
pos. 110 with pos. 40.



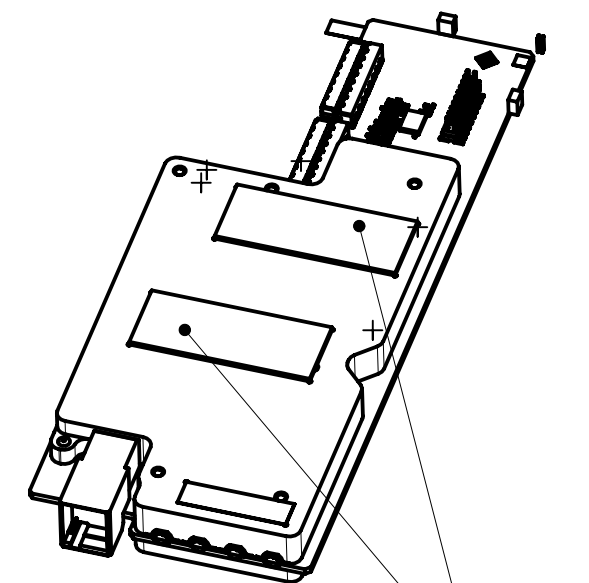
Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Ael. / C.I.	Blatt / Sh.
ROHDE&SCHWARZ	Benennung / Designation	LUEFTER UNIT FAN UNIT	de en	03.00	2
B500R	Datum Date	2015-09-23	Abteilung Dept.	1ENK	Name Name
				AN/GP	
					1331.4559.00 D



1. Schritt/Step
Pos. 30 und 40 zusammenstecken
Pos. 30 and 40 stick together

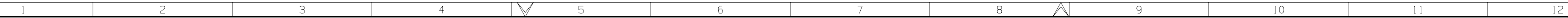
2. Schritt/Step
Auf Kühlplatte B512R Pos. 210/211 auflegen,
dabei auf richtige Positionierung über
Passstifte achten
*Put it on the cooling plate B512R Pos.210/211,
take care of the positioning by the
straight pin*

3. Schritt/Step
Stützrahmen Pos. 200/201 positionieren und
Schrauben ganz einschreiben und festziehen
*Support B512R Pos. 200/201 positioning
and tighten the screws*



Pos. 220: Auf ADC-Board Pos. 30 montieren
Pos. 220: Mounting on ADC-Board Pos. 30

Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Ael. / C.I.	Blatt / Sh.
ROHDE&SCHWARZ	Benennung / Designation		de en	04.00	1
	FSW-B1200 ANALYSIS BANDW. 1200MHZ		Zeichn.Nr. / Drawing No.		
	FSW-B1200 ANALYSIS BANDW. 1200MHZ		1331.6400.01 D		
FSW-B1200	Datum Date	2016-12-23	Abteilung Dept.	1ENK	Name Name
					GP



1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

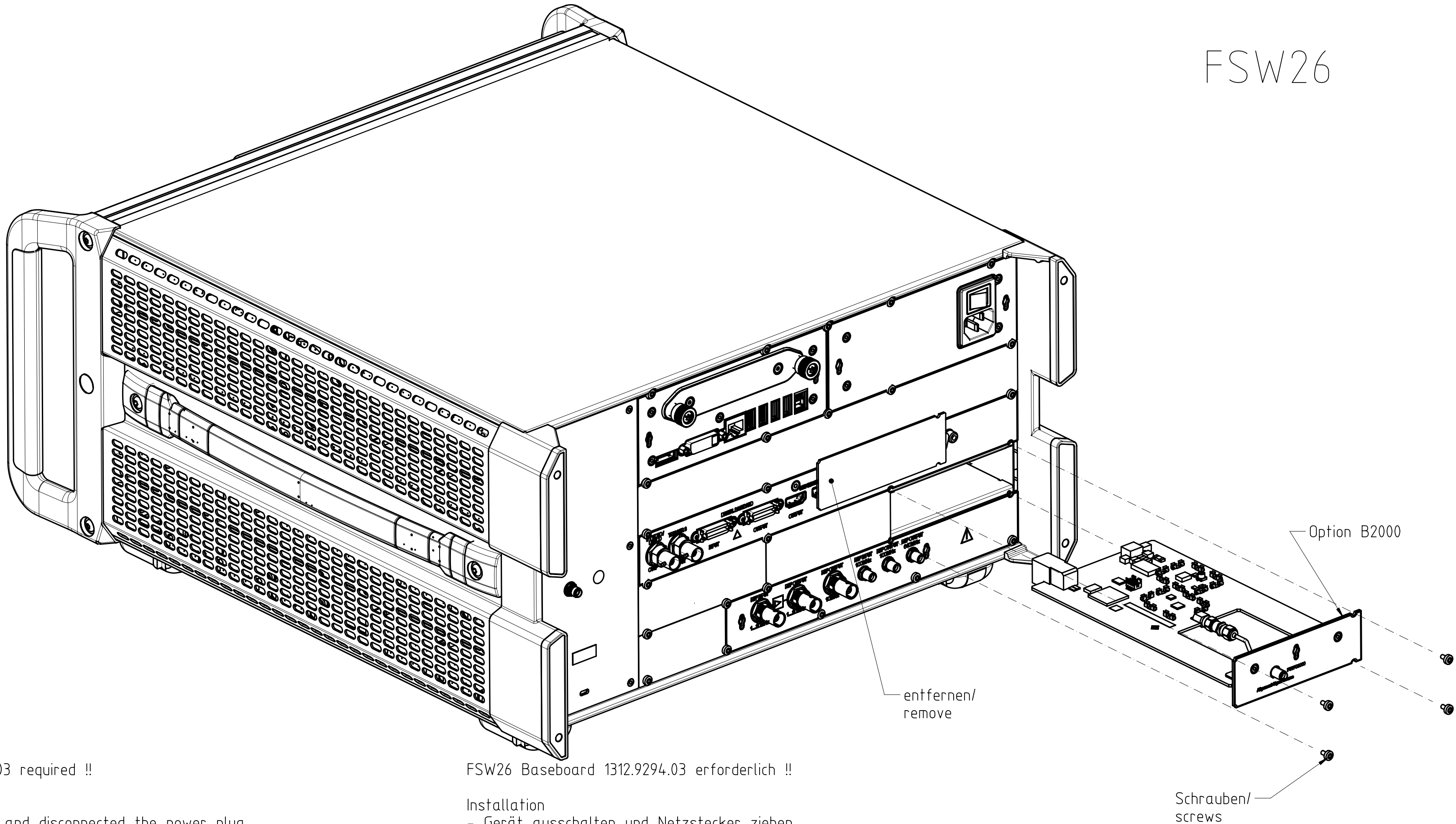
NX

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Maßeinheit
Measuring Unit
[mm]

Projektions-
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A2



FSW26

FSW26 Baseboard 1312.9294.03 required !!

Installation

- switch off the instrument and disconnected the power plug
- unscrew the rear panel, remove foam and insert the option B2000
- when pushing in make sure that the slides are met
- after inserting, fix the module with the 4 rear screws
- Install Option Key (Setup: System Config: Versions + Options: Install Option by XML)

Firmware

- Option FSW-B2000 requires Firmware version 2.20 or higher.

Verification

- press the following keys:

SETUP: System Config: Versions+Options

- check the option list for 2000MHz Analysis Bandwidth B2000

Calibration

- Perform FSW-B2000 Frequency Response Calibration (Level & Phase)

FSW26 Baseboard 1312.9294.03 erforderlich !!

Installation

- Gerät ausschalten und Netzstecker ziehen.
- Rückwandblech lösen, Schaumstoff herausziehen und die Option B2000 einschieben.
- Beim Einschieben darauf achten, dass die seitlichen Führungen getroffen werden.
- Nach dem Einschieben die Baugruppe mit den 4 Rückwandschrauben festschrauben.
- Option Setup Key (Sytem Config: Versions + Options: Install Option by XML)

Firmware

- Option FSW-B2000 erfordert die Firmware version 2.20 oder höher.

Überprüfung

- Drücken Sie die folgenden Tasten:

SETUP: System Config: Versions+Options

- Prüfen ob die Optionsliste den Eintrag 2000MHz Analysis Bandwidth B2000 enthält.

Kalibrieren

- FSW-B2000 Frequenzgang - Kalibrierung ausführen (Pegel & Phase)

Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
ROHDE&SCHWARZ	Benennung / Designation	EINBAUANWEISUNG FSW - B2000 ASSEMBLY INSTRUCTION FSW - B2000	de en	02.00	1
FSW-B2000	Datum Date	2015-01-15	Abteilung Dept.	1ESK	Name AN/BU
					1325.4773.00 D