R&S®FSW
Signal and Spectrum Analyzer
Service Manual

1173.9428.02 – 11

Test and Measurement

Service Manual

ROHDE&SCHWARZ

The Service Manual describes the following R&S®FSW models with firmware version 1.90 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)

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.

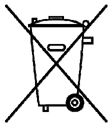
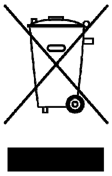
The product is used for its designated purpose if it is used in accordance with its product documentation and within its performance limits (see data sheet, documentation, the following safety instructions). Using the product requires technical skills and, in some cases, a basic knowledge of English. 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 supply voltage
	Caution when handling heavy equipment		Standby indication
	Danger of electric shock		Direct current (DC)

Symbol	Meaning	Symbol	Meaning
	Warning! Hot surface	~	Alternating current (AC)
	Protective conductor terminal	≂	Direct/alternating current (DC/AC)
	Ground		Device fully protected by double (reinforced) insulation
	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 additonal information, see section "Waste disposal/Environmental protection", item 2.
	Warning! Laser radiation For additional information, see section "Operation", item 7.		

Signal words and their meaning

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

⚠ DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates information considered important, but not hazard-related, e.g. messages relating to property damage. In the product documentation, the word ATTENTION is used synonymously.

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

Operating states and operating positions

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

1. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products: predefined operating position is always with the housing floor facing down, IP protection 2X, use only indoors, max. operating altitude 2000 m above sea level, max. transport altitude 4500 m above sea level. A tolerance of ±10 % shall apply to the nominal voltage and ±5 % to the nominal frequency, overvoltage category 2, pollution severity 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 AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with 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 AC supply network, or if the power switch is not suitable for this purpose, use the plug of the connecting cable to disconnect the product from the AC supply network. In such cases, always ensure that the power plug is easily reachable and accessible at all times. For example, if the power plug is the disconnecting device, the length of the connecting cable must not exceed 3 m. Functional or electronic switches are not suitable for providing disconnection from the AC supply network. If products without power switches are integrated into racks or systems, the disconnecting device must be provided at the system level.
5. Never use the product if the power cable is damaged. Check the power cables on a regular basis to ensure that they are in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by, for example, tripping over the cable or suffering an electric shock.

6. The product may be operated only from TN/TT supply networks fuse-protected with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket provided for this purpose. Otherwise, sparks that result in fire and/or injuries may occur.
8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
9. For measurements in circuits with voltages V_{rms} > 30 V, suitable measures (e.g. appropriate measuring equipment, fuse protection, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC60950-1/EN60950-1 or IEC61010-1/EN 61010-1 standards that apply in each case.
11. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
12. If a product is to be permanently installed, the connection between the protective conductor terminal on site and the product's protective conductor must be made first before any other connection is made. The product may be installed and connected only by a licensed electrician.
13. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fuse-protected in such a way that anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.
14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.
15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.
16. Unless specified otherwise, products are not liquid-proof (see also section "Operating states and operating positions", item 1). Therefore, the equipment must be protected against penetration by liquids. If the necessary precautions are not taken, the user may suffer electric shock or the product itself may be damaged, which can also lead to personal injury.
17. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product has been moved from a cold to a warm environment. Penetration by water increases the risk of electric shock.
18. Prior to cleaning the product, disconnect it completely from the power supply (e.g. AC supply network or battery). Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluents for cellulose lacquers.

Operation

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

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

Repair and service

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

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

Batteries and rechargeable batteries/cells

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

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

Transport

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

Waste disposal/Environmental protection

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

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

Instrucciones de seguridad elementales

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

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

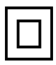
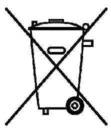
Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto está destinado exclusivamente al uso en la industria y el laboratorio o, si ha sido expresamente autorizado, para aplicaciones de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa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

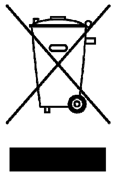
Se parte del uso correcto del producto para los fines definidos si el producto es utilizado conforme a las indicaciones de la correspondiente documentación del producto y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso del producto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

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

Señalización de seguridad de los productos

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

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

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

Palabras de señal y su significado

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

⚠ PELIGRO	Indica una situación de peligro que, si no se evita, causa lesiones graves o incluso la muerte.
⚠ ADVERTENCIA	Indica una situación de peligro que, si no se evita, puede causar lesiones graves o incluso la muerte.
⚠ ATENCIÓN	Indica una situación de peligro que, si no se evita, puede causar lesiones leves o moderadas.
AVISO	Indica información que se considera importante, pero no en relación con situaciones de peligro; p. ej., avisos sobre posibles daños materiales. En la documentación del producto se emplea de forma sinónima el término CUIDADO.

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

Estados operativos y posiciones de funcionamiento

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

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

Seguridad eléctrica

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

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

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

Funcionamiento

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

Reparación y mantenimiento

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

Baterías y acumuladores o celdas

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

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

Transporte

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

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

Eliminación/protección del medio ambiente

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

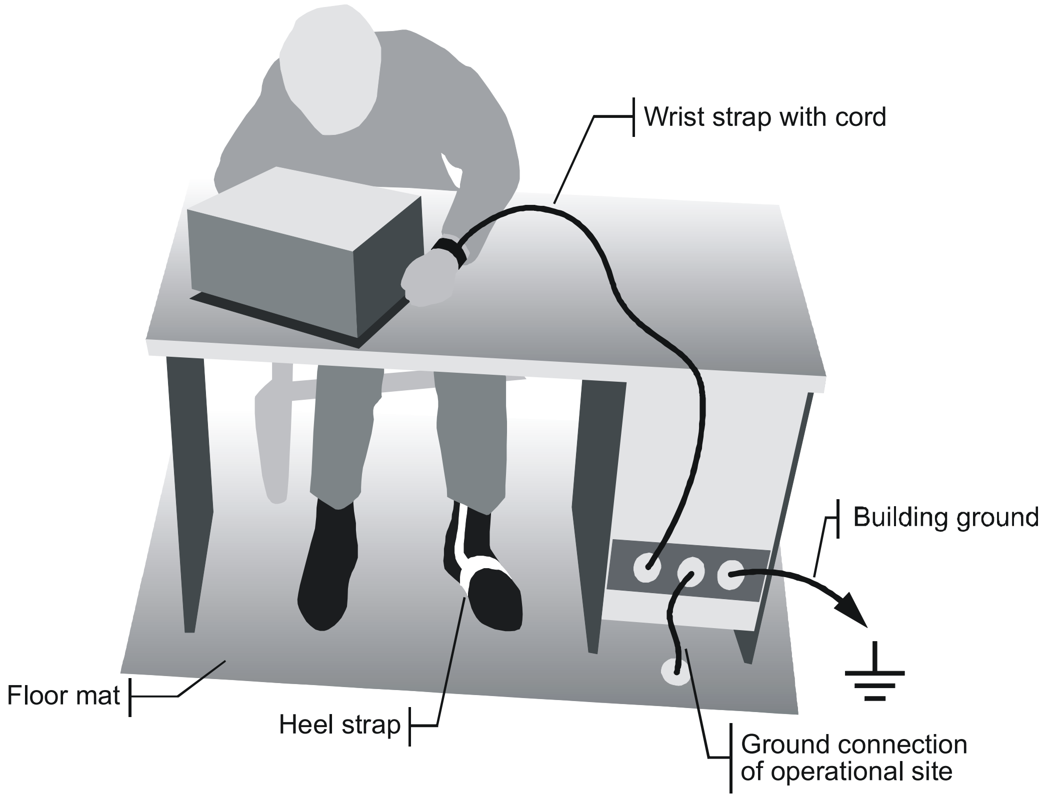
Se puede encontrar más información sobre la protección del medio ambiente en la página web de Rohde & Schwarz.

Instructions for Electrostatic Discharge Protection

NOTICE

Risk of damaging electronic components

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



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

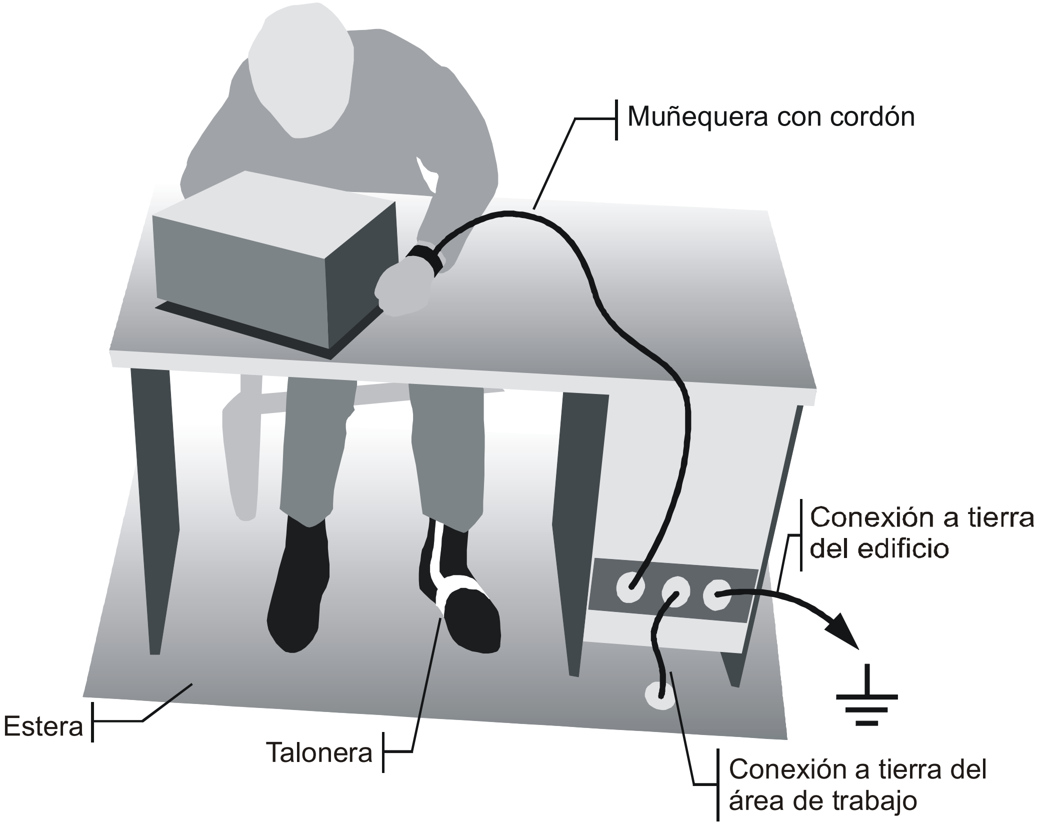
- Wrist strap with cord to ground connection
- Conductive floor mat and heel strap combination

Instrucciones para la protección contra descargas electroestáticas

AVISO

Riesgo de avería de los componentes electrónicos

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



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

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

Procedure in Case of Service and Ordering of Spare Parts

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

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

Shipping the Instrument

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

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

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

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

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

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

Shipping Defective Modules

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

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

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

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

Ordering Spare Parts

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

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

Refurbished Modules

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

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

Taking Back Defective Replaced Modules

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

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

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

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

Table of Contents

Index

Documentation Overview

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

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

Online Help

The Online Help is embedded in the instrument's firmware. It offers quick, context-sensitive access to the complete information needed for operation and programming.

Getting Started

This manual is delivered with the instrument in printed form and in PDF format on the CD. It provides the information needed to set up and start working with the instrument. Basic operations and basic measurements are described. Also a brief introduction to remote control is given. The manual includes general information (e.g. Safety Instructions) and the following chapters:

User Manuals

User Manuals are provided for the base unit and each additional (software) option.

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

Service Manual

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

Release Notes

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

1 Performance Test

1.1 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: 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:≤ 0.3dB 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

Item	Type of equipment	Recommended characteristics or features	Recommended model	R&S Order No.	Application
6	Power meter	-30 dBm to +10 dBm Instrumentation uncertainty<0.5%	R&S NRP	1143.8500.02	Frequency response 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 NRP-Z55 R&S NRP-Z56 R&S NRP-Z57	1138.2008.02 1171.8201.02 1171.8401.02	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: 20 MHz to 40 GHz	R&S ZVA	1145.1110.10 1145.1110.24 1145.1110.24 1145.1110.40	VSWR
12	Voltmeter	20 Hz to 9 kHz	R&S URE2	0350.5315.02	B29, frequency response
13	50 Ω termination	BNC, 50 Ω ± 0.1 %	RAD 50	0844.9352.02	B29, 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	fin : 25 – 33.5 GHz fout : 50 – 67 GHz fundamental wave suppression:< 10dBc	Marki Microwave D-0365		RF-source for measurements > 50 GHz

Item	Type of equipment	Recommended characteristics or features	Recommended model	R&S Order No.	Application
18	Driving amplifier for frequency doubler	Frequency range: 25 – 33.5 GHz Output power: > 15dBm	Marki Microwave AG-2044V		Driving amplifier for frequency doubler for measurements> 50 GHz
19	Two V to WR15 waveguide transitions as highpass filter		RPG S/N: 050		Fundamental wave suppression of frequency doubler for measurements> 50 GHz
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

1.2 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 ± 100 Hz (corresponds to 1E-7)

Model with B4 1 GHz ± 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").

1.3 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: 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

1.3.1 2nd IF Image Frequency Rejection

Additional signal generator settings:	- Frequency f_{in} + 2×1317 MHz - Level: adjust the output level of signal generator for an RF-Input level of 0 dBm
R&S®FSW settings:	- [**FREQ** : CENTER : {f_{in}}]
Test frequencies:	R&S®FSW 8 : f_{in} = 1 GHz R&S®FSW 13/ 26/ 43/ 50/ 67: f_{in} = 1 GHz, f_{in} = 9 GHz
Measurement:	➢ Set marker to peak of signal - [**MKR** ⇒ : PEAK]
Evaluation:	The image frequency rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}): Image frequency rejection = 0dB – L_{dis}

1.3.2 3rd IF Image Frequency Rejection

Additional signal generator settings:	- Frequency f_{in} + 2x37 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 MHz, 100 MHz, 900 MHz, 1100 MHz, 7990 MHz R&S FSW 13/ 26: f_{in} = 63 MHz, 100 MHz, 900 MHz, 1100 MHz, 7990 MHz
Measurement:	Set marker to peak of signal - [**MKR** ⇒ : PEAK]
Evaluation:	The image frequency rejection is the difference between the output level of the signal generator and the level reading of marker 1 (L_{dis}): Image frequency rejection = 0dBm – L_{dis}

1.3.3 2nd IF Rejection

Additional signal generator settings:	- Frequency 1317 MHz - 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: 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 (L_{dis}): IF rejection = -10dBm – L_{dis}

1.3.4 3rd IF Rejection

Additional signal generator settings:	- Frequency 37 MHz - 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	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: 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 (L_{dis}):

IF rejection = -10dBm – L_{dis}

1.4 Checking Nonlinearities

1.4.1 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:	10 MHz to 40 GHz

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

Attenuation a_{ATT} = 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:	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:	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 settings: (both generators):

- Frequency: generator 1 $f_{g1} = f_{in} - 500$ kHz
generator 2 $f_{g2} = f_{in} + 500$ kHz

- ➢ Adjust the output level of the signal generators for an input level at the R&S®FSW of –15 dBm +- 1 dB.
- ➢ 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** : **-5 dBm**]
- [**SPAN** : **4 MHz**]
- [**BW** : RES BW MANUAL : 2 kHz]
- [**FREQ** : CENTER : {f_{in}}]

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®FSWR&S®FSW 26: additional 8.1 GHz to 26.1 GHz in 1 GHz steps
R&S®FSW 43 / 50 / 67: 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.

1.4.2 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

1.5 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.

1.5.1 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 ≤ 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´.

1.5.2 Checking the bandwidth switching level uncertainty with option 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´.

1.6 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

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, R&S°FSW26:
- [**FREQ** : START : **8900 MHz**]
- [**FREQ** : STOP : **Fmax of instrument**]
- [**BW** : RES BW MANUAL : **1 kHz**]

R&S°FSW43, R&S°FSW50:
- [**FREQ** : START : **8900 MHz**]
- [**FREQ** : STOP : **43500 MHz**]
- [**BW** : RES BW MANUAL : **300 Hz**]

R&S°FSW67:
- [**FREQ** : START : **8900 MHz**]
- [**FREQ** : STOP : **26500 MHz**]
- [**BW** : RES BW MANUAL : **300 Hz**]

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

1.7 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

➢ Terminate the RF input of the FSW with 50 Ω

R&S FSW settings:
- [**PRESET**]
- [**AMPT** : RF ATTEN MANUAL : **0 dB**]
- [**AMPT** : **-60 dBm**]
- [**SPAN** : 0 Hz]
- [**TRACE 1** : AVERAGE]
- [**TRACE 1** : SWEEP COUNT : {SWPCNT} **ENTER**]
- [**MEAS** : TIME DOMAIN POWER : MEAN]
- [**FREQ** : CENTER : {f_n}]
- [**BW** : RBW MANUAL : {RBW}]
- [**BW** : VBW MANUAL : {VBW}]

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 For instruments with a maximum frequency > 8 GHz: Activate the YIG Filter Bypass and check the following test frequencies:

8001 MHz, 8500 MHz to maximum Frequency in 500 MHz steps.

Test limits according to datasheet.

1.8 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:	43.5 GHz to 67 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 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

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 67 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	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

1.8.1 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 dBm ± 0.1 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** ⇒ : 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:

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

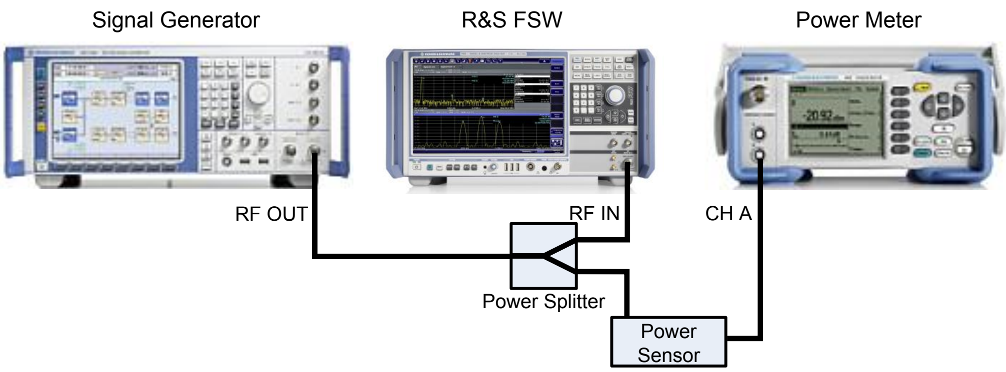
Additional measurement for instruments with FSW-B25: Repeat Measurement with RF attenuation = 10 dB, electronic attenuation = 0n and electronic attenuation = 0, 10 and 20 dB

1.8.2 Frequency response

1.8.2.1 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:
- ➢ 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 0 dBm
- Frequency 64 MHz

R&S FSW settings:
- [**PRESET**]
- [**AMPT** : RF INPUT {coupling}]
- [**AMPT** : RF ATTEN MANUAL : **{a_{FSW}}**]
- [**AMPT** : **0 dBm**]
- [**SPAN : 100 kHz**]
- [**BW** : RES BW MANUAL : **10 kHz**]
- [**FREQ** : CENTER : **64 MHz**]
- [**MKR ⇒** : MORE : EXCLUDE LO]

Reference measurement:
- ➢ Determine signal level $L_{powermeter}$.
- ➢ Set marker to peak of signal
- [**MKR ⇒** : PEAK]
- ➢ Read level indication from R&S FSW (reading of marker 1): L_{FSW}

Power Meter:
- ➢ Read level indication from power meter : $L_{powermeter}$

Evaluation:	➢ Calculate ΔRef / dB = L_{FSW} / dBm – $L_{powermeter}$ / dBm Record ΔRef / dB
Signal generator settings:	Set the signal generator to the test frequency
R&S FSW settings:	- [**SPAN : zero**] - [**FREQ** : CENTER : {f_{fresp}}] - [**BW** : RES BW MANUAL : **{RBW}**] For f < 100 kHz use a RBW = Fin / 10, use a RBW of 10 kHz for other frequencies. ➢ Set marker to peak of signal - [**MKR** ⇒ : PEAK] ➢ Read level indication from R&S FSW (reading of marker 1): L_{FSW}
Power Meter:	➢ Read level indication from Power Meter : $L_{powermeter}$
Evaluation:	➢ The frequency response can be calculated as: Freq. response / dB = L_{FSW} – $L_{powermeter}$ - ΔRef / dB
Attenuator Setting	Repeat the measurement for RF attenuation of 0 dB, 5 dB, 10 dB, 20 dB, 40 dB
Test frequencies	Fin = 10 kHz, 30 kHz, 100 kHz, 300 kHz, 1 MHz, 3MHz, DC coupling Fin = 10 MHz, 50 MHz, 100 MHz 200 MHz, 500 MHz to 8 GHz in 500 MHz steps, AC coupling 8500 MHz to the maximum Frequency of the instrument in 500 MHz steps, AC coupling Test limits according to datasheet.
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.
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.

1.9 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:
Measurement:
- ➢ Read out the mean marker value (= L_{Ref})

Step attenuator settings:
- attenuation {a_{ATT}}

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

Evaluation:
- ➢ Read out the mean marker value. The difference between the level of the input signal of the R&S FSW and the reference L_{Ref} (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.

a_{ATT}	10 dB to 50 dB	50 dB to 80 dB	80 dB to 100 dB
Sweep time	200 ms	600 ms	1000 ms

1.10 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** ⇒ : 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 + a_{FSW} } **dBm**]
- [**MKR** ⇒ : 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].

a_{ATT}	70 dB	80 dB	75 dB	65 dB	60 dB	55 dB	50 dB	40dB	30 dB	20 dB	10 dB
a_{FSW}	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

1.11 Checking the Phase Noise

Test equipment: Signal generator (refer to "Measurement Equipment", item 16)
Frequency 1000 MHz
Level ≥ 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]
- [**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 a 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.
At 100 Hz offset the measurement is performed at 95 Hz to avoid interference with the line frequency f.e. in Europe.

Settings for phase noise measurement				
Offset	Span	RBW / VBW	Reference level	a_{FSW}
100 Hz	220 Hz	1 Hz / 1 Hz Trace Average 5	= signal level	= signal level
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

1.12 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 : {a_{FSW}}]

Measurement:
- ➢ See operating manual of the network analyzer for detailed information about S_{11} 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 S_{11} of the R&S FSW input with the following setting of the RF attenuator and input set to DC coupling:
  a_{FSW} = 5 dB, 10 dB, 20 dB, 40 dB
- ➢ Determine S_{11} of the R&S FSW input with the following setting of the RF attenuator and input set to AC coupling:
  a_{FSW} = 10 dB

Test frequencies
Fin = 10 MHz 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: additional from Fin = 8 GHz to 40 GHz 201 points,

test limits according to datasheet

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

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

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 Level	Baseband Input	IQ Mode	Full Scale Level
+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:

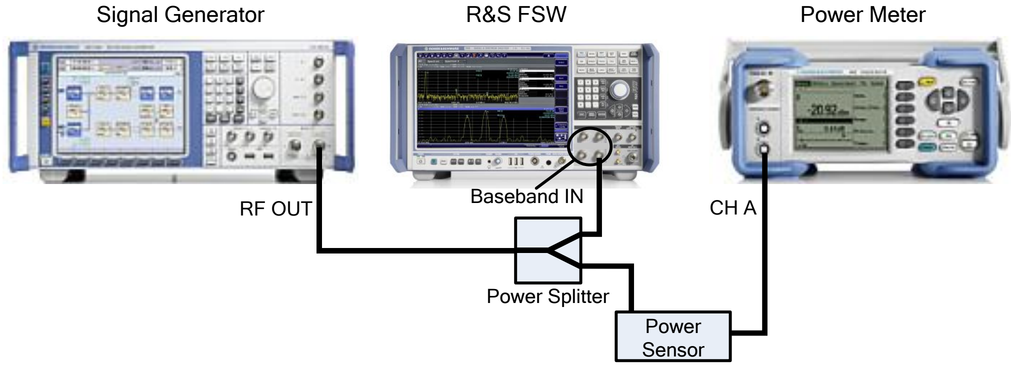
$$\text{Level uncertainty}_{1MHz} = L_{FSW} - L_{powermeter}$$

test limits according to datasheet

1.12.2 Frequency response R&S®FSW-B71

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

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): L_{FSW}

Power Meter:
➢ Read level indication from power meter : $L_{powermeter}$

Evaluation:
➢ Calculate
ΔRef / dB = L_{FSW} / dBm – $L_{powermeter}$ / dBm

Record ΔRef / 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): L_{FSW}

Power Meter:
➢ Read level indication from Power Meter : $L_{powermeter}$

Evaluation:
➢ The frequency response can be calculated as:
Freq. response / dB = L_{FSW} – $L_{powermeter}$ - ΔRef / 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

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

1.13.1 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 dBm
RSS ≤ 2.5% referred to measured power
Impedance Z = 50 Ω
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]

- []

Fix IF2-Frequency to 1,58GHz
- [**DIAG**:SERV:SFUN ‘2.3.16.1.4’]

Select LO-Power:
- [**SENS:**MIX:LOP {P_{LO}}]
for P_{LO} = 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** : {$f_{Center1}$}]
resulting LO-frequency f_{LO} = ($f_{Center1}$ – 1580,0 MHz) / 2

Select lower sideband with service-function:
- [**SETUP** : SERVICE FUNCTIONS **2.5.2.2.0**]
- [**FREQ CENTER** : {$f_{Center2}$}]
resulting LO-frequency f_{LO} = ($f_{Center2}$ + 1580,0 MHz) / 2

Test setup:
- ➢ Connect power sensor via fixed attenuator to the output ‘LO_{out} / IF_{in}’

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 dB

Test Frequencies
Fcenter1 = 16880 MHz to 26880 MHz in 500 MHz Steps
Fcenter2 = 23820 MHz to 33320 MHz in 500 MHz Steps

1.13.2 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]

- []

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’]

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 LO_{out} / IF_{in};

Measurement:
- [**MKR->** : PEAK]
➢ Read out the marker
➢ Test limit according to datasheet

1.13.3 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]

- []

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’]

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 LO_{out} / IF_{in};

Measurement:
- [**MKR->** : PEAK]
➢ Read out the marker
➢ Test limit according to datasheet

2 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.

2.1 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.

2.2 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 Adjustment or by the sequence described here.

2.2.1 Measuring Equipment

Table 2-1: 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:$1x10^{-9}$	R&S SMA100A with SMA-B106, SMA-B22	1400.0000.02 1405.0809.02 1405.1805.02	Frequency uncertainty of the reference oscillator

2.2.2 Adjustment Sequence

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

- Frequency: 1000 MHz
- Level: -15 dBm
- Frequency uncertainty: $<1x10^{-9}$

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]

Warning 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.

2.2.3 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 ± 100 Hz
- Model with option R&S FSW-B4: 1.0 GHz ± 10 Hz

For verification proceed as follows:

R&S FSW settings:

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

Signal generator settings: Frequency: as above 1000 MHz

R&S 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.

3 Repair

The following chapter describes how to replace modules in the R&S 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.

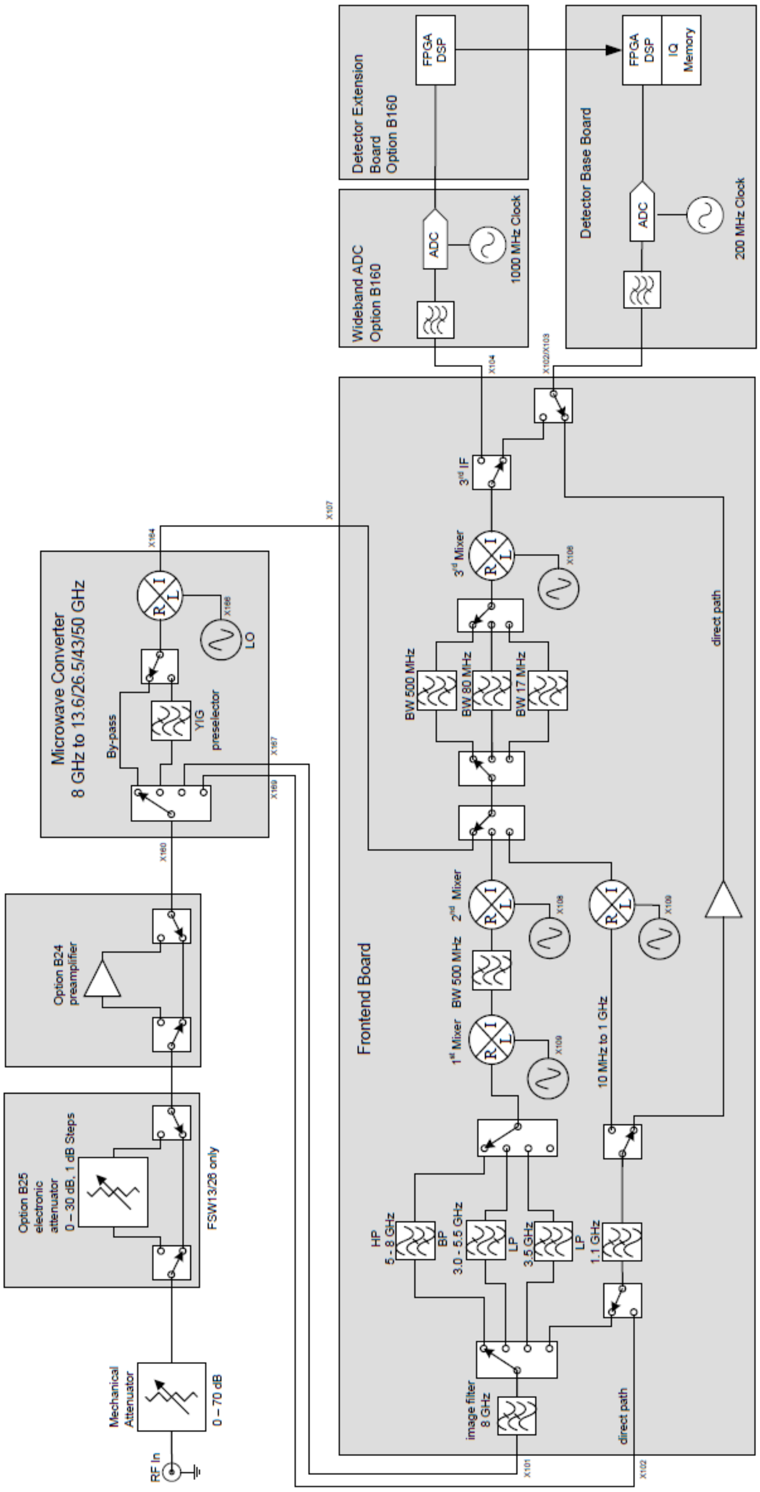
Read all safety instructions at the beginning of this manual carefully!

3.1 Repair for R&S FSW8/13/26/43/50

The following chapter describes how to replace modules in the R&S FSW8/13/26/43/50.

3.1.1 Functional Description

The following figure shows a block diagram of the R&S FSW8/13/26/43/50.



The R&S 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 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 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 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.

3.1.1.1 Attenuator A60

The attenuator switches in 5 dB steps and has a maximum total attenuation of 75 dB, it contains an AC coupling that can be bypassed and a switch for the internal calibration sources to the input.

3.1.1.2 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.

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

The high frequency models of the R&S FSW (frequency range > 8 GHz) 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 and otherwise to the microwave path.

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.

3.1.1.4 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.

3.1.1.5 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.

3.1.1.6 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.

3.1.1.7 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.

3.1.1.8 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.

3.1.1.9 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.

3.1.1.10 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.

3.1.1.11 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.

3.1.1.12 Options

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.

Preamplifier R&S FSW-B24

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

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.

Analysis Bandwidth Extension R&S FSW-B160, FSW-B320, FSW-B500

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 500 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.

LO/IF connections for external mixers R&S FSW-B21

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.

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.

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.

3.1.2 Basic Steps and Information for Module Replacement

3.1.2.1 Location of the Modules

On the rear side of the instrument:

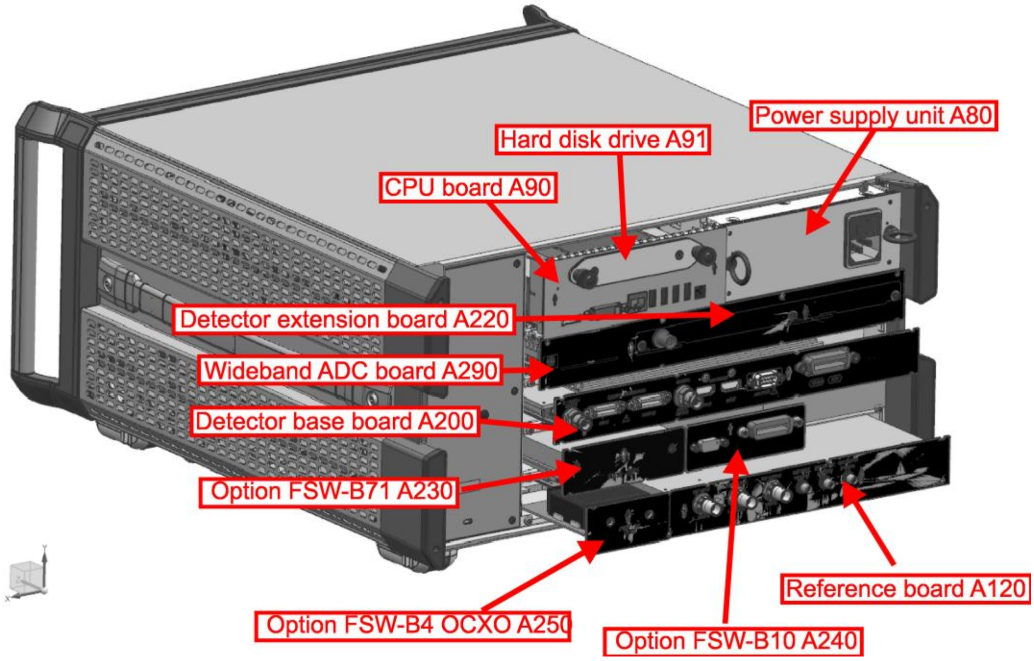


Figure 3-1: Instrument equipped with FSW-B160 or FSW-B320

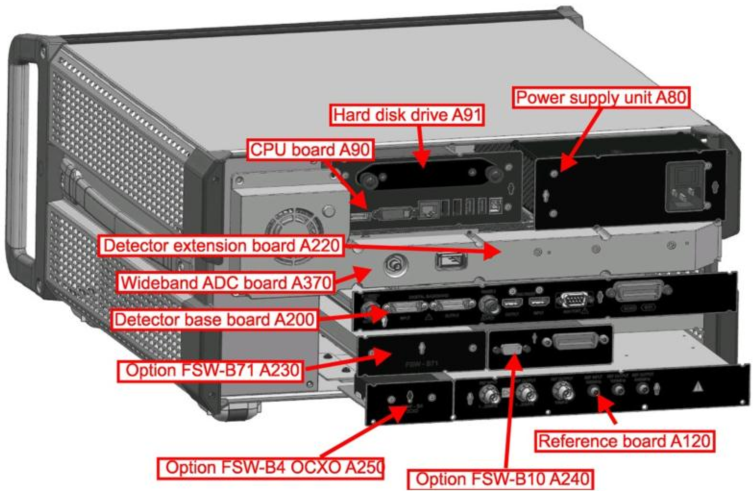
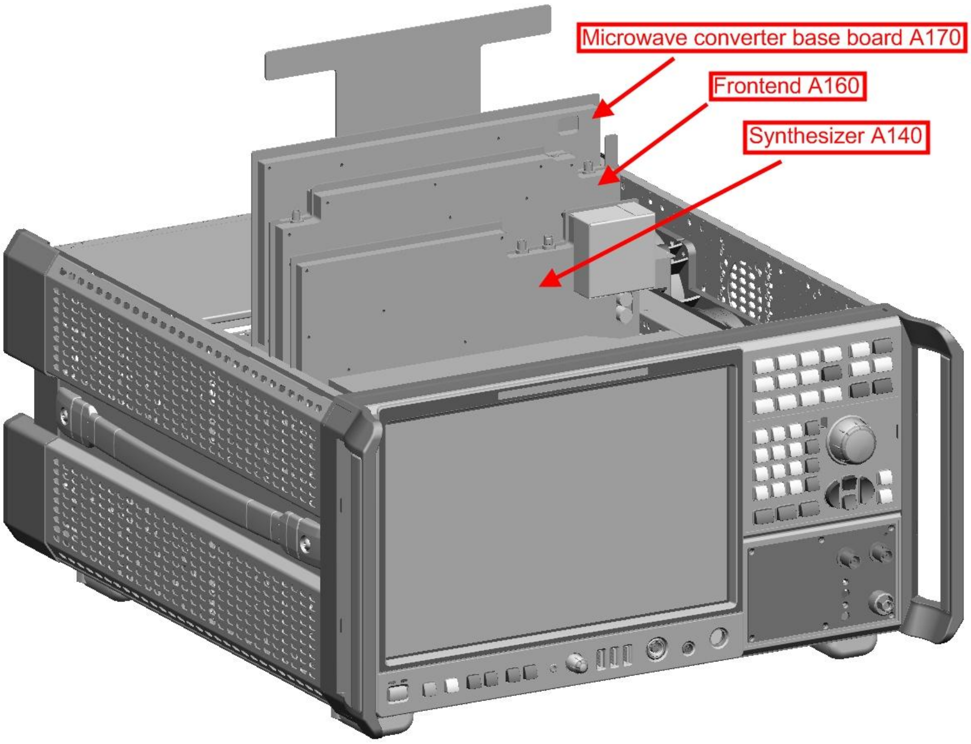
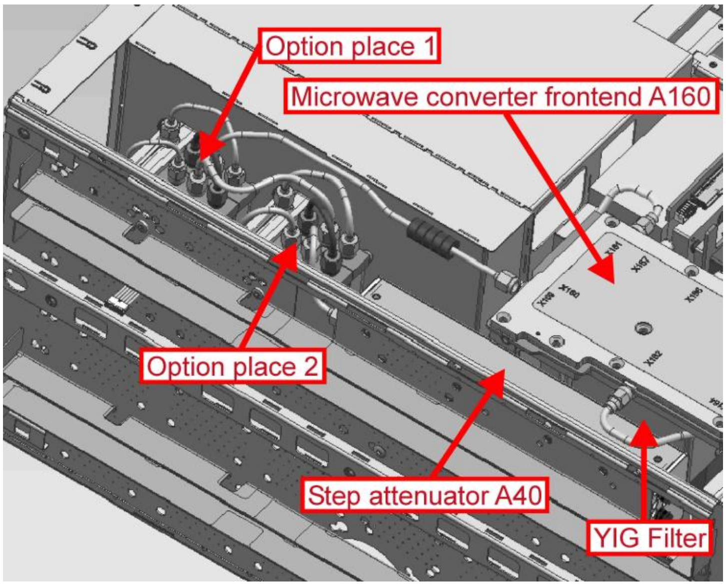


Figure 3-2: Instrument equipped with FSW-B500

On the front side of the instrument:



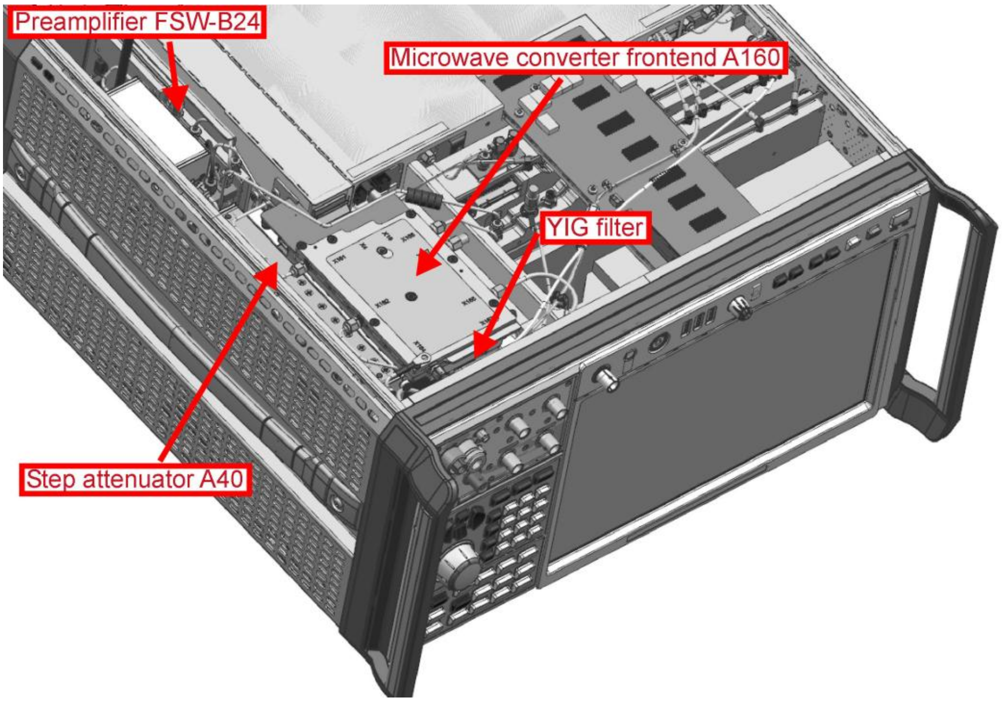
On the bottom of the instrument (R&S FSW13/26):



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

On the bottom of the instrument (R&S FSW43):



3.1.2.2 Basic Cable Routing

The following pictures show the cable routing of an R&S FSW8 and an R&S FSW13/26. Depending on the options installed the routing may differ. For a schematic overview of the cable connections see chapter 5.

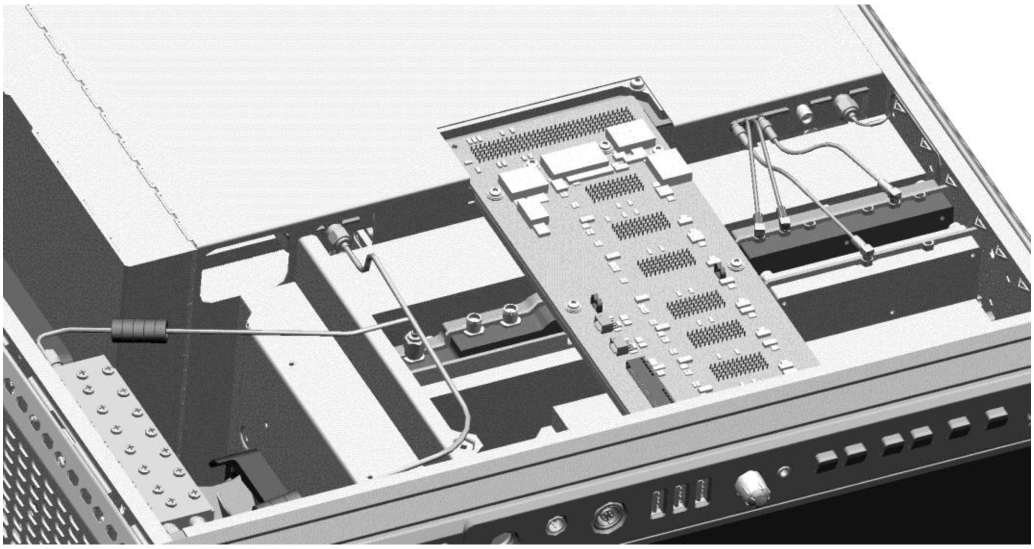


Figure 3-3: Cable routing on the lower side of an R&S FSW8 without option R&S FSW-B24 and R&S FSW-B25.

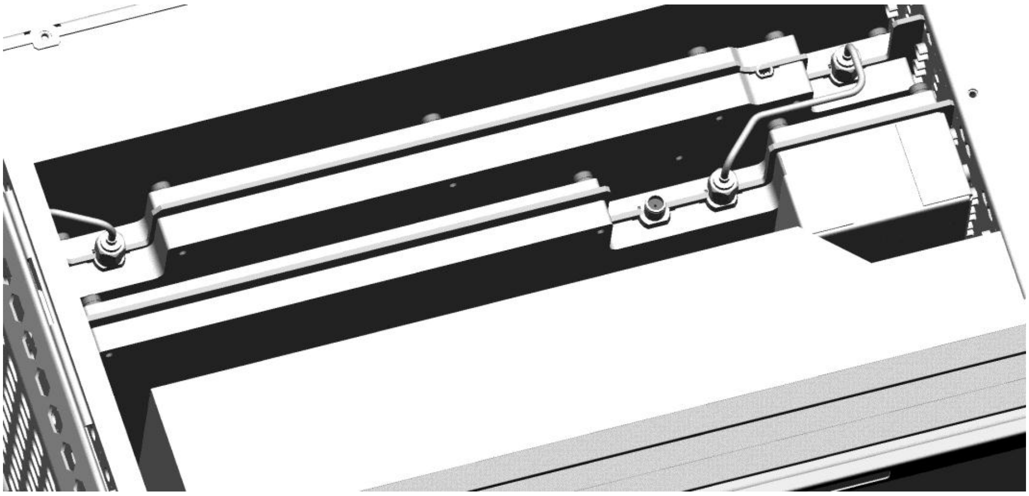


Figure 3-4: Cable routing on the upper side of an R&S FSW8.

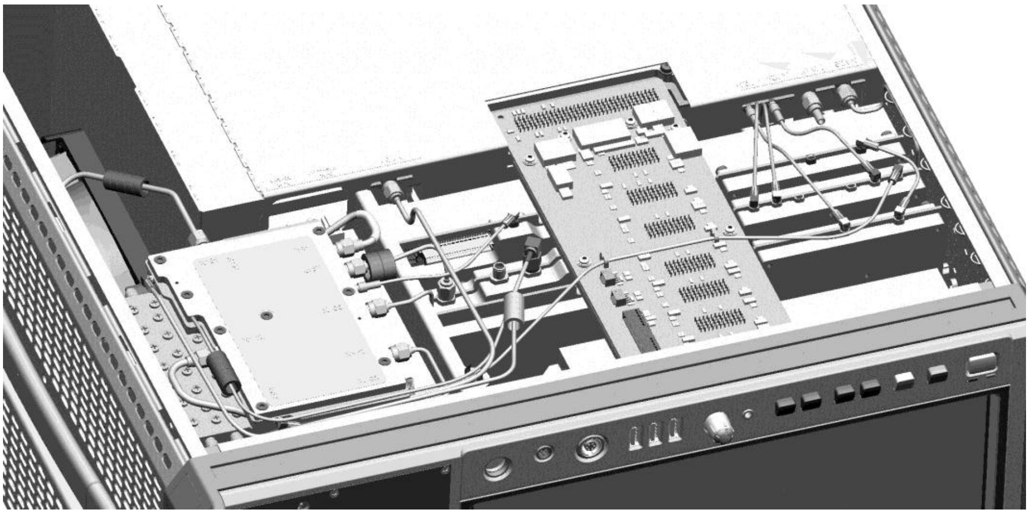


Figure 3-5: Cable routing on the lower side of an R&S FSW13/26 without options R&S FSW-B24 and R&S FSW-B25.

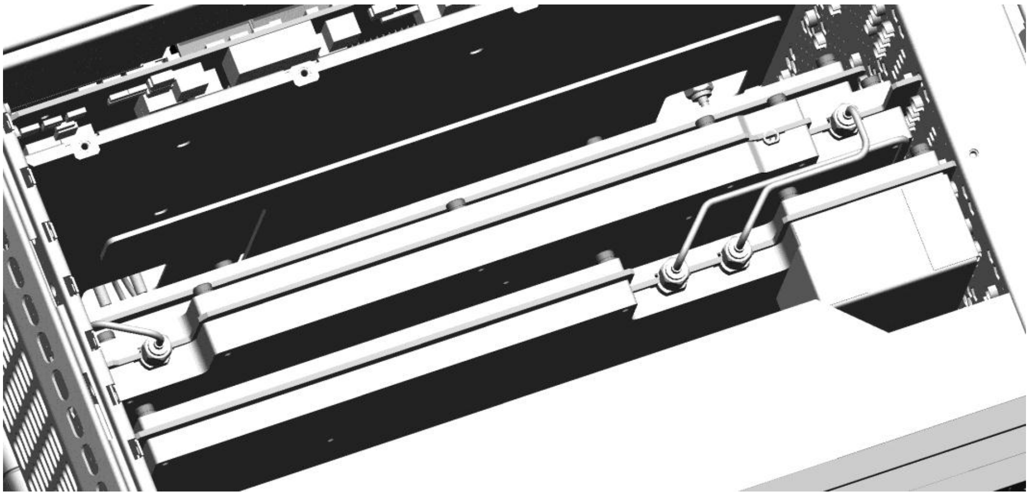


Figure 3-6: Cable routing on the upper side of an R&S FSW13/26/43 without options R&S FSW-B24 and R&S FSW-B25.

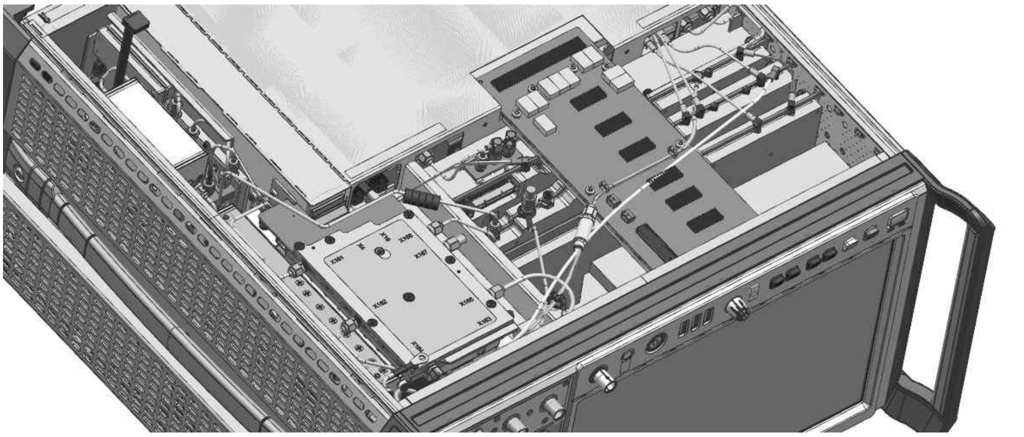


Figure 3-7: Cable routing on the lower side of an R&S FSW43 with option R&S FSW-B24 installed

3.1.2.3 Connector types

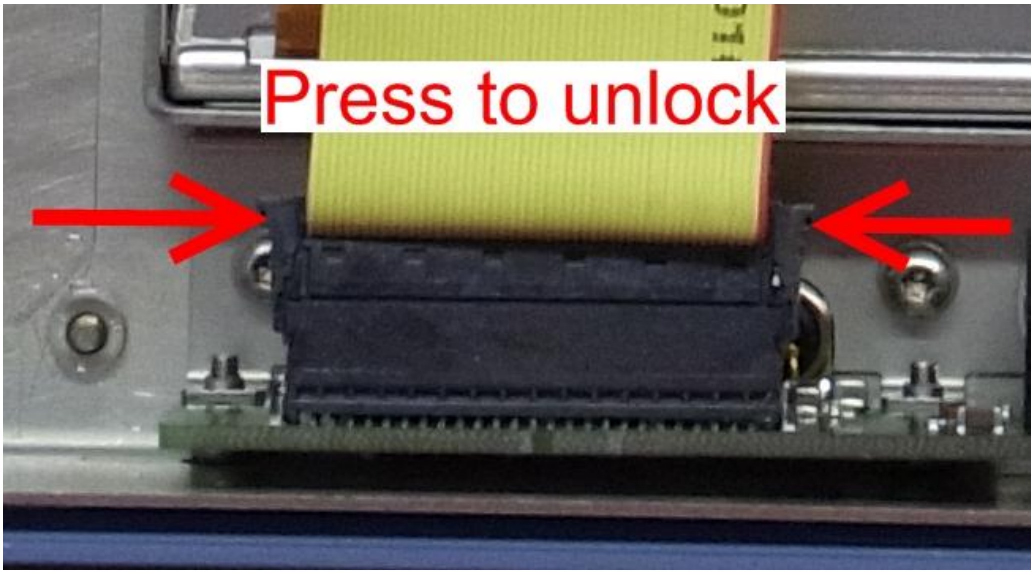
To connect the boards in the instrument different type of connectors are used. In the following releasing and plugging of the different types of connectors are described. The pictures illustrate the handling of the connectors in principle.

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.

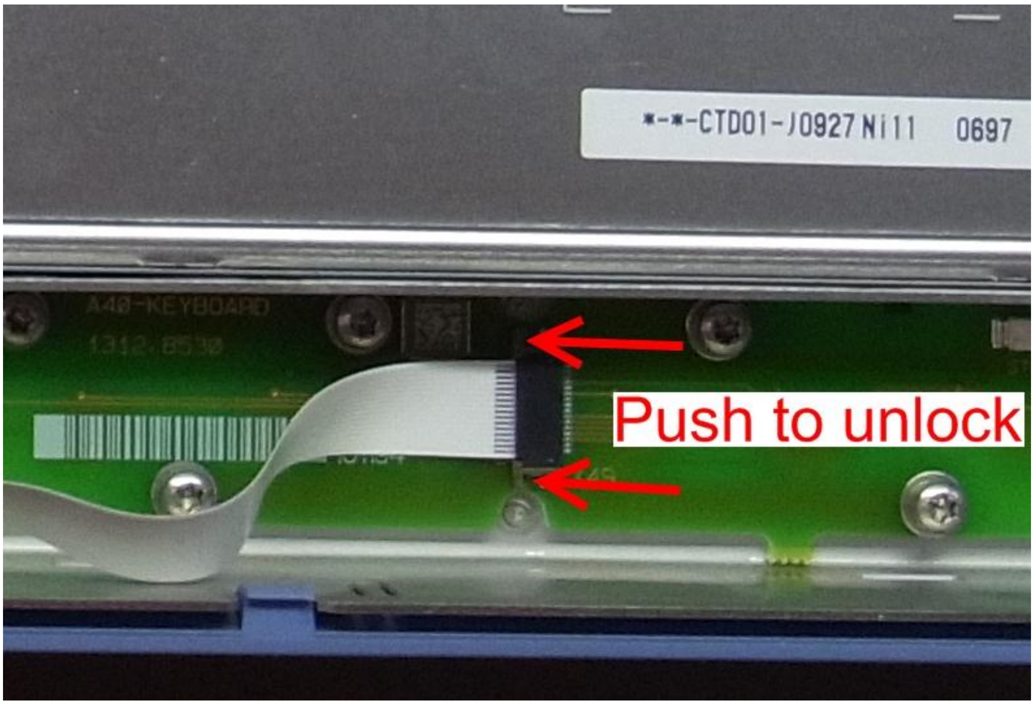
Be careful when unlocking and unplugging the connector. The connector can be damaged easily when it is not proper unlocked or not straight unplugged.

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



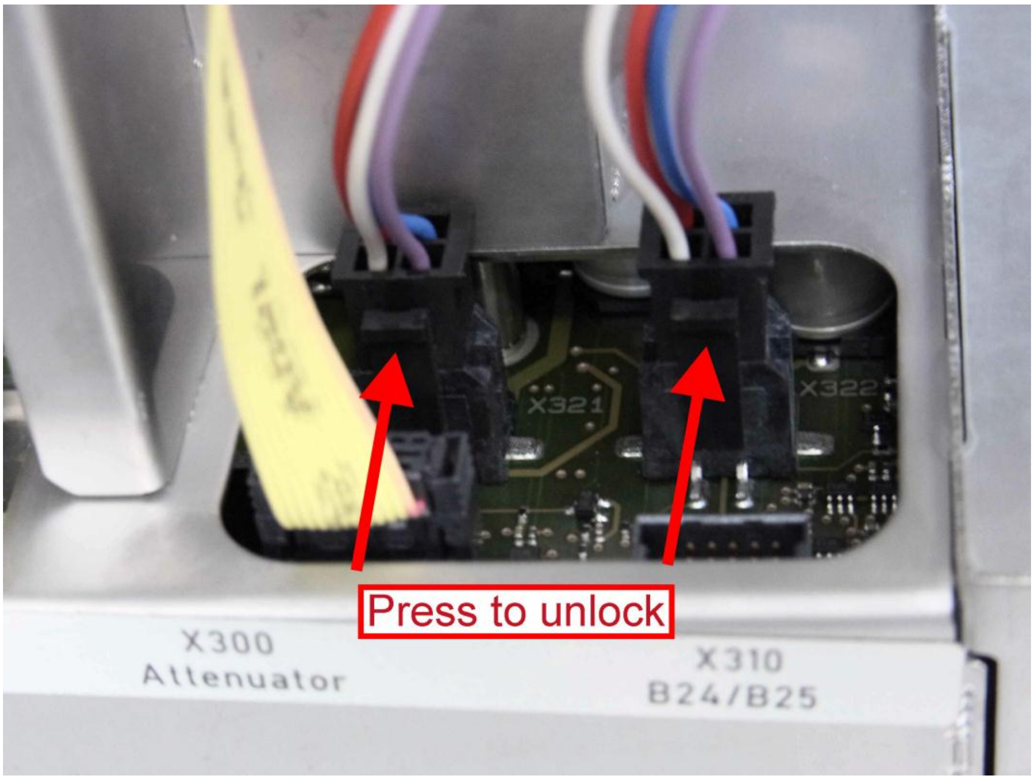
Foil Cable Connector

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.



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.



3.1.2.4 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.

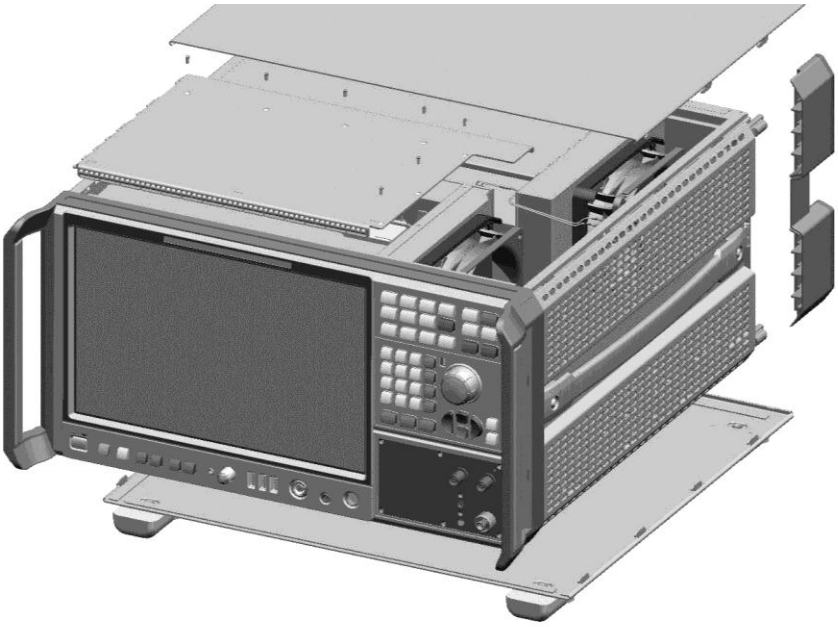
Module or part of module to replace	Unmount Upper cover	Unmount lower cover	Unmount inner lid	Unmount right side cover	Unmount frontpanel
CPU Board A90	-	-	-	-	-
Frontpanel	X	X	X	X	X
Power supply A80	-	-	-	-	-
Frontend BoardA100	X	X	X	-	-
Detector board A200	-	-	-	-	-
Attenuator A40	-	X	X	-	-
Digital motherboard A20	X	X	X	-	-
Analog motherboard A10	-	X	-	-	-
Microwave converter A160 A161 A162	X	X	X	X	-
Speaker, fans	X	X	-	-	-
OCXO R&S FSW-B4 A250	-	-	-	-	-
Synthesizer board A140	X	X	X	-	-
Reference board A 120	-	X	-	-	-
Preamplifier A270 R&S FSW-B24	-	X	-	X	-
Bandwidth Extension 160 MHz R&S FSW-B160 and Bandwidth Extension 320 Mhz A220 and A290	-	-	-	-	-
Bandwidth Extension 500 MHz A220 and A370	-	-	-	-	-
Electronic Attenuator A280 R&S FSW-B25	-	X	-	X	-
Analog Baseband Inputs R&S FSW-B71 Analog Baseboard A230	-	-	-	-	-
Analog Baseband Inputs R&S FSW-B71 Input connectors	X	X	-	X	X
LO/IF connections for external	X	X	X	X	X

Module or part of module to replace	Unmount Upper cover	Unmount lower cover	Unmount inner lid	Unmount right side cover	Unmount frontpanel
mixers R&S FSW-B21					
External Generator Control A240 R&S FSW-B10	-	-	-	-	-

Unmounting the Upper and/or Lower Cover

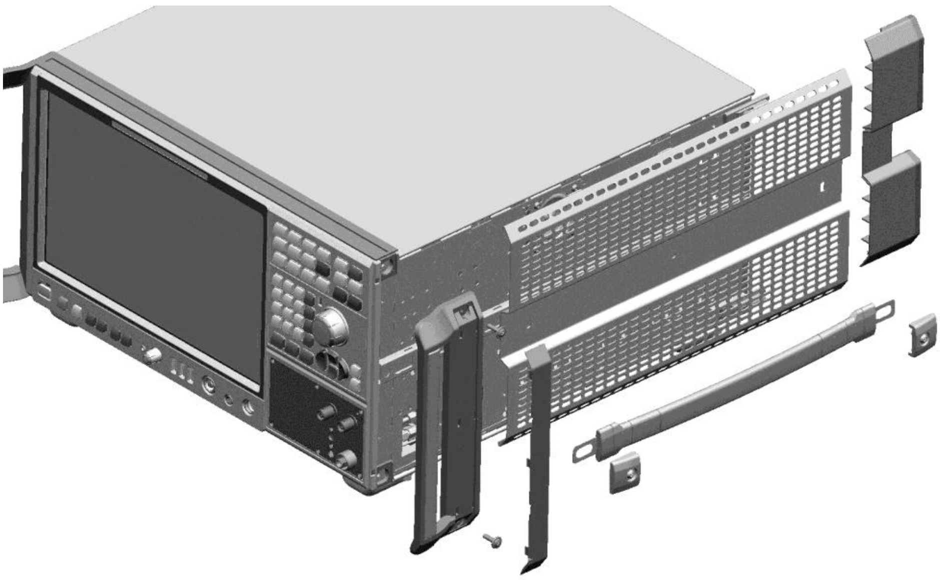
1. Switch off the instrument and disconnect the power plug.
2. Unscrew the four screws in the rear wall feet and remove them.
3. Remove the upper and/or the lower housing metal sheet by pushing it towards the back of the instrument.

Unmounting the Inner Lid



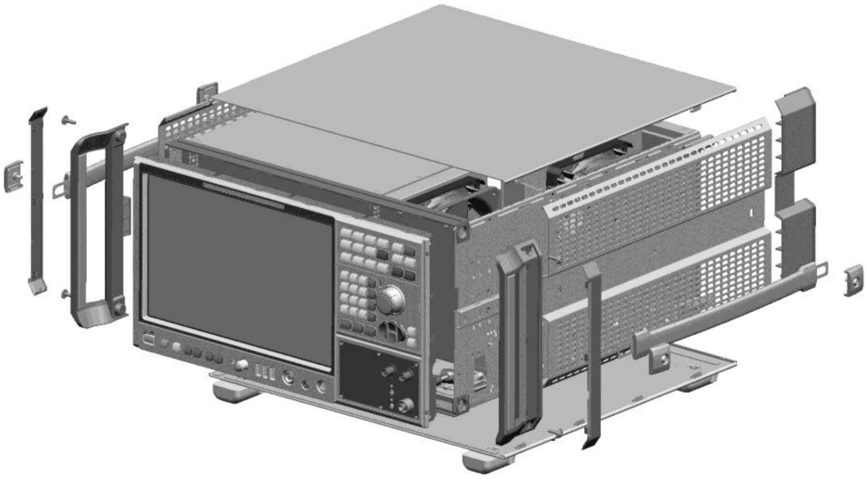
1. Switch off the instrument and disconnect the power plug.
2. Unscrew the four screws in the rear wall feet and remove them.
3. Remove the upper housing metal sheet by pushing it towards the back of the instrument.
4. Unscrew the seven screws on the top of the instrument.
5. Carefully remove the lid by pulling it up at the right side. Be careful not to damage the EMI shielding gaskets!

Unmounting the Side Cover



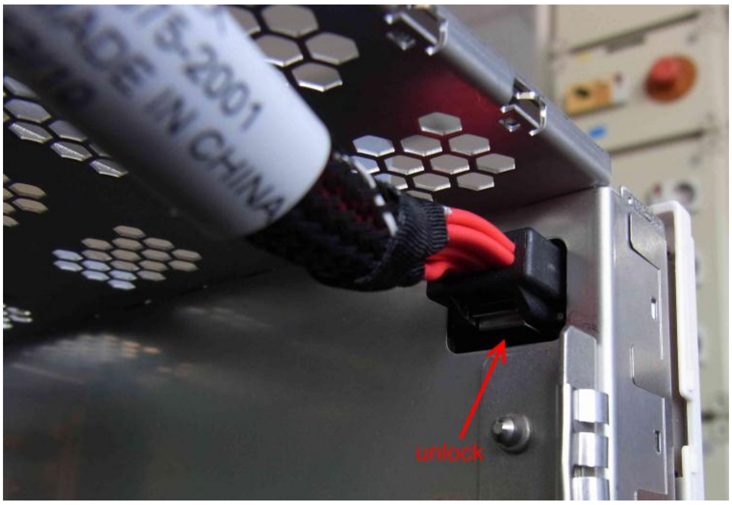
1. Switch off the instrument and disconnect the power plug.
2. Unscrew the two screws in the right rear wall foot and remove the foot.
3. Unscrew the two screws fastening the side handle and remove the side handle.
4. Open the plastic cover on the side of the front handle using a small slotted screwdriver.
5. Unscrew the two screws below the plastic cover and remove the handle.
6. Remove the side cover by pushing it towards the back of the instrument. After that remove the side covers completely.

Unmounting the Frontpanel



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 metal sheet by pushing it towards the back of the instrument.
4. Unscrew the two screws fastening the side handle on the right side of the instrument and remove the side handle.
5. Open the plastic cover on the side of the front handle using a small slotted screwdriver.
6. Unscrew the two screws below the plastic cover and remove the handle.
7. Remove the side cover by pushing it towards the back of the instrument. After that remove the side covers completely.
8. Remove the two cable ties around the display cable, if installed.
9. 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.



10. Unscrew the RF input cable.

    Note: On the R&S FSW13/26/43 you can access the connector through the cutout at the right side of the instrument.

For R&S FSW8:

► Unscrew the grounding cable at the frontend unit, if installed.

For R&S FSW13/26:

► Unscrew the grounding cable at the microwave converter frontend unit, if installed.

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.

11. Unscrew the four screws fastening the frontpanel on the left and right side of the instrument.
12. Carefully pull the frontpanel out of the instrument and unplug the flat ribbon cable to the analog motherboard on the frontpanel.

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

If option R&S FSW-B71 is installed:

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

3.1.2.5 Assembling the Instrument

The assembling of the instrument is done in the reverse order of disassembling it:

1. Mount the frontpanel if unmounted.
2. Remount the EMI shielding gaskets if unmounted.
3. Mount the upper and lower plastic bead if unmounted.
4. Plug the flat ribbon cable in its connector on the frontpanel.

    If option R&S FSW-B71 is installed:

    a. Plug in the 4 SMA connectors on the BNC plug plate.
    b. Carefully insert the frontpanel in the instrument frame. The frontpanel must snap into the upper and lower plastic bead.

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

    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 and install a new label on the RF input connector carrier board.
    b. Reinstall the four screws previously removed at the right and left side of the instrument.
    c. Connect the display cable.

       Note: Be sure the plug is locked! The connector is locked with an audible “CLICK” when plugged in.
    d. Reinstall the two cable ties to the display cable.
    e. Reconnect the RF input cable and the grounding cable, if previously removed.

5. Mount the inner lid if unmounted and reinstall the seven screws previously removed.

   Note: Be sure to reinstall all EMI shielding gaskets!

6. Remount the side cover if unmounted.
7. Remount the front handles and install the covers on the handles.
8. Remount the side handles by installing the two screws previously removed if unmounted.
9. 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.

10. Remount the feet at the back of the instrument by fastening the two screws inside the feet.
11. For the next steps to be carried out refer to 3.1.2.6 Putting into Operation.

3.1.2.6 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 1 to verify the functionality of the instrument

Replaced Module	**Basic Instrument Checks (refer to Basic Instrument Checks)**	**Frequency response correction (refer to Performing a Frequency Response Correction)**	**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	-

Replaced Module	Basic Instrument Checks (refer to Basic Instrument Checks)	Frequency response correction (refer to Performing a Frequency Response Correction)	Additional Tests/Tasks (refer to corresponding chapter)
Microwave-converter frontend A161	X	X	X
YIG filter A162	X	X	X
Triplexer (R&S FSW43/50 only) A340	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	(R&S FSW13/26/43 only)	-
Input Cable	X	X	-
Preamplifier relais unit or preamplifier board (R&S FSW-B24)	X	X	X
Electronic attenuator relais A282 unit or electronical attenuator board A281 (R&S FSW-B25)	X	X	X
OCXO B4 A260	X	Reference frequency adjustment only	-
Wideband ADC board A290 (R&S FSW-B160 and FSW-B320)	X	-	-
Detector extension board A220 (R&S FSW-B160 and FSW-B320)	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	-

Replaced Module	Basic Instrument Checks (refer to Basic Instrument Checks)	Frequency response correction (refer to Performing a Frequency Response Correction)	Additional Tests/Tasks (refer to corresponding chapter)
External Generator Control A240 (R&S FSW-B10)	X	-	-
Wideband ADC board A370 (R&S FSW-B500)	X	-	-
Detector extension board A220 (R&S FSW-B500)	X	-	-

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 Massages

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.

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 2.1 Adjustment.

3.1.3 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.

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.

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!

Tools recommended for module replacement:

Tool	**Part to replace**
BW2010 KEY (1174.0301.00)	CPU Board, Power supply, Detector board Reference board
Extra long screwdriver Tx 8x200 (e.g. Carl Kammerling “Triton ESD TX08x200”	Microwave converter frontend unit, YIG Filter, R&S FSW43/50: Preamplifier, triplexer,

Tool	Part to replace
T4718ESD 0820)	R&S FSW13/26/4350: step attenuator
USB Keyboard and USB Mouse	Front board, Display
SMP Connector removal Tool (e.g. Rosenberger extraction tool Order No. 11W101-000)	Digital Motherboard

3.1.3.1 CPU Board A90

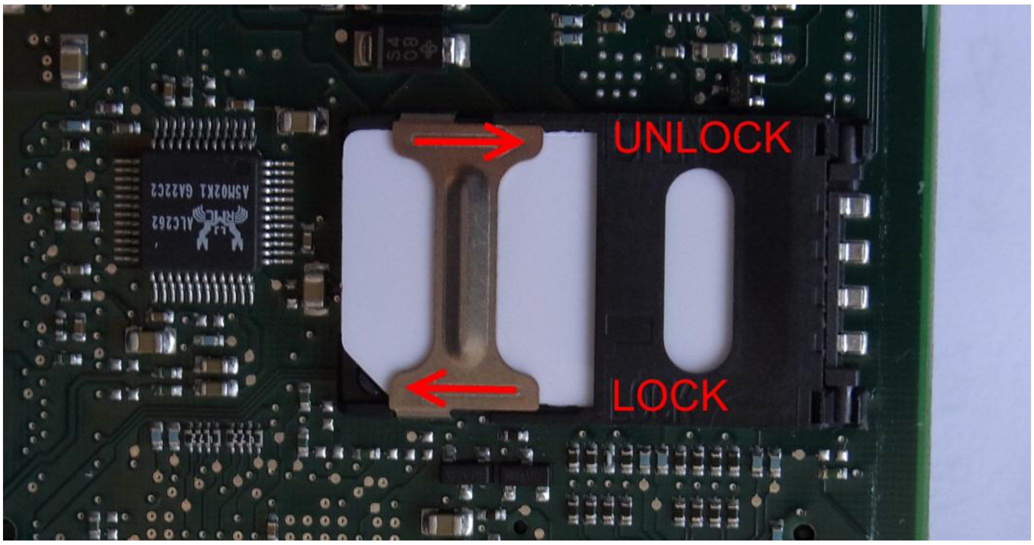
Replacing the whole CPU Board

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. Unlock the CPU Board using the BW2010 tools.

   Note: To unlock the module push the BW2010 tools 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 is unlocked and can be removed by gently pulling on the BW2010 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.

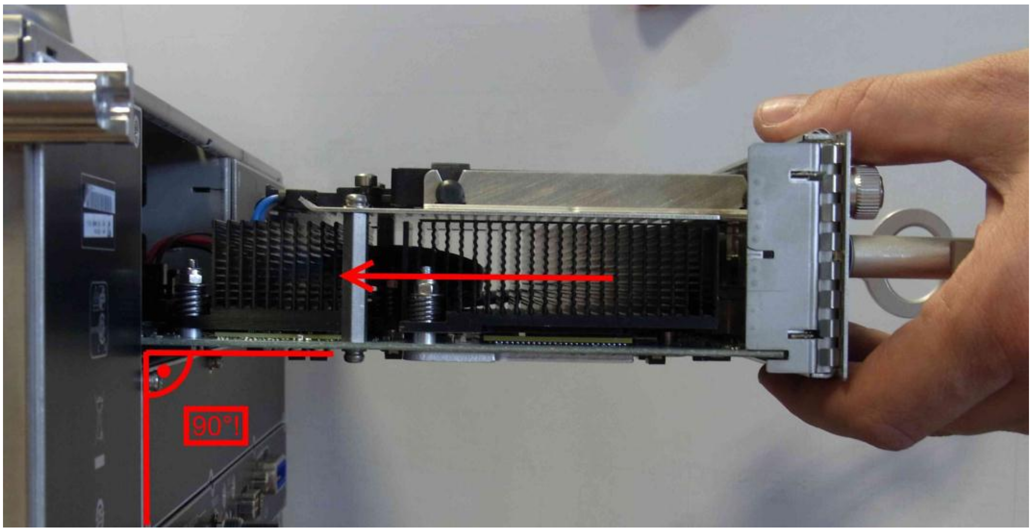


6. Insert the smart card in the new controller board. First open the holder as described above and put in the smart card properly. Then close the holder and lock it.

   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. Insert the new controller board in the instrument. The board is locked to the instrument by an audible “CLICK”.

   NOTICE! Risk of damage to the controller 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.



8. 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.

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 IPC10 CPU boards**. 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.

9. Perform the Basic Instrument Checks according to chapter Basic Instrument Checks

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.

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the two knurled screws and remove the hard disk drive to the rear.
3. Unlock the CPU Board using the BW2010 tool for removing boards.
4. Gently pull the controller out of the instrument.

   Note: be sure to pull out the controller straight ahead.
5. Carefully push the contact springs of the battery holder and remove the battery.
6. 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!
7. Insert the controller board in the instrument (**CPU Board A90**).

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.

8. Remount the hard disk drive.
9. 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.
10. Wait for firmware to come up.
11. Perform the Basic Instrument Checks according to chapter Basic Instrument Checks.

Replacing SATA Hard Drive A91

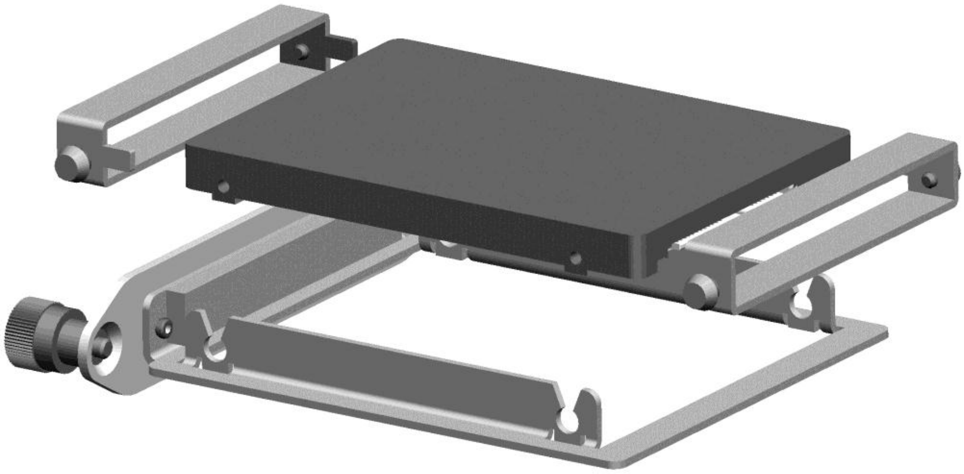
The spare part is already formatted for the R&S FSW and contains the complete software.

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.

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.

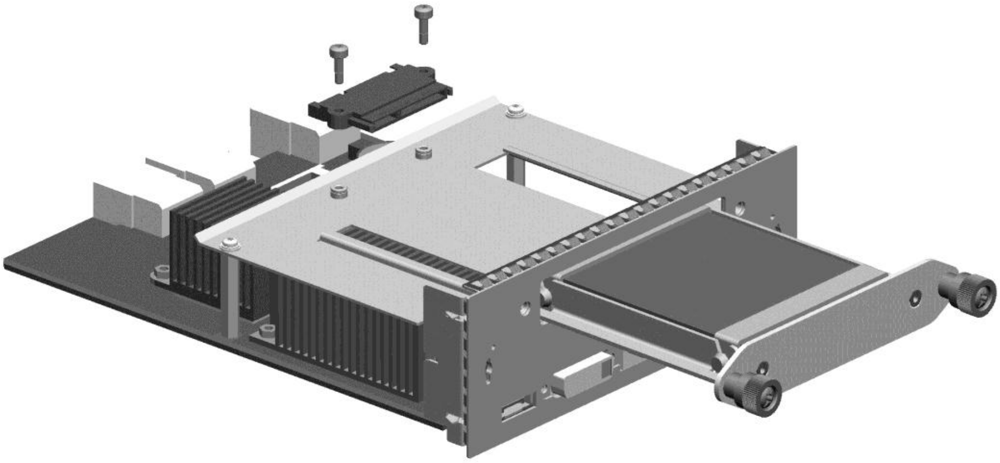
NOTICE

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 Basic Instrument Checks.
10. If needed, update the FW to the latest version.

Replacing the SATA Adaptor A92



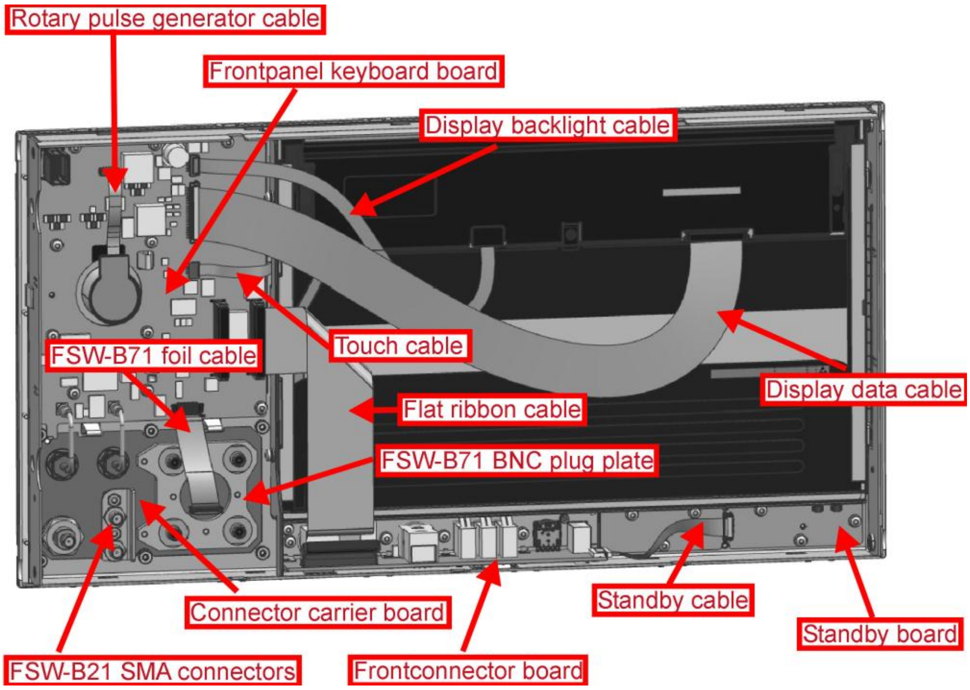
1. Switch off the instrument and disconnect the power plug.
2. Remove the CPU Board as described in chapter CPU Board A90.
3. Unplug the SATA data cable and the SATA power cable from the SATA adaptor.
4. Unscrew the two screws fastening the adaptor.
5. Fix the new adaptor with the two screws previously 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.

3.1.3.2 Front Unit



Replacing the Display with Touch Screen A70

1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug the display data cable and display backlight cable at the plugs on the display.
5. Unplug touch cable.
6. Unplug flat ribbon cable on both sides and remove it.
7. Loose 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.
8. 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.
9. 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!

10. Reinstall the flat ribbon cable.
11. Plug in the display data cable and the display backlight cable.
12. Plug in the touch cable.
13. Mount the frontpanel to the instrument (refer to 3.1.2.5).
14. Mount the right side cover (refer to 3.1.2.5).
15. Mount the upper and lower cover (refer to 3.1.2.5).
16. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
17. 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.
18. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks.**
19. Perform a frequency response correction as described in chapter Performing a Frequency Response Correction.

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 upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug display data cable and display backlight cable at the plugs on the frontpanel keyboard.
5. Unplug touch cable and rotary pulse generator cable on the frontpanel keyboard.
6. Unplug flat ribbon cable on frontpanel keyboard.
7. Unplug the two RF cables.

If Option R&S FSW-B71 is installed:

► Unplug the B71 foil cable on the frontpanel keyboard board.

8. Loosen the eight screws fastening the frontpanel keyboard and remove the board.
9. 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.
10. Replug the display data cable and display backlight cable.

11. Replug the touch cable and rotary pulse generator cable.
12. Replug the flat ribbon cable.
13. Replug the two RF cables.

If Option R&S FSW-B71 is installed:

► Replug the B71 foil cable on the frontpanel keyboard board

14. Mount the frontpanel to the instrument (refer to 3.1.2.5).
15. Mount the right side cover (refer to 3.1.2.5).
16. Mount the upper and lower cover (refer to 3.1.2.5).
17. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
18. 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.
19. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**
20. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
21. Press any hard key twice until every key on the key test program lights up green.
22. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

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 upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug standby cable at the plug on the standby board.
5. Unscrew the five screws fastening the standby board.
6. Replace standby board by the new one.

   Note: Be sure the push button board is inserted properly.
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 3.1.2.5).
10. Mount the right side cover (refer to 3.1.2.5).
11. Mount the upper and lower cover (refer to 3.1.2.5).
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 **Basic Instrument Checks**
14. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
15. Press any hard key twice until every key on the key test program lights up green.
16. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Front Connector Board A30

1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug flat ribbon cable at the plug on the front connector board.
5. Unplug standby cable at the plug on the front connector board.
6. Remove headphone volume adjust knob.
7. Unscrew the four screws fastening the front connector board.
8. Replace front connector board by the new one.
9. Fasten the four screws previously removed.
10. Plug in standby cable.

    Note: The plug is contacting the cable on the top side!
11. Plug in flat ribbon cable.
12. Remount headphone volume adjust knob.
13. Mount the frontpanel to the instrument (refer to 3.1.2.5).
14. Mount the right side cover (refer to 3.1.2.5).
15. Mount the upper and lower cover (refer to 3.1.2.5).
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 Basic Instrument Checks.
18. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
19. Press any hard key twice until every key on the key test program lights up green.
20. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

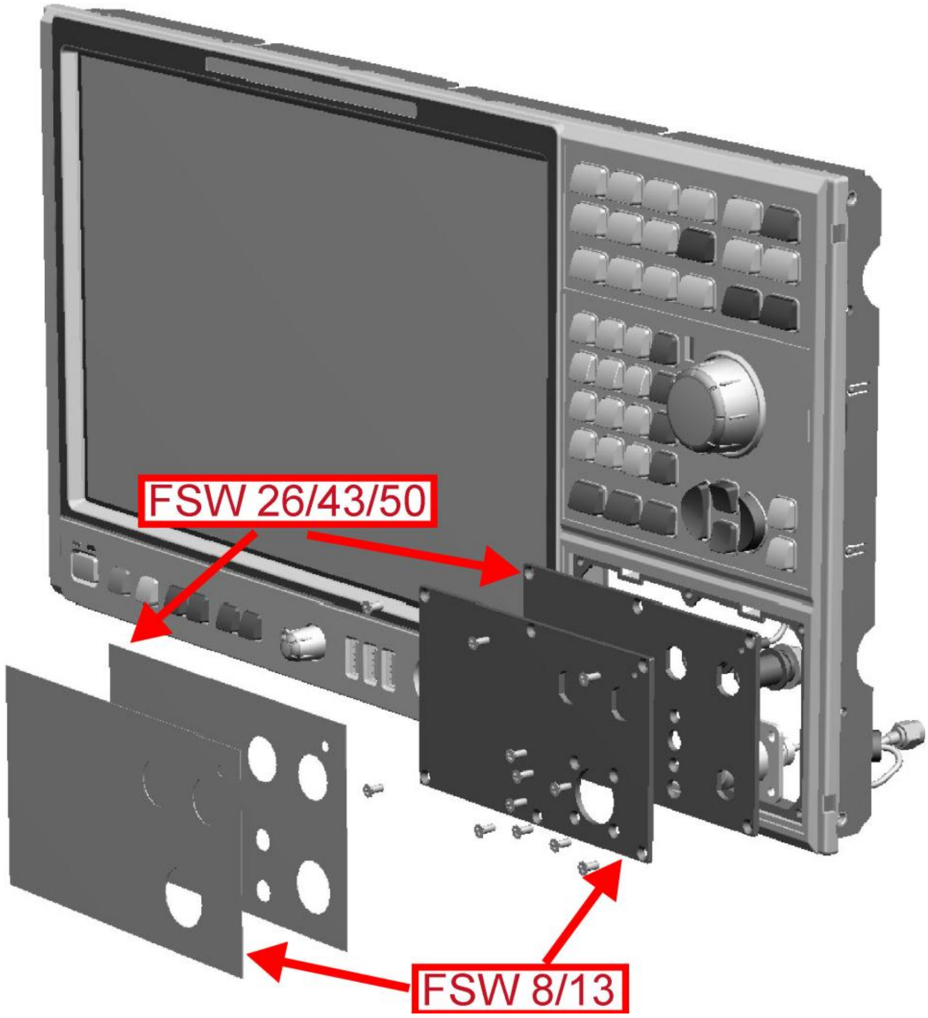
Replacing the Rotary Pulse Generator A42

1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug rotary pulse generator cable at the plug on the rotary pulse generator.
5. Remove knob from rotary pulse generator.
6. Unscrew the nut on the rotary pulse generator.
7. Replace rotary pulse generator by a new one.
8. Fasten the nut.
9. Plug in rotary pulse generator cable.

    Note: The plug is contacting the cable on the bottom side!
10. Reinstall the knob.
11. Mount the frontpanel to the instrument (refer to 3.1.2.5).
12. Mount the right side cover (refer to 3.1.2.5).
13. Mount the upper and lower cover (refer to 3.1.2.5).
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 Basic Instrument Checks.
16. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
17. Press any hard key twice until every key on the key test program lights up green.
18. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the RF Input Connector X1



1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).

For R&S FSW8/13:

a. Remove the label R&S FSW connector around the input connector.
b. Unmount the grounding cable, if installed.
c. Unscrew the four screws fastening the N-type input connector.
d. 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.

e. Fasten the four screws previously removed.
f. Reinstall the grounding cable if previously removed.
g. Add a new label R&S FSW connector.

For R&S FSW26/43/50:

a. Unscrew the nut fastening the input connector.
b. Unmount the grounding cable, if installed.
c. Replace the input connector to a new one.
d. Reinstall the grounding cable, if previously removed.
e. Fasten the nut previously removed.

4. Mount the frontpanel to the instrument (refer to 3.1.2.5).
5. Mount the right side cover (refer to 3.1.2.5).
6. Mount the upper and lower cover (refer to 3.1.2.5).
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 Basic Instrument Checks.
9. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Frontcover

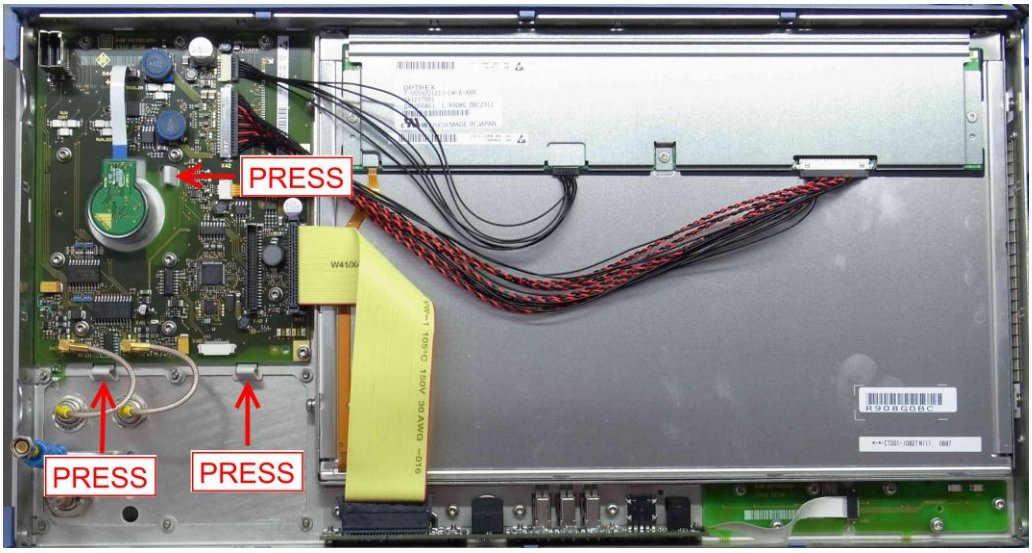
1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug display data cable and display backlight cable at the plugs on the front board.
5. Unplug touch cable and rotary pulse generator cable on the frontpanel keyboard.
6. 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

7. Unscrew the eight screws fastening the frontpanel keyboard and remove it.
8. 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.



9. Snap the new front cover onto the sheet metal.
10. Reinstall the frontpanel keyboard and fasten the eight screws.

    Note: Be sure the push-button board is inserted correct in the front bezel.
11. Replug the display data cable and display backlight cable.
12. Replug the touch cable and rotary pulse generator cable.
13. Replug the flat ribbon cable.

If Option R&S FSW-B71 is installed:

► Replug the B71 foil cable on the frontpanel keyboard board

14. Mount the frontpanel to the instrument (refer to 3.1.2.5).
15. Install the new labels on the front cover.

    Note: Be sure to mount the labels properly. They can only be installed once!
16. Mount the right side cover (refer to 3.1.2.5).
17. Mount the upper and lower cover (refer to 3.1.2.5).
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 the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

19. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
20. Press any hard key twice until every key on the key test program lights up green.
21. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Pushbutton Board Upper Half

1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug display data cable and display backlight cable at the plugs on the front board.
5. Unplug touch cable and rotary pulse generator cable on the frontpanel keyboard.
6. Unplug flat ribbon cable on frontpanel keyboard.
7. Unplug the two RF cables.

If Option R&S FSW-B71 is installed:

► Unplug the B71 foil cable on the frontpanel keyboard board

8. Unscrew the eight screws fastening the frontpanel keyboard and remove the board.
9. Replace the pushbutton board by a new one.
10. 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.
11. Replug the display data cable and display backlight cable.
12. Replug the touch cable and rotary pulse generator cable.
13. Replug the flat ribbon cable.
14. Replug the two RF cables.

If Option R&S FSW-B71 is installed:

► Replug the B71 foil cable on the frontpanel keyboard board

15. Mount the frontpanel to the instrument (refer to 3.1.2.5).
16. Mount the right side cover (refer to 3.1.2.5).
17. Mount the upper and lower cover (refer to 3.1.2.5).
18. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
19. 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.
20. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
21. Start the key test program by

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

22. Press any hard key twice until every key on the key test program lights up green.
23. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Pushbutton Board Lower Half

1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug standby cable at the plug on the standby board.
5. Unscrew the five screws fastening the standby board.
6. Remove the standby board.
7. Replace push button board by a new one.
8. 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.
9. Fasten the five screws previously removed.
10. Plug in standby cable.

    Note: The plug is contacting the cable on the top side!
11. Mount the frontpanel to the instrument (refer to 3.1.2.5).
12. Mount the right side cover (refer to 3.1.2.5).
13. Mount the upper and lower cover (refer to 3.1.2.5).
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 Basic Instrument Checks
16. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
17. Press any hard key twice until every key on the key test program lights up green.
18. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

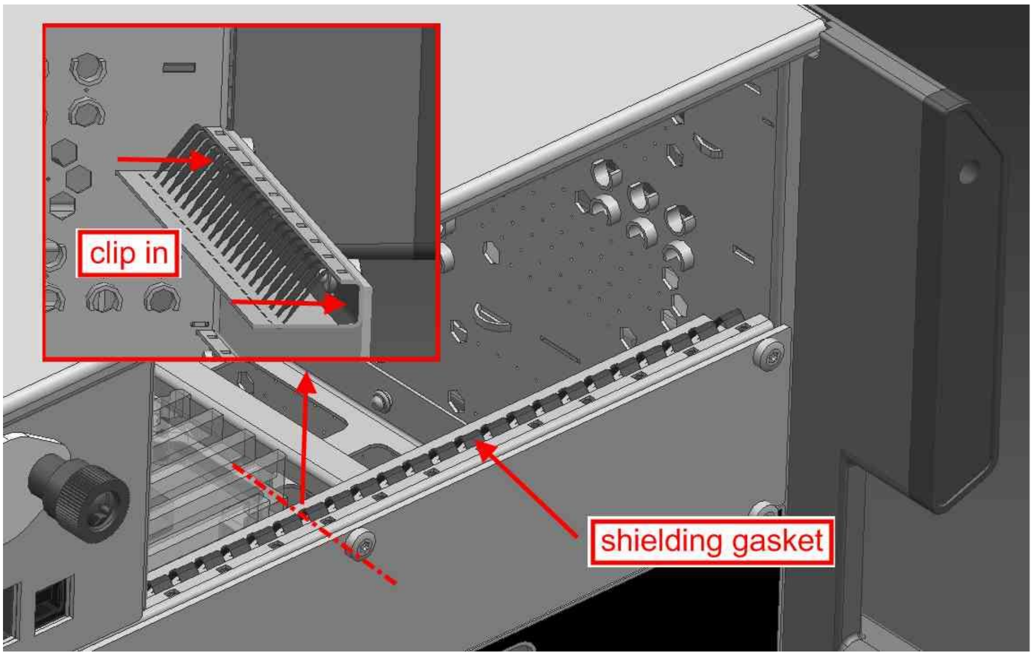
3.1.3.3 Replacing the Power Supply Unit A80

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

2. Remove the power supply using the BW2010 tool and check the R&S order number of the removed power supply.

   For PSU with R&S order number 3584.5577.00:

   To ensure the EMI shielding performance of the instrument housing an additional EMI shielding gasket must be installed to the instrument frame. The additional shielding gasket can be ordered by the R&S order number 1313.0590.00. The shielding gasket is installed on the bottom side of the slot where the power supply is installed. The gasket is clipped to instrument frame as shown in the picture below.



   For PSU with R&S order number 1174.9580.00:
   The shielding gasket is already installed in the factory. No additional action is needed.

3. Insert the new power supply carefully.

   Note: The power supply unit is locked to the frame of the instrument with an audible “CLICK”. Be sure the EMI shielding gaskets contacting the housing of the power supply to the instrument frame are installed properly.

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

5. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

3.1.3.4 Replacing the Frontend Board A100

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

2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).

3. Unmount the inner lid (refer to Unmounting the Inner Lid).
4. Unplug all RF cables and the grounding cable 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 and the grounding cable (if previously installed) at the frontend board (for detailed cable routing refer to chapter 3.1.2.2).

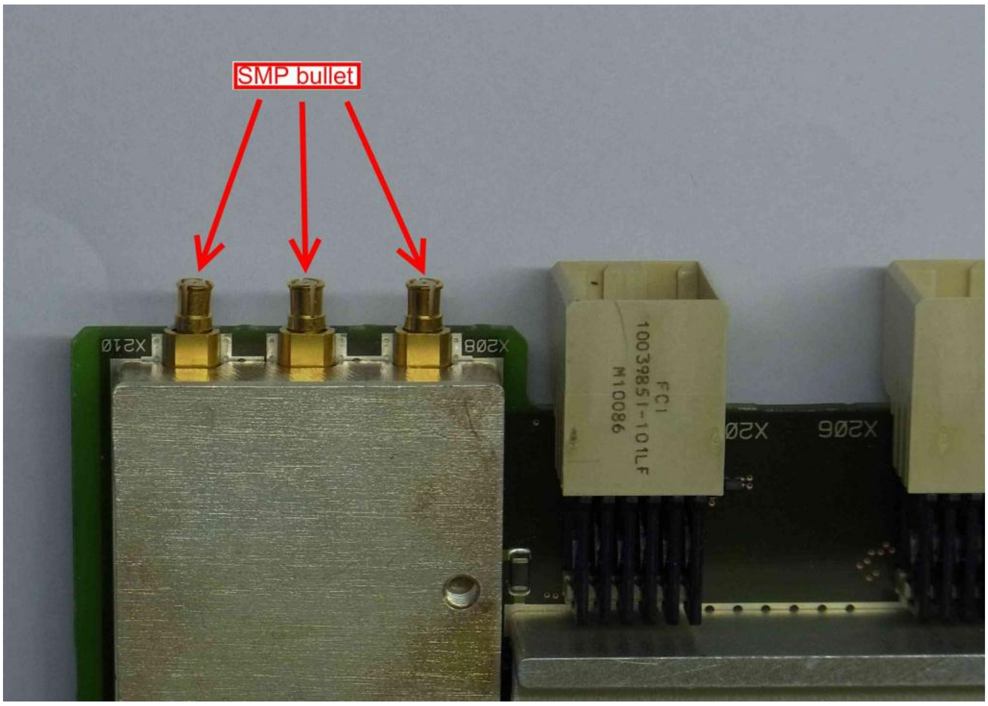
   Tip: The connector to plug in is written on the yellow tube on the cable.
8. Mount the inner lid (refer to 3.1.2.5).
9. Mount the upper and lower cover (refer to 3.1.2.5).
10. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
11. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
12. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.1.3.5 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 **Basic Instrument Checks**.

   Note: If the firmware shows a “DCM unlock” error (refer to Errors During Startup of the Instrument) when booting the instrument check the SMP bullets in the detector board for proper installation!

3.1.3.6 Replacing the Attenuator A40

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).
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 FSW13/26/43:

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

a. Remove the microwave converter frontend unit. For removing the microwave converter frontend unit refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW13/26) for R&S FSW13/26 and to chapter Microwave Converter A160, A162 and A161 (R&S FSW43) for R&S FSW43.
b. Remove RF cable to the microwave converter frontend.
c. Unscrew the four screws fastening the attenuator from the right side of the instrument.

For R&S FSW50:

a. Remove the microwave converter frontend unit. For removing the microwave converter frontend unit refer to chapter Unmounting the Microwave converter frontend unit.
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.

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. Fasten the three screws previously removed.
b. Reinstall the RF cable to the frontend.

For R&S FSW13/26/43:

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

a. Reinstall the microwave converter frontend unit. For reInstalling the microwave converter frontend unit refer to chapter Replacing the Microwave Converter Frontend for R&S FSW13/26 and to chapter Replacing the Microwave Converter Frontend for R&S FSW43.
b. Fasten the four screws previously removed.
c. Reinstall the RF cable to the microwave converter frontend.

For R&S FSW50:

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 Replacing the Microwave Converter Frontend.
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 3.1.2.5).
12. Mount the lower cover (refer to 3.1.2.5).
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 **Basic Instrument Checks**.
15. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.1.3.7 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.

Replacing the Digital Motherboard

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the inner lid (refer to Unmounting the Inner Lid).
4. Remove the CPU Board using the BW2010 tool (**CPU Board A90**).
5. Remove the power supply unit using the BW2010 tool (refer to 3.1.3.3).
6. Remove the reference board (refer to 3.1.3.15).
7. Remove the frontend board(refer to 3.1.3.4).
8. Remove the synthesizer board (refer to 3.1.3.14).

If option R&S FSW-B71 is installed:

a. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).

   Note: For details on how to route the R&S FSW-B71 cables refer to chapter 3.1.3.20.

b. Unplug the RF cables on the BNC plug plate at the frontpanel.
c. Unplug the RF cables on the R&S FSW-B71relay
d. Loosen the cable ties on the R&S FSW-B71 cables
e. Remove the R&S FSW-B71relay with its holder.

For R&S FSW13/26/43/50:

► Remove the microwave converter base board and the microwave converter frontend unit.

For R&S FSW13/26 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW13/26).

For R&S FSW43 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW43).

For R&S FSW50 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW 50).

9. Unplug the two fans.

   Note: The connectors are locked! To unlock press the lever down and disconnect the cable carefully!

10. 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.

11. 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!

12. Remove the screws fastening the digital motherboard and holder.

13. 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.

14. Remove the screws fastening the holder of the digital motherboard.

15. Remove the RF cables from the digital motherboard using the SMP removal tool.

16. 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.

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.

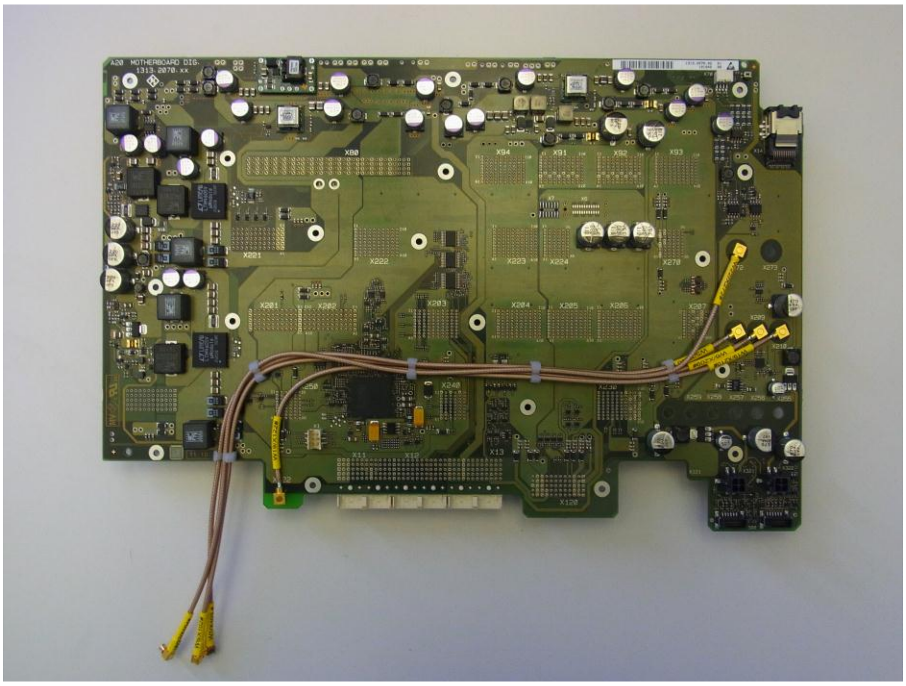


Figure 3-8: Cable routing without option R&S FSW-B71 installed

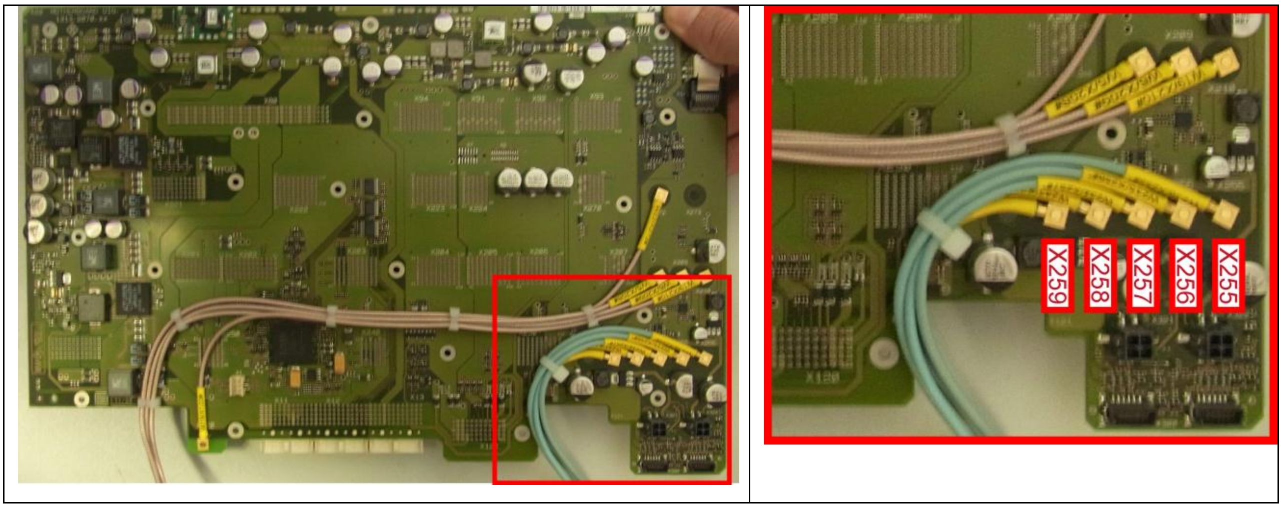


Figure 3-9: Cable routing with option R&S FSW-B71 installed

17. Replace the old digital motherboard by the new one and install it on the old holder. Reinstall the screws previously removed.
18. 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 3-10: Cable routing without option R&S FSW-B71 installed

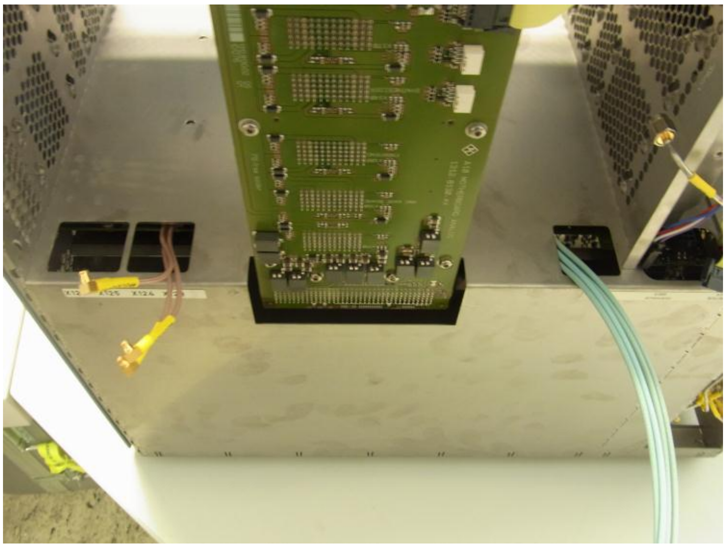


Figure 3-11: Cable routing with option R&S FSW-B71 installed

19. Remount the motherboard to the instrument frame using the previously removed screws.
20. Reinstall the CPU Board (Replacing the whole CPU Board).
21. Reinstall the power supply unit (refer to 3.1.3.3).
22. Reinstall the reference board (refer to 3.1.3.15).
23. Reinstall the frontend board(refer to 3.1.3.4).
24. Reinstall the synthesizer board (refer to 3.1.3.14).

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 Replacing the BNC plug plate)
c. Reinstall the front panel (refer to chapter 3.1.2.5)
d. Reinstall the cable ties to R&S FSW-B71 cables.

25. Plug in the two fans.
26. Plug in the attenuator and, if installed, the preamplifier.

For R&S FSW13/26/43/50:

► Reinstall the microwave converter base board and the microwave converter frontend unit.

For R&S FSW13/26 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW13/26).

For R&S FSW43 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW43).

For R&S FSW50 refer to chapter Replacing the Microwave Converter Frontend.

27. 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”.

28. Mount the right side cover (refer to 3.1.2.5).
29. Mount the upper and lower cover (refer to 3.1.2.5).
30. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
31. 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]
32. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
33. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

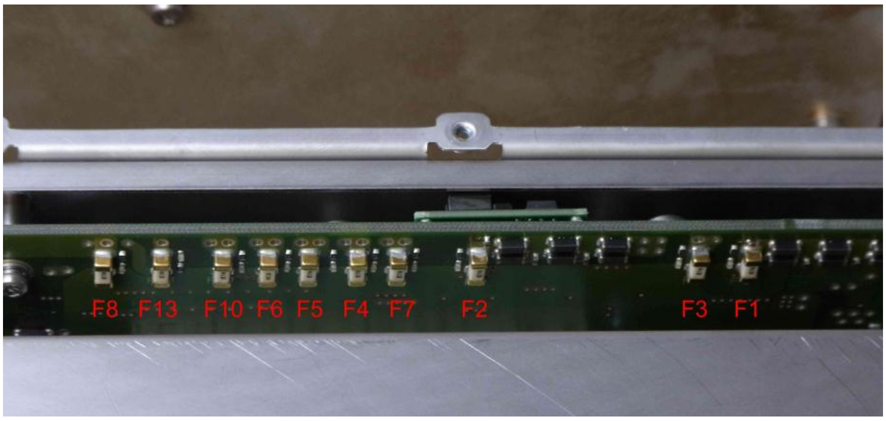
Replacing a Defective Fuse

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the inner lid (refer to **Unmounting the Inner Lid**).
4. The fuses are located on the upper side of the digital motherboard.
5. To identify the blown fuse refer to 3.1.4.
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	6100.7862.00	3A 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 digital option modules
F10	2079.5994.00	7A FF	Supply rail for CPU Board
F13	6100.7862.00	3A FF	Standby supply rail



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. The upper end of the fuse is the power rail to the boards. The voltage on all fuses is rated by 12.2V ± 5 %.

    Tip: If the fuse is blown again check the boards supplied by this power rail. See chapter 3.1.4 for further details.

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

12. Mount the inner lid (refer to 3.1.2.5).
13. Mount the upper cover (refer to 3.1.2.5).
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 **Basic Instrument Checks**.

3.1.3.8 Replacing the Analog Motherboard

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Remove the eight screws fastening the analog motherboard.
4. Carefully remove the analog motherboard.
5. Carefully plug in the new module.
6. Fasten the eight screws previously removed.
7. Mount the lower cover (refer to 3.1.2.5).
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 **Basic Instrument Checks**.

3.1.3.9 Microwave Converter A160, A162 and A161 (R&S FSW13/26)

Replacing the Base Board

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the inner lid (refer to **Unmounting the Inner Lid**).
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 3.1.2.5).

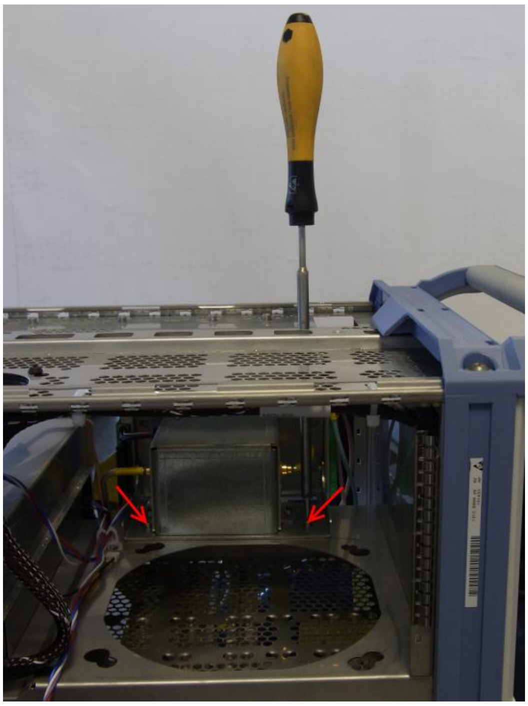
10. Mount the inner lid (refer to 3.1.2.5).
11. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
12. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
13. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Microwave Converter Frontend

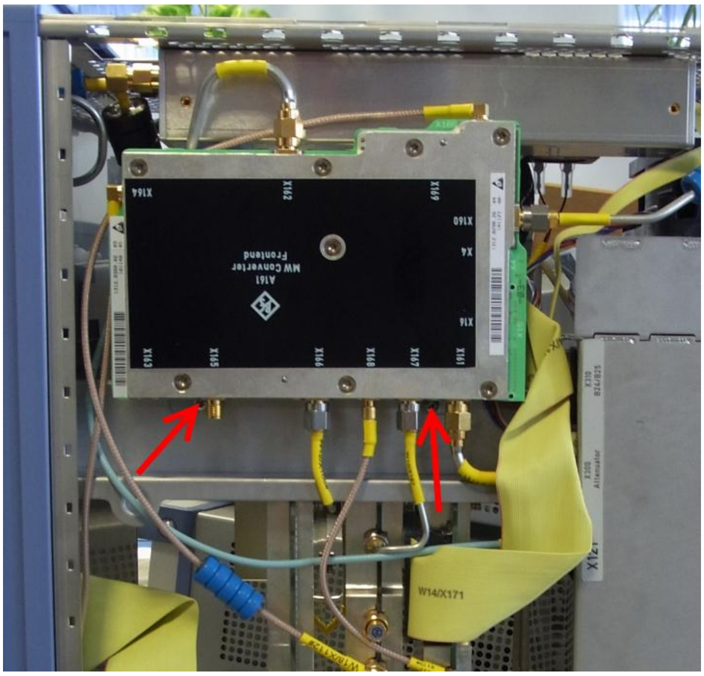
The microwave converter frontend is located on the bottom of the instrument close to the RF attenuator. The board is mounted on the microwave converter frontend unit. In the figure for cable routing of the R&S FSW13/26 in 3.1.2.2 the location of the microwave converter frontend is shown.

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).
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 grounding cable at the microwave converter frontend, if installed.
7. Unscrew the two screws shown in the picture below using the extra long TX8 screw driver. The screws can be reached through the right side wall of the instrument. (For uninstalling the microwave converter frontend unit, there is no need to unmount the fan!)

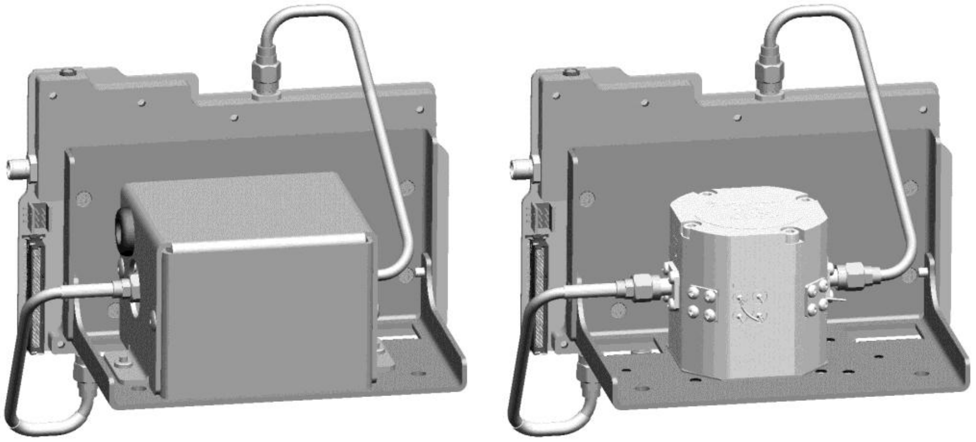


8. Unscrew the two screws at the bottom of the microwave converter frontend unit as shown on the picture below.



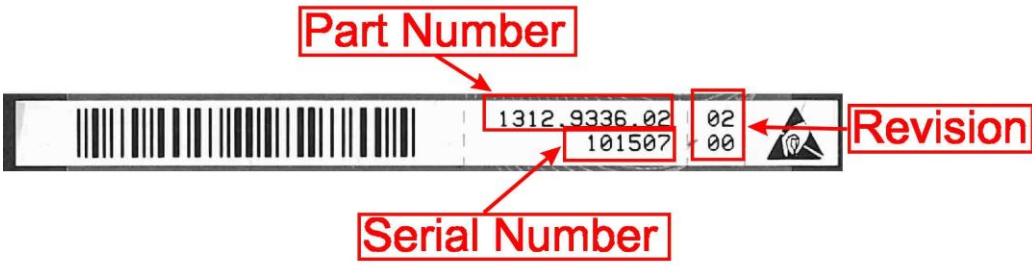
9. Remove the microwave converter frontend unit from the instrument.
10. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
11. Unplug the YIG filter control cable.
12. Uninstall the two RF cable on the YIG filter.

13. Uninstall the shielding cap of the YIG filter.
14. Unscrew the four screws fastening the microwave converter frontend to the YIG filter.



15. Replace the microwave converter frontend by a new one and fasten the four screws previously removed.
16. Write down the serial number, the partnumber 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 Eprom!)



17. Reinstall the shielding cap of the YIG filter
18. Replug the YIG filter control cable to the new microwave converter frontend .
19. Reconnect the RF cables at connector X161 and X162 and the YIG filter

20. Reinstall the microwave converter frontend unit to the instrument and fasten it using the four screws previously removed and the extra long TX8 screwdriver.
21. Reconnect all RF cables to its corresponding plugs.

    Tip: The connector to plug in is written on the yellow tube on the cable.
22. Reconnect the grounding cable if it was previously installed.
23. Plug in the flat ribbon cable.
24. Mount the right side cover (refer to 3.1.2.5).
25. Mount the upper and lower cover (refer to 3.1.2.5).
26. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
27. 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 partnumber, 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!

       Note: This service function will be available with the firmware version 1.40 and higher.

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!

---

28. Enter the service function

    [3.7.7.0.FRONTEND]

    and verify the displayed data with the data of the new installed hardware.
29. Reset the service password

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]
    [Reset Password]
30. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

31. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

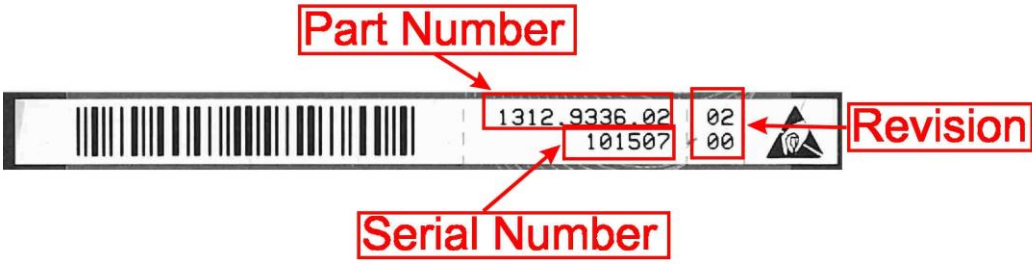
Replacing the YIG Filter

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).
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 **3.1.3.9** step 6 to 9.
7. Unplug the RF cables at connector X161 and X162 at the YIG filter side.
8. Unplug the YIG filter control cable.
9. Unscrew the two screws fastening the shielding cover of the YIG filter and remove the cover.
10. Unscrew the four screws fastening the YIG filter on 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 partnumber 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 Eprom!)



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 using the four screws previously removed and the extra long TX8 screwdriver.
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 3.1.2.5).
21. Mount the upper and lower cover (refer to 3.1.2.5).
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 partnumber, 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 **Basic Instrument Checks**.

27. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.1.3.10 Microwave Converter A160, A162 and A161 (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.

Replacing the Base Board

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

2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).

3. Unmount the inner lid (refer to **Unmounting the Inner Lid**).

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

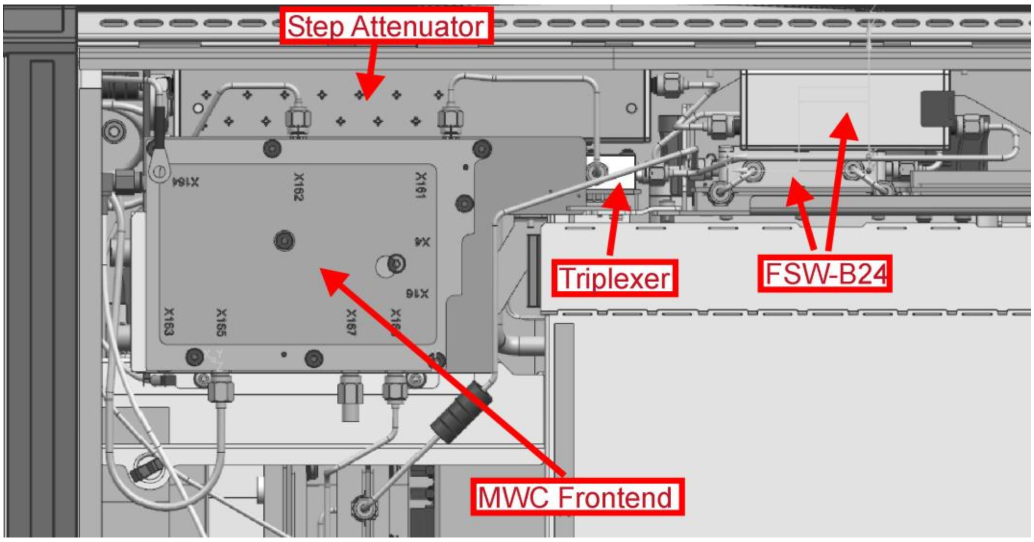
Make sure you plug in the flat ribbon cable connectors in a right angle. Otherwise, the contacts inside the connector may be damaged.

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 3.1.2.5).
12. Mount the inner lid (refer to 3.1.2.5).
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 **Performing a Frequency Response Correction**.
15. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

Unmounting the Microwave converter frontend unit

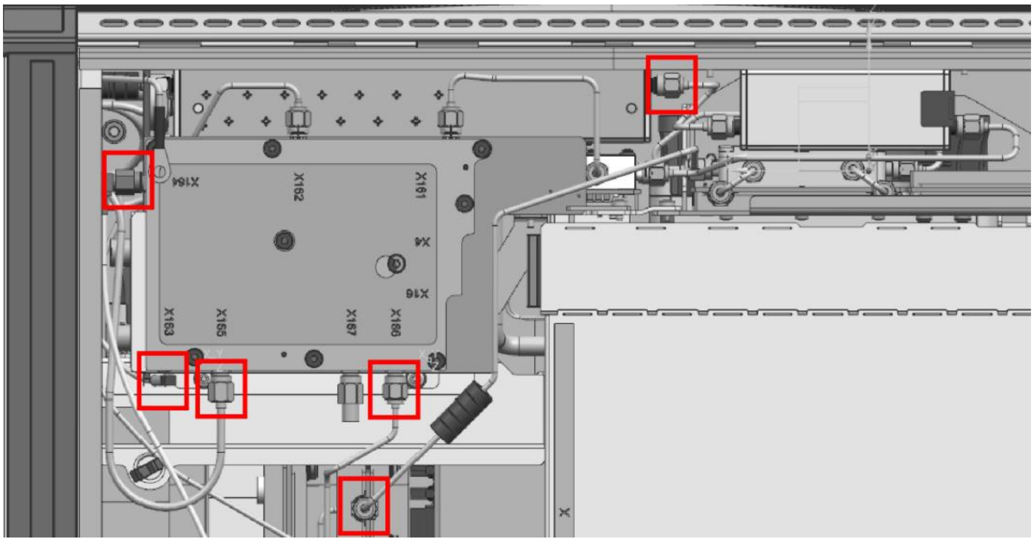


1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).
4. Unplug the flat ribbon cable at the microwave converter frontend side.

   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 marked in the picture below from the microwave converter frontend unit.

   Note: The picture shows an instrument with option R&S FSW-B24 installed.

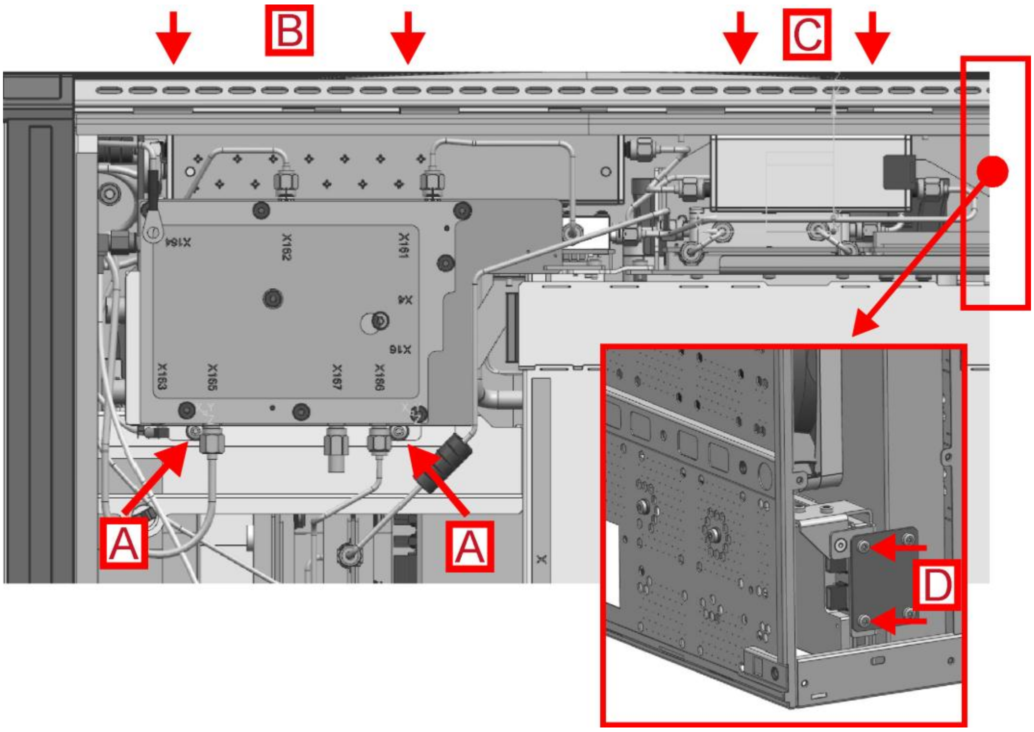


6. Unscrew the two screws marked with A fastening the microwave converter frontend unit.

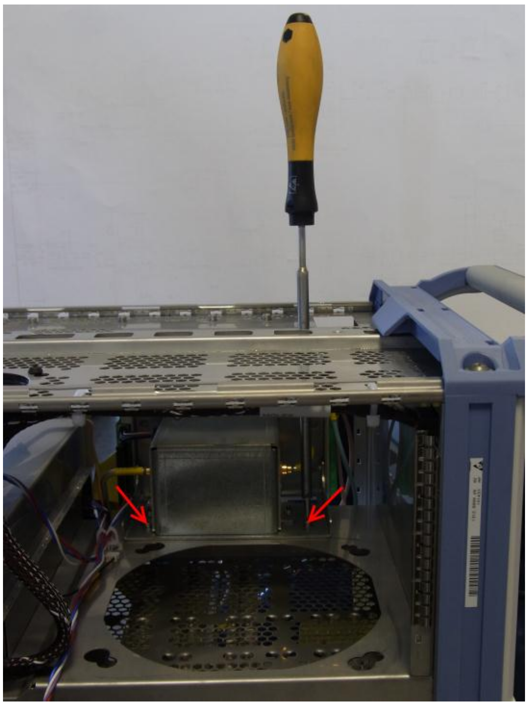
   Note: The picture shows an instrument with option R&S FSW-B24 installed.

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.



7. Unscrew the two screws marked with B as shown in the picture below using the extra long TX8 screw driver. The screws can be reached through the right side wall of the instrument. (To uninstall the microwave converter frontend unit, there is no need to unmount the fan!)



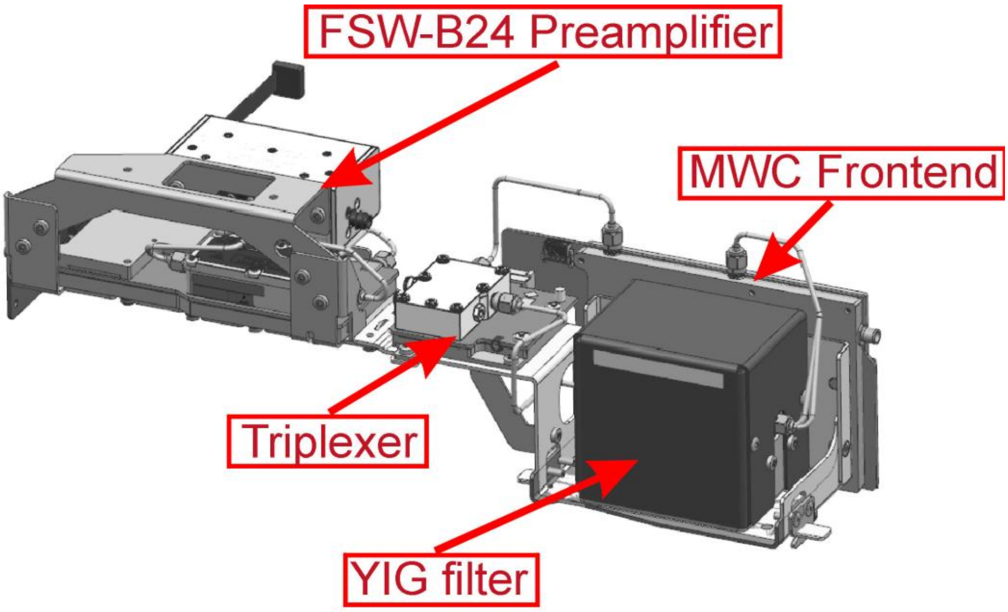
8. Carefully remove the microwave converter frontend unit from the instrument chassis.

Installing the microwave converter frontend unit

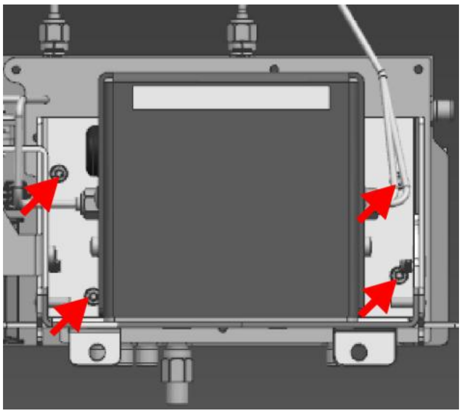
1. Carefully insert the microwave converter frontend unit in the instrument chassis.
2. Fasten the microwave converter frontend unit by installing the screws previously removed
3. Reconnect all RF cables previously removed.
4. reconnect the flat ribbon cables at the microwave converter base board.
5. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
6. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Microwave Converter Frontend

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 Microwave Converter A160, A162 and A161 (R&S FSW43) . The picture below shows the microwave converter frontend unit with installed option R&S FSW-B24.

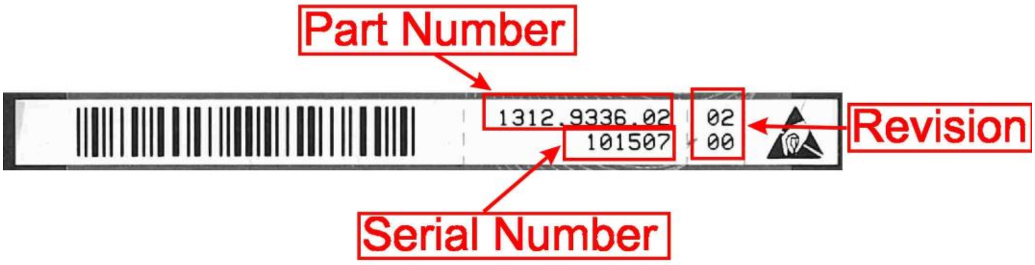


1. Unmount the microwave converter frontend unit as described in chapter Microwave Converter A160, A162 and A161 (R&S FSW43)
2. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
3. Unscrew the four screws fastening the microwave converter frontend to the frontend 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 partnumber 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 Eprom!)



8. Reconnect the RF cables at connector X161 and X162

   Tip: The connector to plug in is written on the yellow tube on the cable.
9. Reinstall the frontend unit to the instrument as described in chapter Front Unit
10. Mount the right side cover (refer to 3.1.2.5).
11. Mount the upper and lower cover (refer to 3.1.2.5).
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 partnumber, 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!

   Note: This service function will be available with the firmware version 1.40 and higher.

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

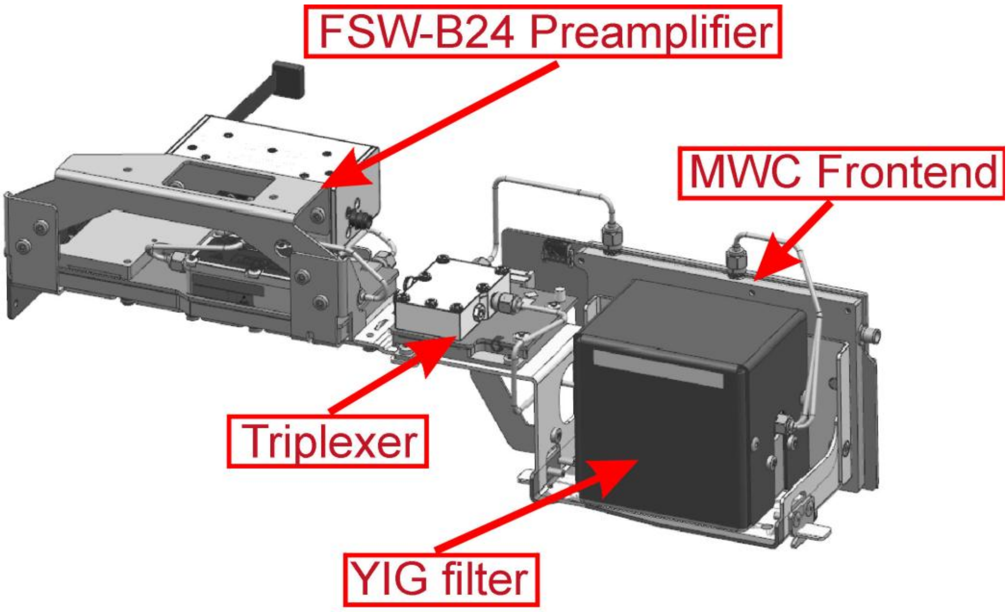
    [SETUP : MORE : SERVICE : SERVICE FUNCTION]
    [Reset Password]

16. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

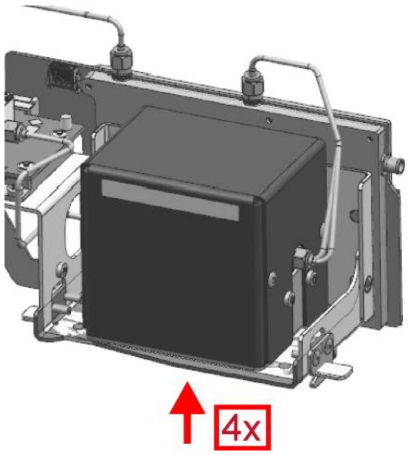
17. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the YIG Filter

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.

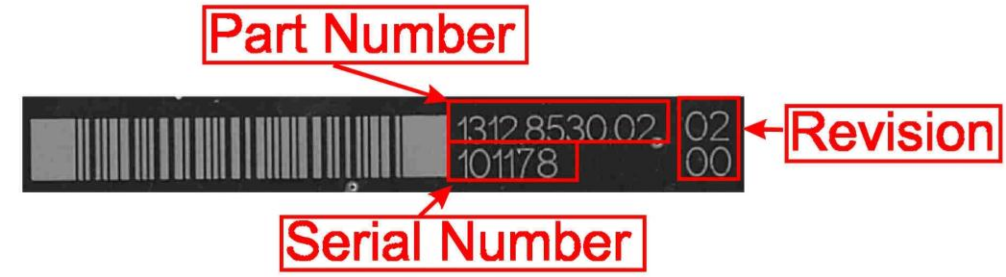


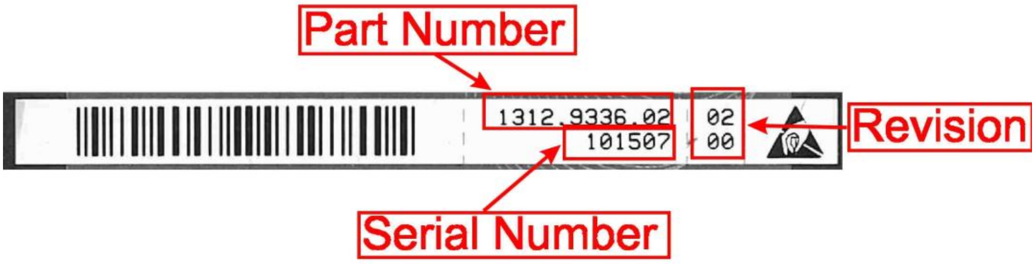
1. Unmount the microwave converter frontend unit as described in chapter Microwave Converter A160, A162 and A161 (R&S FSW43)
2. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
3. Unplug the YIG filter control cable.
4. Uninstall the two RF cable on the YIG filter.
5. Uninstall the shielding cap with the YIG filter by unscrewing the four screws fixing the YIG filter shielding cap.



6. Unmount the shielding cap from the YIG filter.
7. Replace the YIG filter by a new one.
8. Write down the serial number, the partnumber 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 Eprom!)





9. Reinstall the YIG filter with the shielding cap to the frontend unit frame.
10. Replug the YIG filter control cable to the microwave converter frontend.
11. 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.
12. Reinstall the frontend unit to the instrument as described in chapter **Front Unit**
13. Mount the right side cover (refer to 3.1.2.5).
14. Mount the upper and lower cover (refer to 3.1.2.5).
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 partnumber, 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.

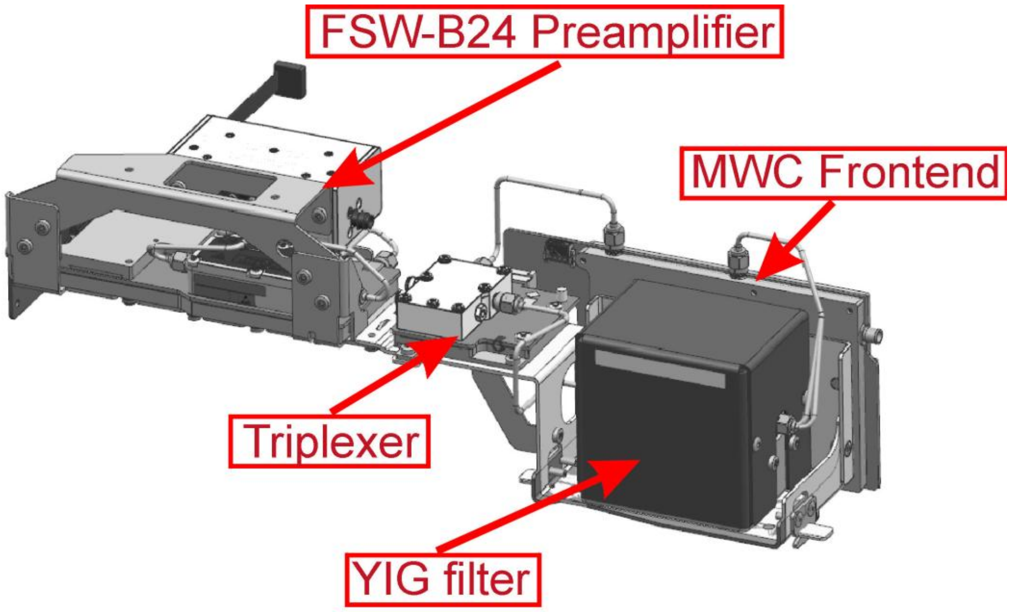
18. Reset the service password

    [SETUP : MORE : SERVICE : SERVICE FUNCTION]
    [Reset Password]

19. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

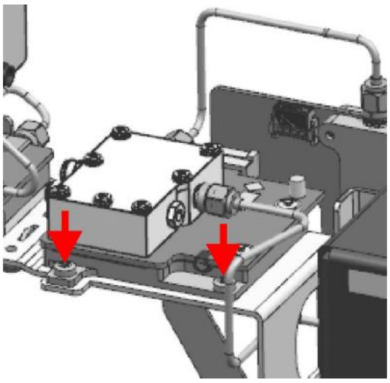
20. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Triplexer



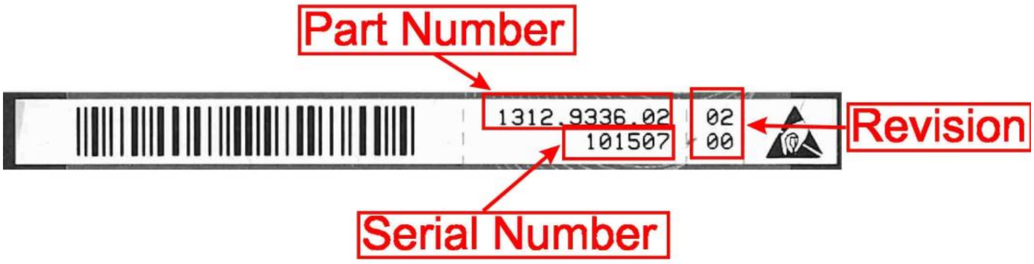
The triplexer is located on the microwave converter frontend unit.

1. Unmount the microwave converter frontend unit as described in chapter Microwave Converter A160, A162 and A161 (R&S FSW43)
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 partnumber 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 Eprom!)



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 **Front Unit**
11. Mount the right side cover (refer to 3.1.2.5).
12. Mount the upper and lower cover (refer to 3.1.2.5).
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 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 partnumber, 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.

15. Enter the service function

    [3.7.7.0.TRIPLEXER]
    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 the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
18. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.1.3.11 Microwave Converter A160, A162 and A161 (R&S FSW 50)

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 th 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.

Replacing the Base Board

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the inner lid (refer to **Unmounting the Inner Lid**).
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

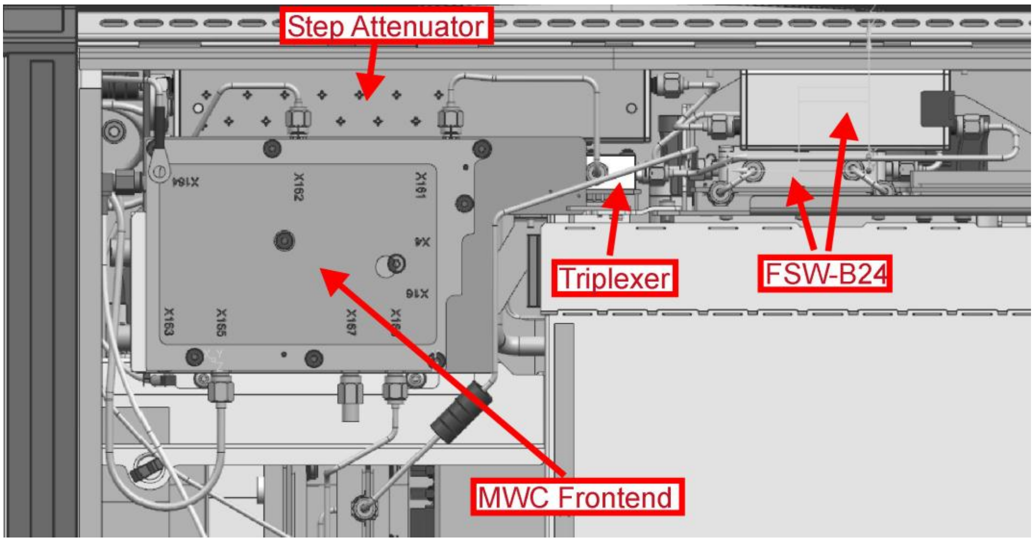
Risk of damaging connector contacts

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 3.1.2.5).
12. Mount the inner lid (refer to 3.1.2.5).
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 **Performing a Frequency Response Correction**.
15. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

Unmounting the Microwave converter frontend unit



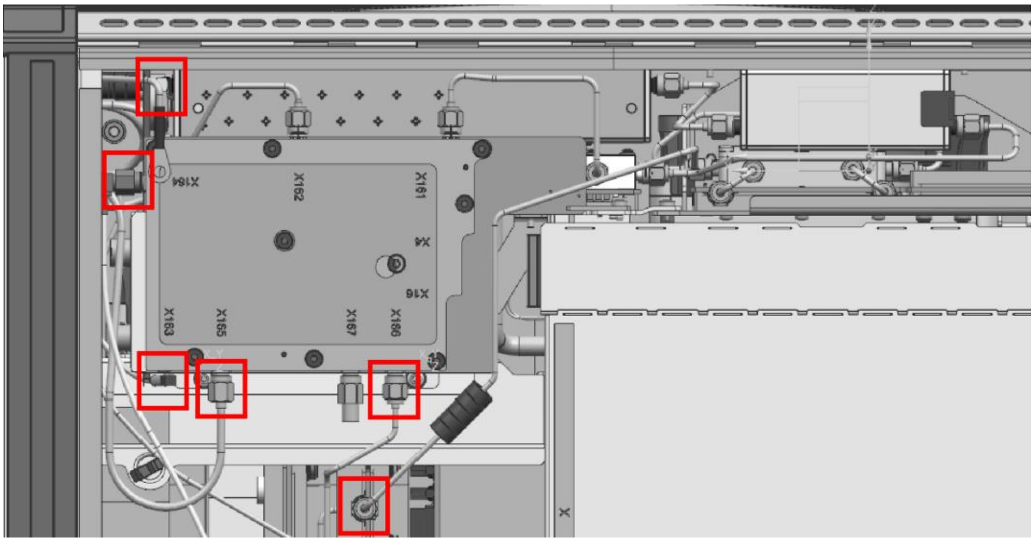
16. Switch off the instrument and disconnect the power plug.

17. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
18. Unmount the right side cover (refer to **Unmounting the Side Cover**).
19. 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.
20. 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.
21. 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.

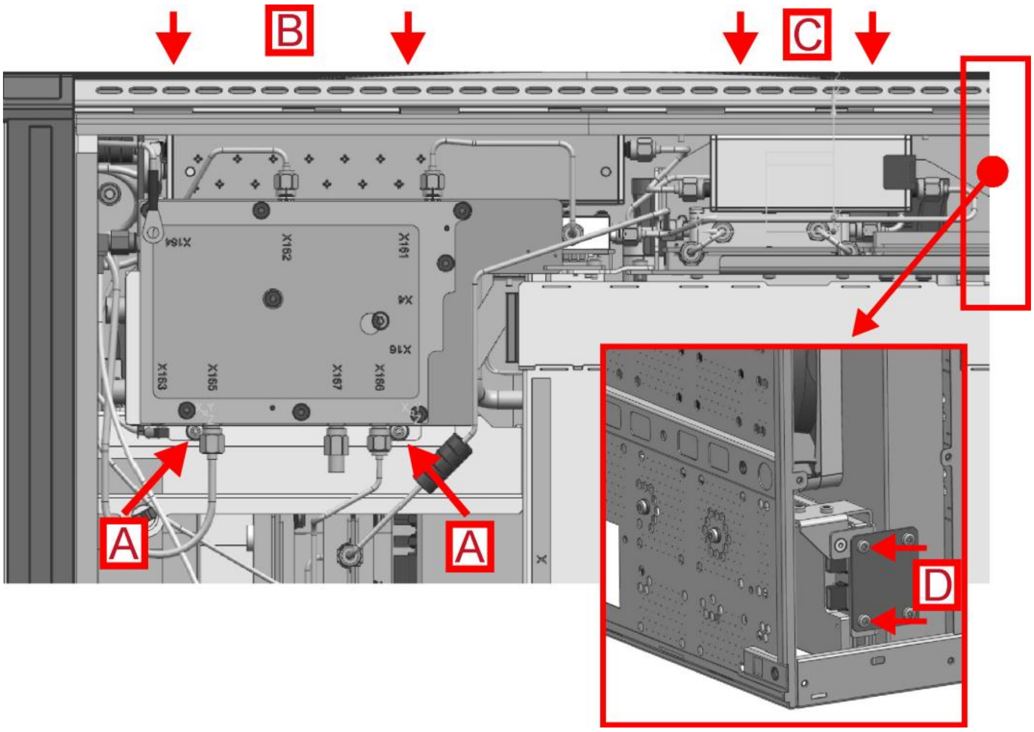


22. Unscrew the two screws marked with A fastening the microwave converter frontend unit.

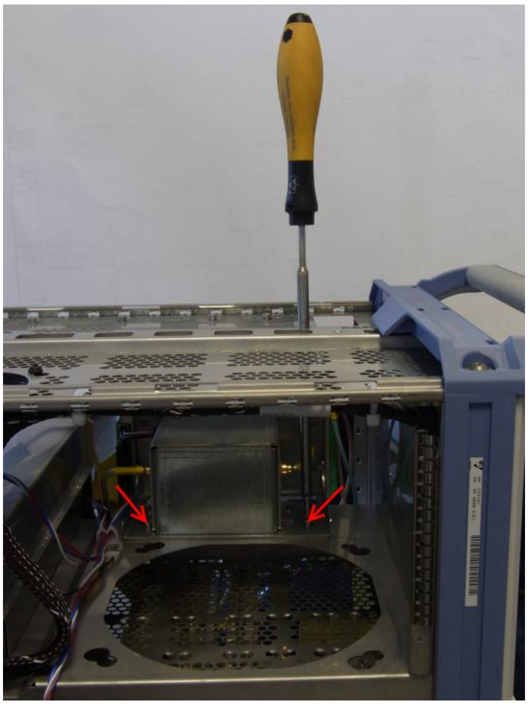
    Note: The picture shows an instrument with option R&S FSW-B24 installed.

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.



23. Unscrew the screws fastening the step attenuator at the right side of the instrument marked with B.
24. Unscrew the two screws fastening the microwave converter frontend unit to the instrument as shown in the picture below using the extra long TX8 screw driver. The screws can be reached through the right side wall of the instrument. (To uninstall the microwave converter frontend unit, there is no need to unmount the fan!)



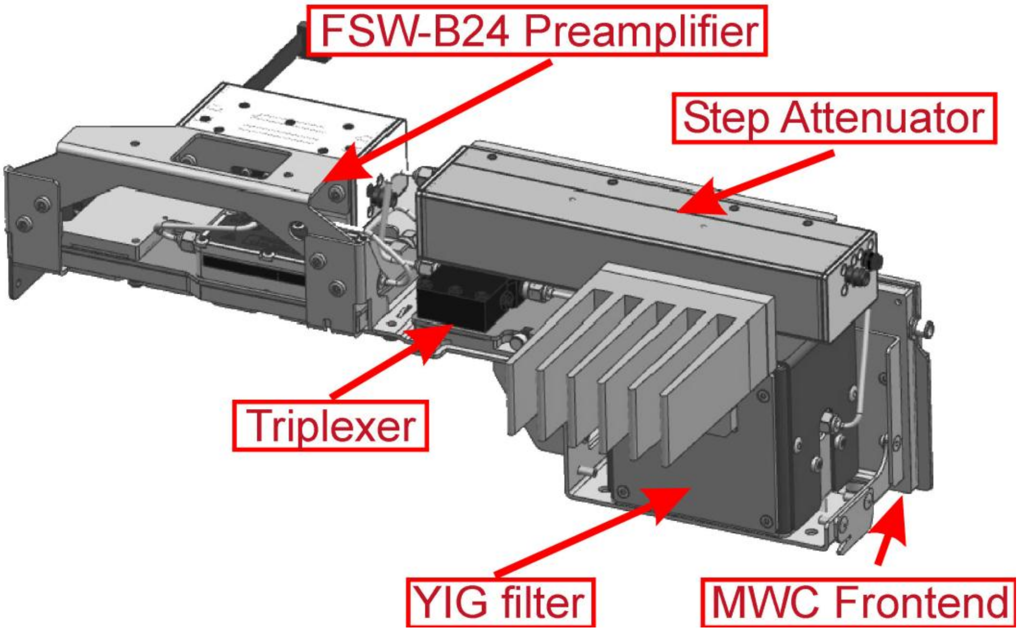
25. Carefully remove the microwave converter frontend unit from the instrument chassis.

Installing the microwave converter frontend unit

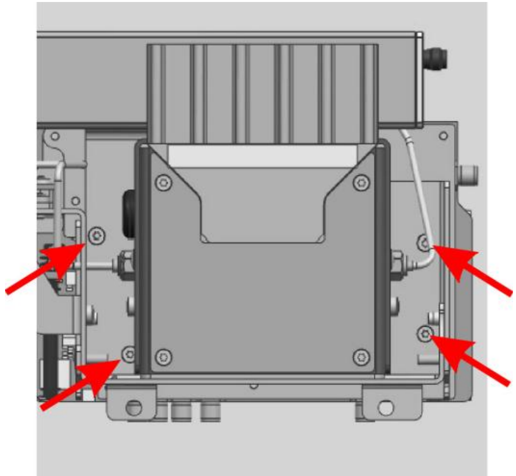
1. Carefully insert the microwave converter frontend unit in the instrument chassis.
2. Fasten the microwave converter frontend unit by installing the screws previously removed
3. Reconnect all RF cables previously removed.
4. Reconnect the flat ribbon cables at the microwave converter base board.
5. Reconnect the cable of the step attenuator at the motherboard.
6. Mount the upper and lower cover (refer to 3.1.2.5).
7. Mount the right cover (refer to 3.1.2.5).
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 **Basic Instrument Checks**.
10. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Microwave Converter Frontend

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 Microwave Converter A160, A162 and A161 (R&S FSW43) . The picture below shows a R&S FSW 50 microwave converter frontend unit with installed option R&S FSW-B24.

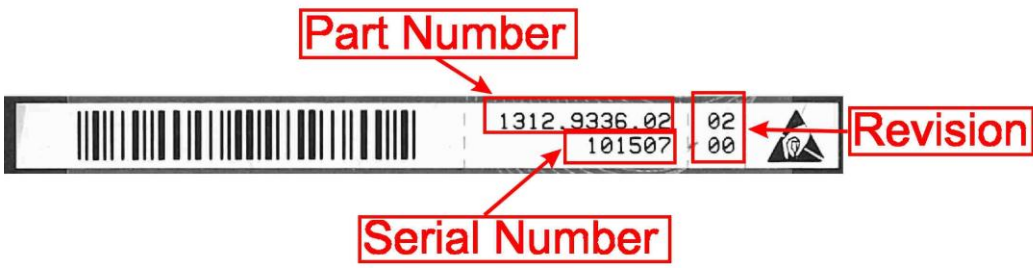


1. Unmount the microwave converter frontend unit as described in chapter Microwave Converter A160, A162 and A161 (R&S FSW43)
2. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
3. Unscrew the four screws fastening the microwave converter frontend to the frontend 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 partnumber 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 Eprom!)



8. Reconnect the RF cables at connector X161 and X162

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 Installing the microwave converter frontend unit.
10. Mount the right side cover (refer to 3.1.2.5).
11. Mount the upper and lower cover (refer to 3.1.2.5).
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 partnumber, 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!

       Note: This service function will be available with the firmware version 1.40 and higher.

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

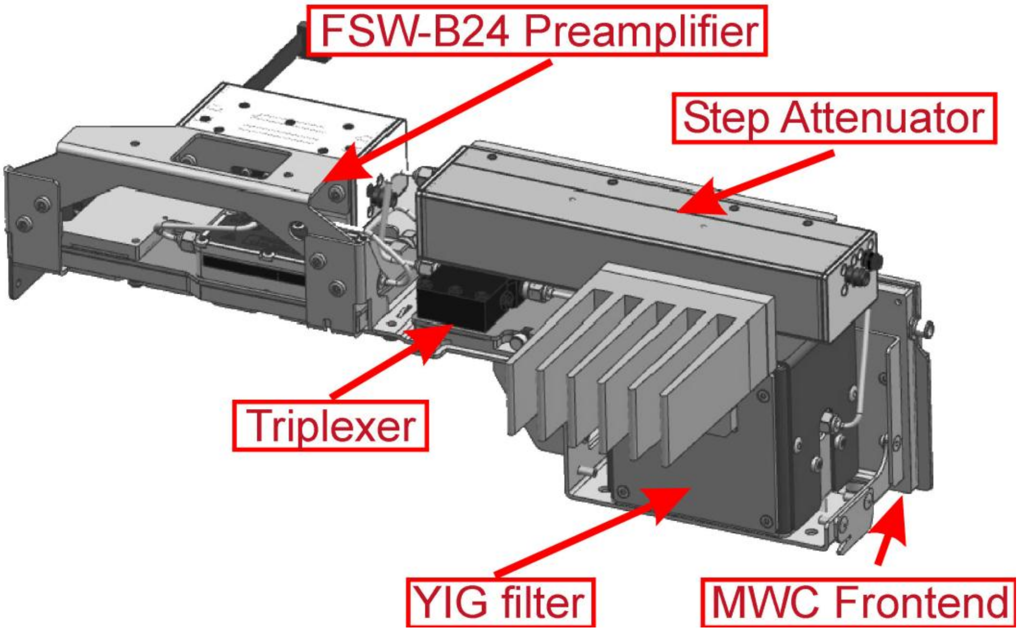
    [3.7.7.0.FRONTEND]

    and verify the displayed data with the data of the new installed hardware.
15. Reset the service password

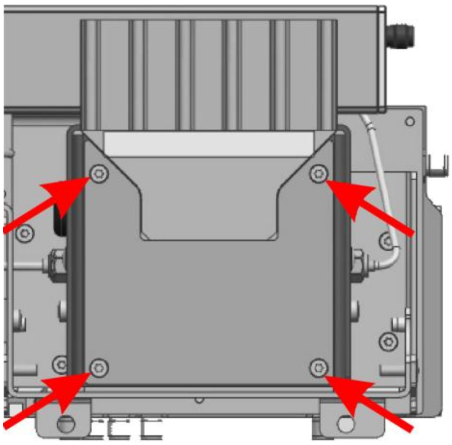
    [SETUP : MORE : SERVICE : SERVICE FUNCTION]
    [Reset Password]
16. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
17. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the YIG Filter

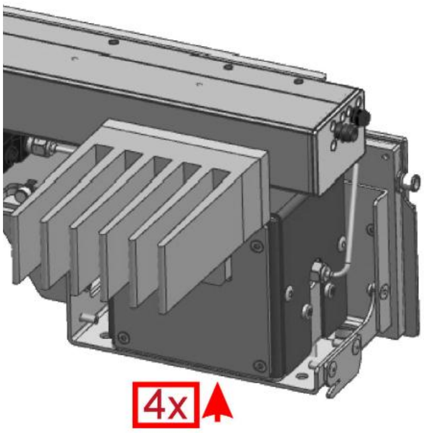
The YIG filter is mounted on the microwave converter frontend unit. To replace it the whole microwave converter frontend unit has to be removed from the instrument.



1. Unmount the microwave converter frontend unit as described in chapter Unmounting the Microwave converter frontend unit
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 heat sink on the YIG filter by removing the four screws fastening the heat sink.

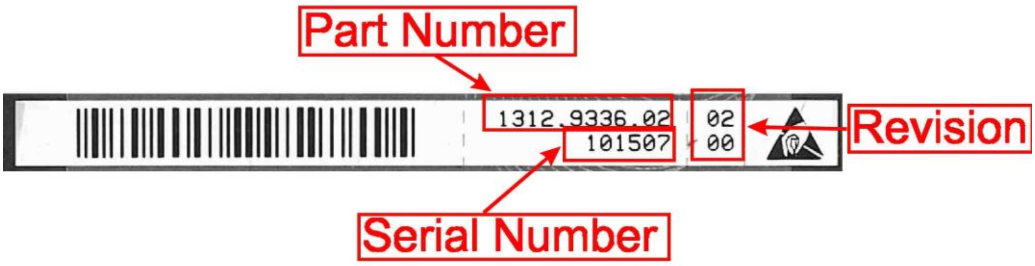


6. Uninstall the shielding cap with the YIG filter by unscrewing the four screws fixing the YIG filter shielding cap.



7. Disconnect the RF cable at the step attenuator.
8. Unmount the step attenuator from the Microwave converter frontend unit by removing the screws fastenint the step attenuator.
9. Unmount the shielding cap from the YIG filter.
10. Replace the YIG filter by a new one.
11. Write down the serial number, the partnumber 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 Eprom!)



12. Reinstall the YIG filter with the shielding cap to the frontend unit frame.

13. Replace the thermal conductive pad if it was installed formerly and reinstall the heat sink.
14. Replug the YIG filter control cable to the microwave converter frontend.
15. Mount the step attenuator to the microwave converter frontend unit.
16. Reconnect the RF cable to the step attenuator.

    Tip: The connector to plug in is written on the yellow tube on the cable.
17. 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.
18. Reinstall the microwave converter frontend unit to the instrument as described in chapter Installing the microwave converter frontend unit
19. Mount the right side cover (refer to 3.1.2.5).
20. Mount the upper and lower cover (refer to 3.1.2.5).
21. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
22. Update the EPROM Data of the YIG filter
    c. Enter the service password

       [SETUP : Service : Service Function : Password = 30473035]
    d. 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 partnumber, 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.

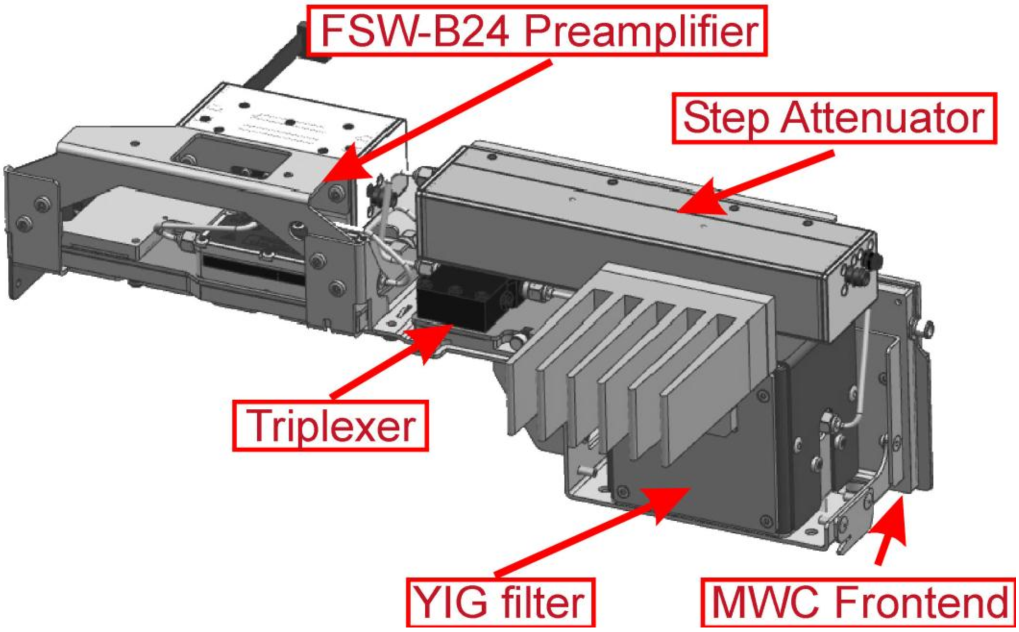
       Note: This service function will be available with the firmware version 1.40 and higher.
23. Enter the service function

    [3.7.7.0.YIG_UNIT]
    and verify the displayed data with the data of the new installed hardware.
24. Reset the service password

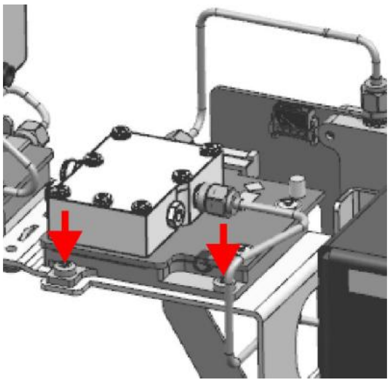
    [SETUP : MORE : SERVICE : SERVICE FUNCTION]
    [Reset Password]
25. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.
26. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

Replacing the Triplexer

The triplexer is located on the microwave converter frontend unit.



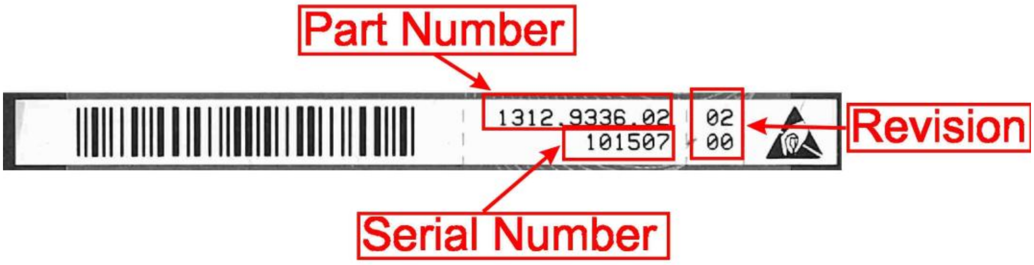
1. Unmount the microwave converter frontend unit as described in chapter Unmounting the Microwave converter frontend unit.
2. Unconnect the RF cables to the step attenuator.
3. Unmount the step attenuator from the microwave converter frontend unit.
4. Uninstall the three RF cables to the triplexer.
5. 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 partnumber 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 Eprom!)



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 Installing the microwave converter frontend unit
15. Mount the right side cover (refer to 3.1.2.5).
16. Mount the upper and lower cover (refer to 3.1.2.5).
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 partnumber, 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 **Basic Instrument Checks**.

22. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.1.3.12 Parts Mounted on the Instrument Chassis

Replacing the Speaker B1

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the inner lid (refer to **Unmounting the Inner Lid**).
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 3.1.2.5).
11. Mount the upper cover (refer to 3.1.2.5).
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 **Basic Instrument Checks**.
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.

Replacing the Fans

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover)

For R&S FSW13/26/43/50:

► Remove the microwave converter base board and the microwave converter frontend unit.

For R&S FSW13/26 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW13/26).

For R&S FSW43 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW43).

For R&S FSW50 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW 50)

3. Unplug the fan to be replaced.

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

4. Remove the fan from its holder.

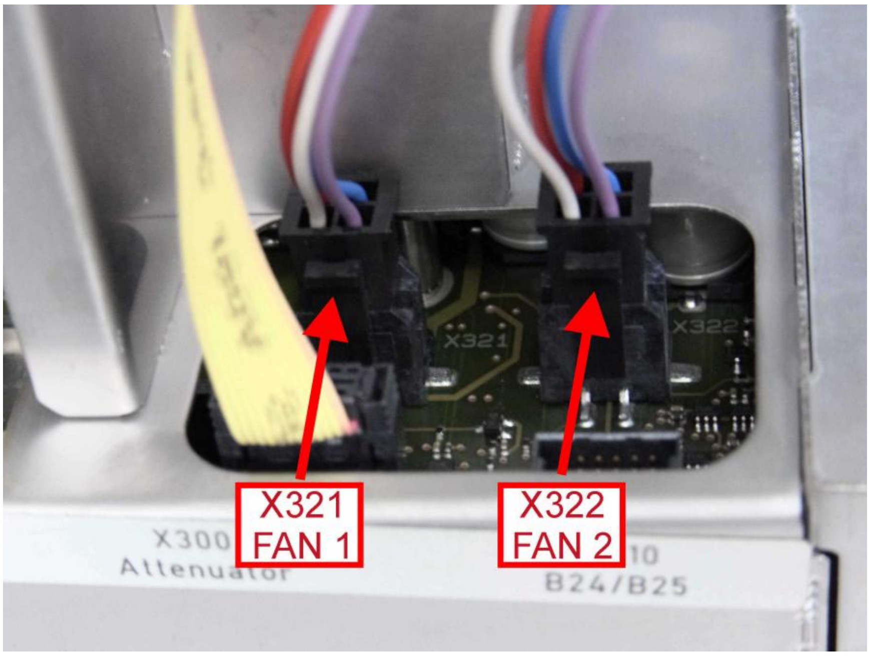
   Tip: you can pull at the lever on the rubber holder while pushing out the fan.

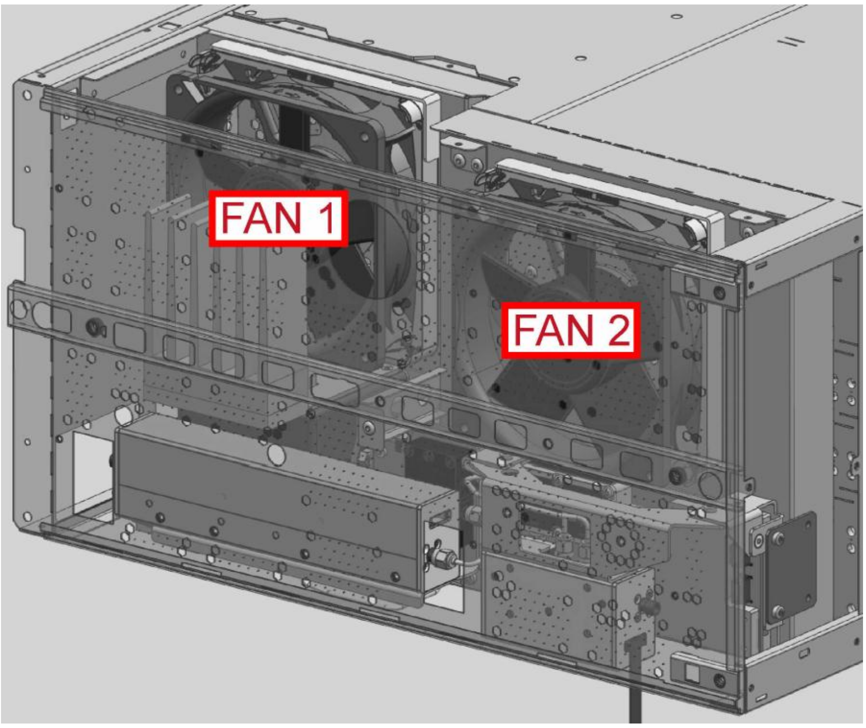
5. Install the new fan. Insert the lower corner of the fan in the holder, then press the other two corners in the holder. The fourth corner can be inserted in the holder by pulling the lever at that corner.

   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!

6. 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.





For R&S FSW13/26/43/50:

► Remount the microwave converter frontend.

For R&S FSW13/26 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW13/26).

For R&S FSW43 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW43).

For R&S FSW50 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW 50).

7. Mount the upper and lower cover (refer to 3.1.2.5).
8. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
9. 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!

10. Open the file C:\r_s\instrument\eeprom\motherboard\config.ini in the texteditor.

    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 Funktion: 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!

11. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
12. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.1.3.13 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 **Basic Instrument Checks**.
7. Adjust the reference frequency according to chapter 2.1 or perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.1.3.14 Replacing the Synthesizer Board A140

13. Switch off the instrument and disconnect the power plug.
14. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
15. Unmount the inner lid (refer to **Unmounting the Inner Lid**).
16. Unplug all RF cables at the synthesizer board.

    Note: there are one or more cables routed on the upper side of the instrument!
17. Remove the synthesizer board carefully.
18. Install the new synthesizer board.
19. Reconnect all RF cables at the synthesizer board (for detailed cable routing refer to chapter 3.1.2.2).

    Tip: The connector to plug in is written on the yellow tube on the cable.
20. Mount the inner lid (refer to 3.1.2.5).
21. Mount the upper and lower cover (refer to 3.1.2.5).

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 the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
24. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.1.3.15 Replacing the Reference Board A120

25. Switch off the instrument and disconnect the power plug.
26. Unmount the lower cover (refer to Unmounting the Upper and/or Lower Cover)
27. Unscrew the eight screws fastening the reference board.

Without R&S FSW-B4 installed:

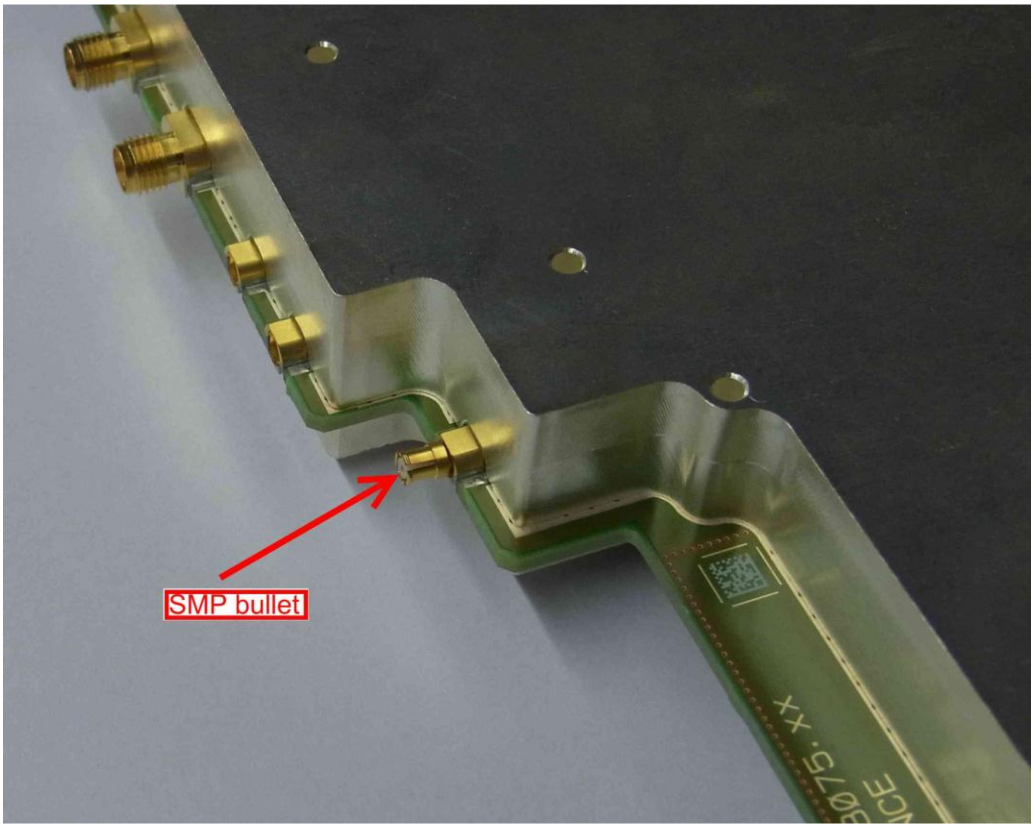
► Unscrew the four screws fastening the metal sheet covering the R&S FSW-B4 slot and remove the cover.

With R&S FSW-B4 installed:

► Uninstall the R&S FSW-B4 according to chapter 3.1.3.13.

28. Unplug all RF cables inside the instrument from the reference board.
29. Remove the reference board from the instrument.
30. Install the new reference board.

    Note: Do not forget to install the SMP bullet!



31. Reconnect all RF cables at the reference board (for detailed cable routing refer to chapter 3.1.2.2).

    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 3.1.3.13.

32. Fasten the reference board by installing the eight screws previously removed.
33. Mount the lower cover (refer to 3.1.2.5).
34. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
35. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
36. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

    Note: If the firmware shows a “DCM unlock” Error (refer to Errors During Startup of the Instrument) when starting the instrument check the SMP bullet for proper installation!

3.1.3.16 Replacing the Preamplifier

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 relais 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 relais unit must be replaced.

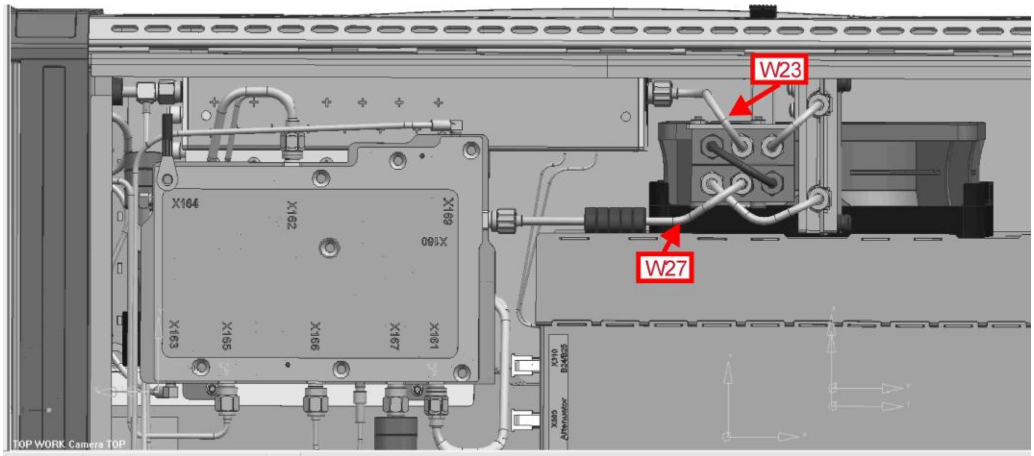


Figure 3-12: Cabling of an R&S FSW13/26 equipped with R&S FSW-B24

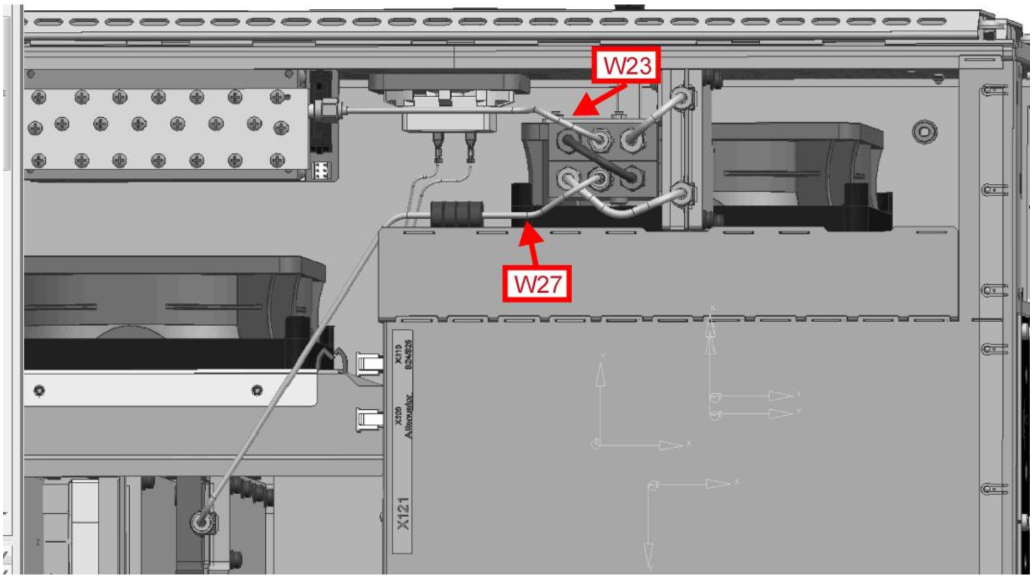


Figure 3-13: Cabling of an R&S FSW8 equipped with R&S FSW-B24

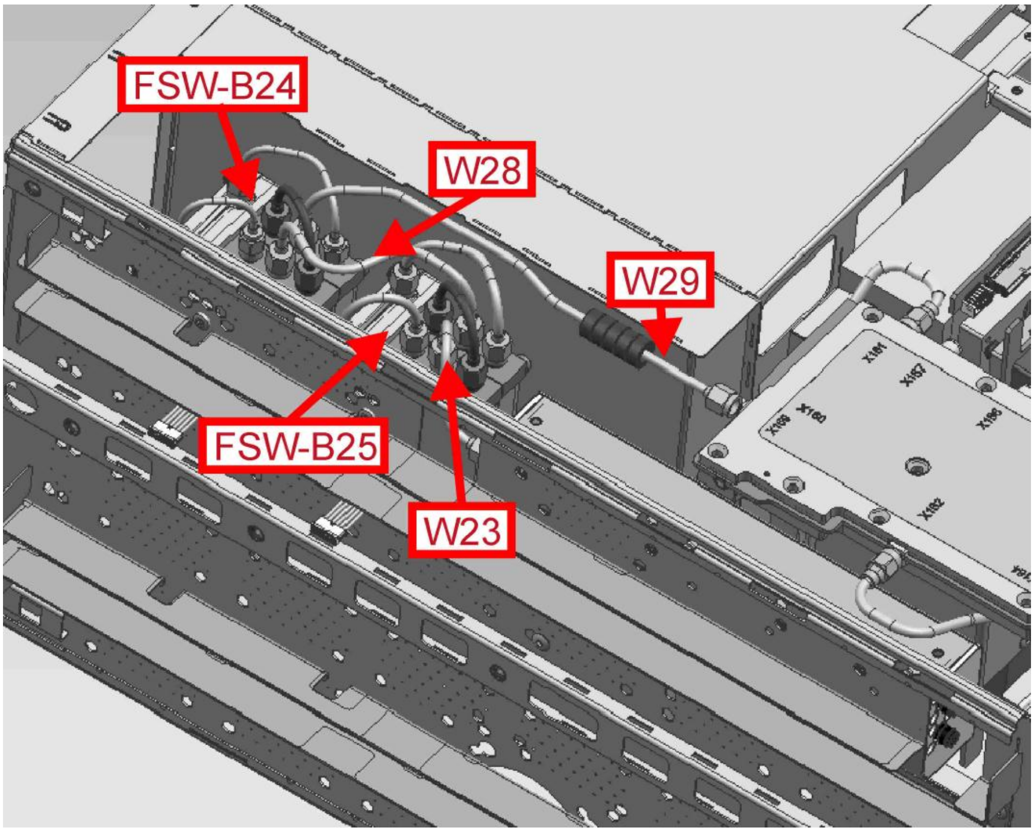


Figure 3-14: Cabling of an R&S FSW13/26 equipped with R&S FSW-B24 and B25

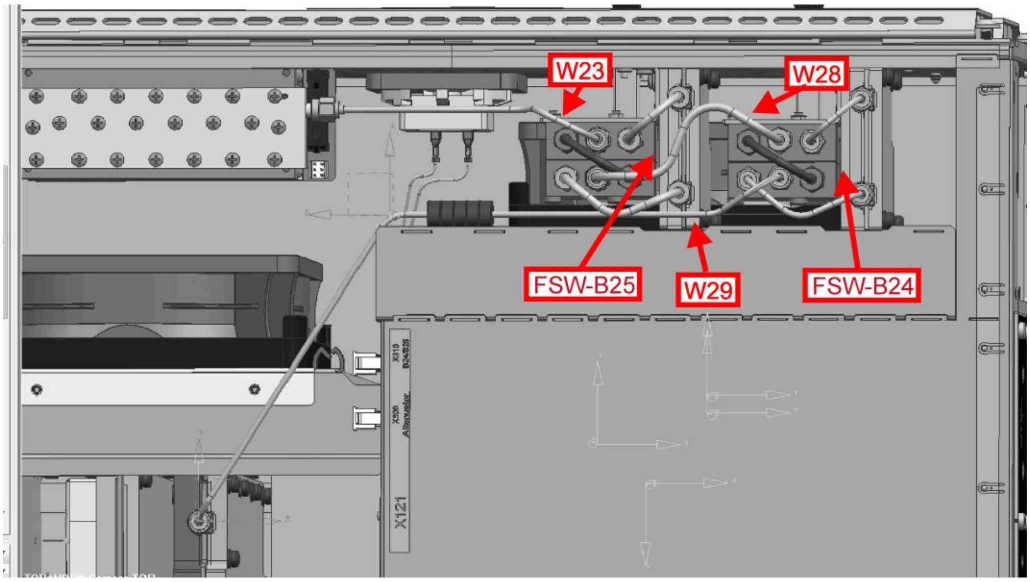


Figure 3-15: Cabling of an R&S FSW8 equipped with R&S FSW-B24 and B25

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).

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:

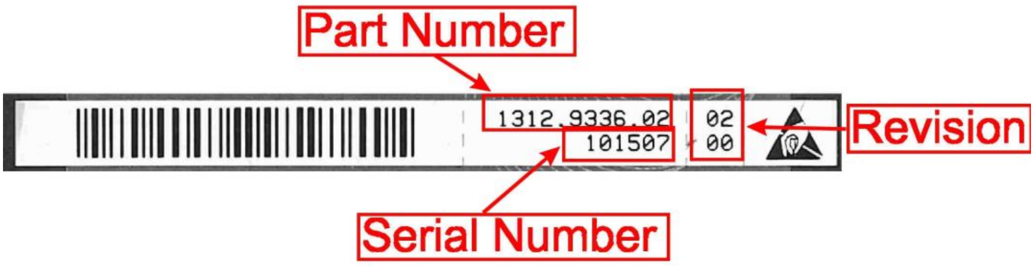
► Unplug the RF cables W28 at the electronic attenuator (R&S FSW-B25) and W29 at the microwave converter frontend

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 relais unit by a new one and reassemble the preamplifier frontend unit.
8. Write down the serial number, the partnumber 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 Eprom!)



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 overtighten 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.

12. Mount the right side cover (refer to 3.1.2.5).
13. Mount the lower cover (refer to 3.1.2.5).
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:
        i) Enter the service password
        [SETUP : Service : Service Function : Password = 30473035]
        ii) 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 partnumber, 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.

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!

        iii) 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 relais unit has been changed:
        i) Enter the service password
        [SETUP : Service : Service Function : Password = 30473035]

ii) 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 partnumber, 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.

iii) 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 **Basic Instrument Checks**.
17. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**

Preamplifier in R&S FSW43/50, 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 Microwave Converter A160, A162 and A161 (R&S FSW43) for R&S FSW43 and chapter Microwave Converter A160, A162 and A161 (R&S FSW 50) for R&S FSW50.
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.

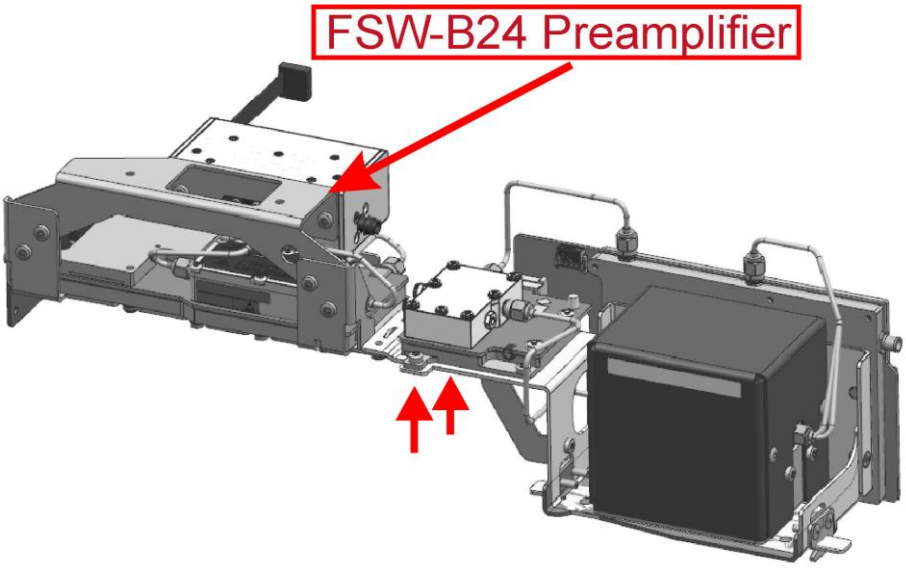


Figure 3-16: Microwave converter frontend for R&S FSW43

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 **Front Unit**
8. Mount the right side cover (refer to 3.1.2.5).
9. Mount the upper and lower cover (refer to 3.1.2.5).
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 **Basic Instrument Checks**.
12. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.1.3.17 Replacing the Electronic Attenuator (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 relais unit A272 and the electronical 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 electronical attenuator board or the relais unit must be replaced.

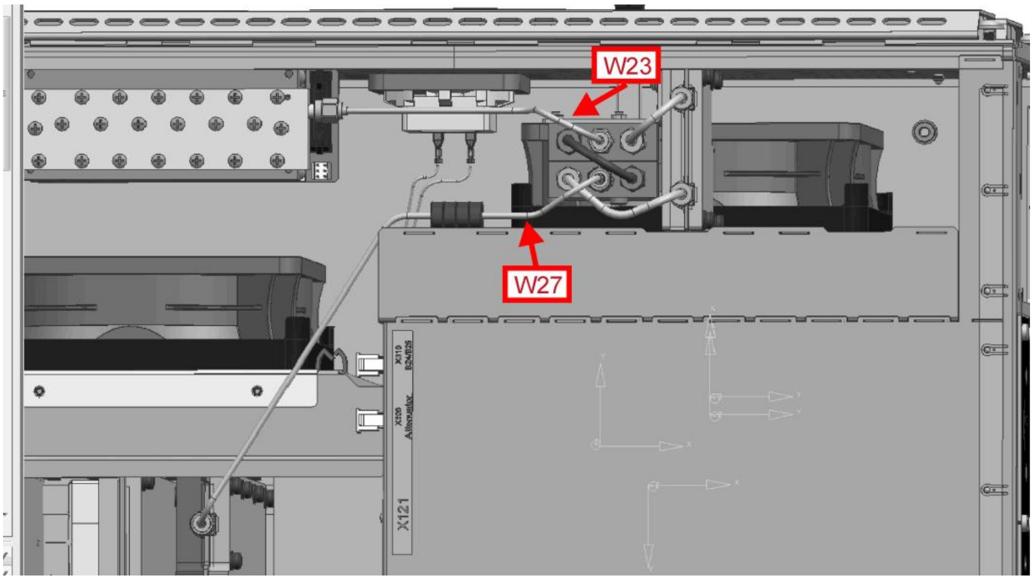


Figure 3-17: Cabling of an R&S FSW8 equipped with R&S FSW-B25

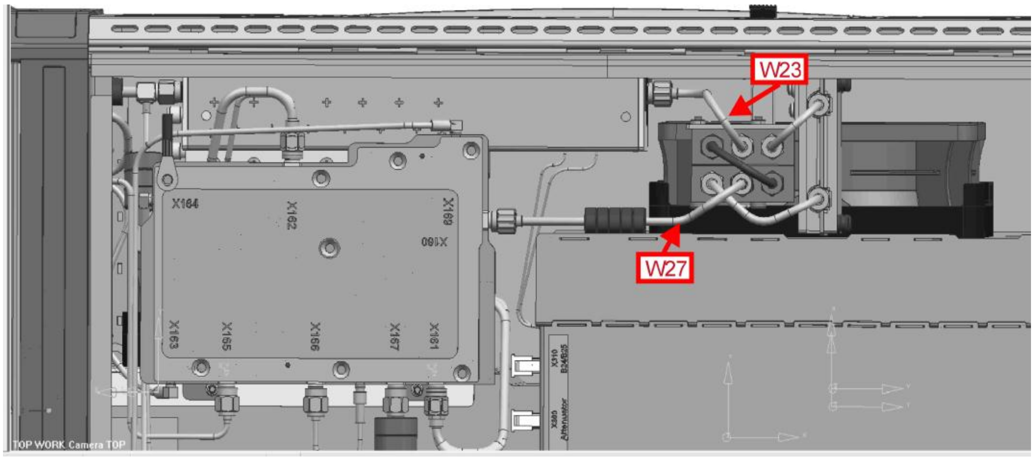


Figure 3-18: Cabling of an R&S FSW13/26 equipped with R&S FSW-B25

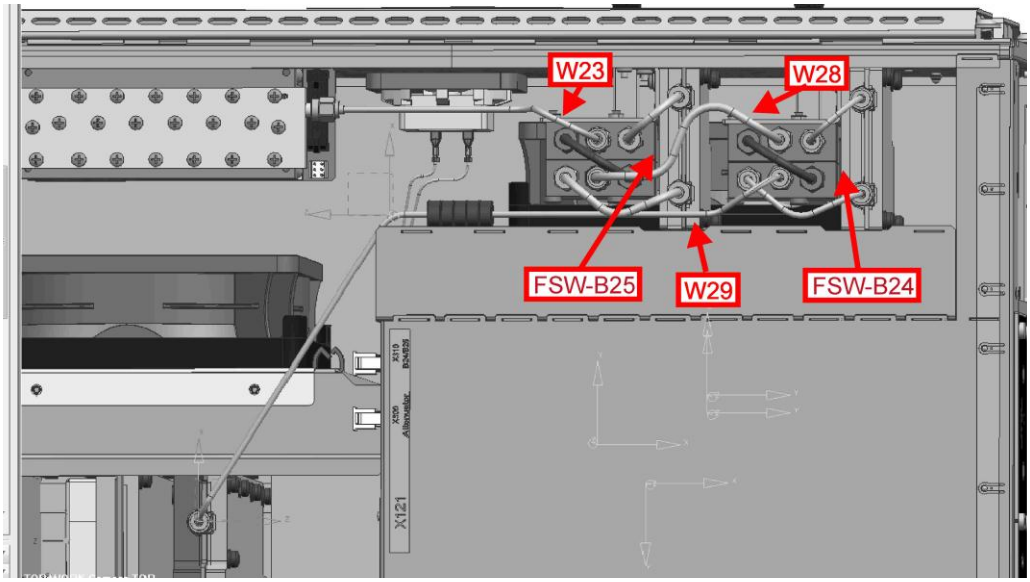


Figure 3-19: Cabling of an R&S FSW8 equipped with R&S FSW-B24 and B25

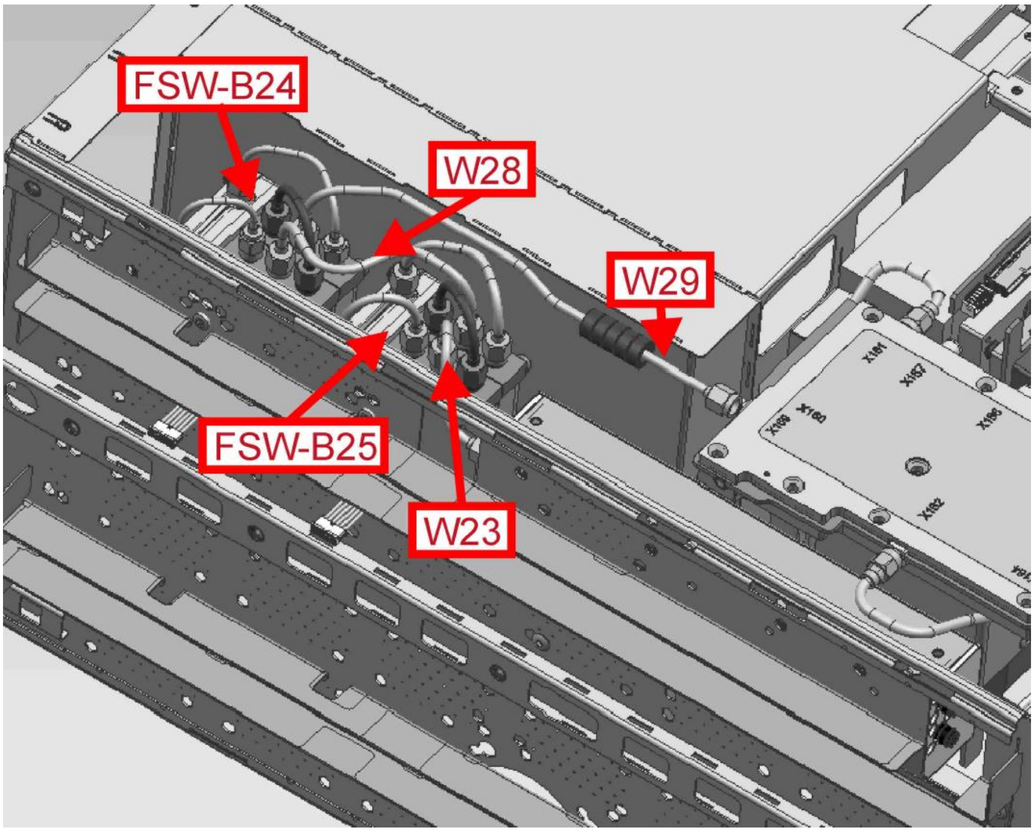


Figure 3-20: Cabling of an R&S FSW13/26 equipped with R&S FSW-B24 and B25

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).
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:

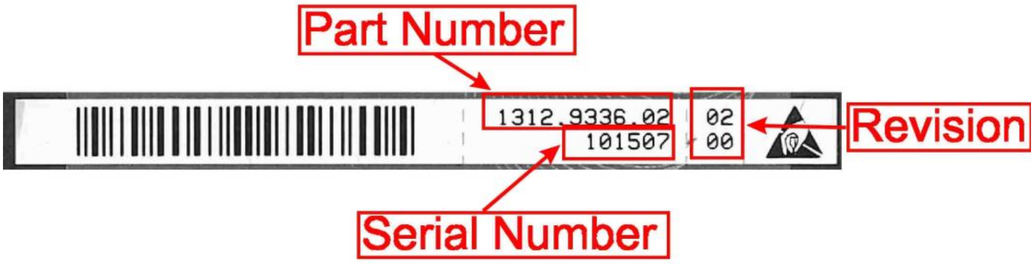
► Unplug the RF cables W28 at the preamplifier frontend unit and W23 at the step attenuator.

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 electronical 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 relais unit or the electronical attenuator board by a new one and reassemble the electronic attenuator frontend unit.
9. Write down the serial number, the partnumber 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 Eprom!)



10. Connect the flat ribbon cable to the electronical attenuator board.
11. Install the electronic attenuator frontend unit to the instrument and fasten it with the two screws previously removed.

    Note: Do not overtighten the screws!
12. Reinstall all RF cables previously removed (for detailed cable routing refer to chapter 3.1.2.2).

    Tip: The connector to plug in is written on the yellow tube on the cable.
13. Mount the right side cover (refer to 3.1.2.5).
14. Mount the lower cover (refer to 3.1.2.5).
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:
        i) Enter the service password
        [SETUP : Service : Service Function : Password = 30473035]
        ii) 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 partnumber, 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.

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!

iii) 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 relais unit has been changed:

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

ii) 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 partnumber, 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.

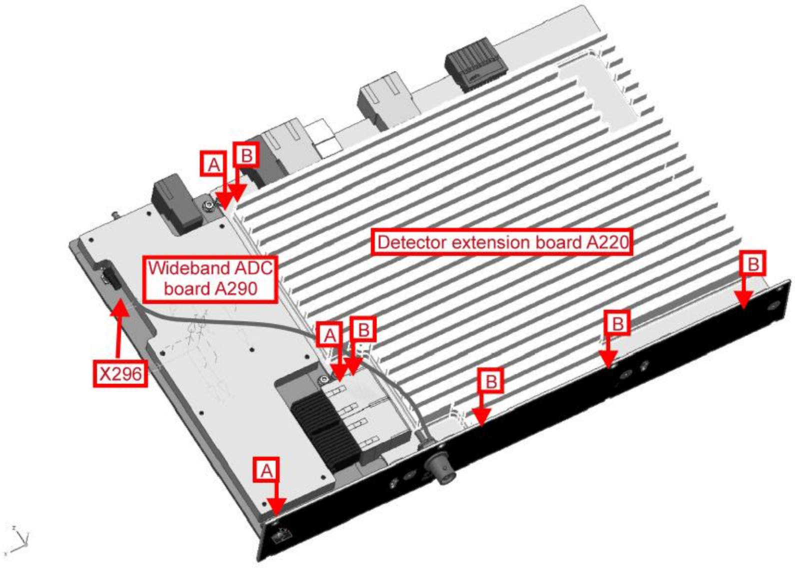
iii) Enter the service function
[3.21.7.0.RELAIS_UNIT]
and verify the displayed data with the data of the new installed hardware.

17. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

18. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.1.3.18 Replacing the Bandwidth Extension (option R&S FSW-B160 and FSW-B320)

The option R&S FSW-B160 or FSW-B320 consists of two boards: The wideband ADC board A290 and the detector extension board A220. The boards can be replaced independently.


A
B
Detector extension board A220
Wideband ADC
board A290
B
B
A
B
X296
B
A

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.

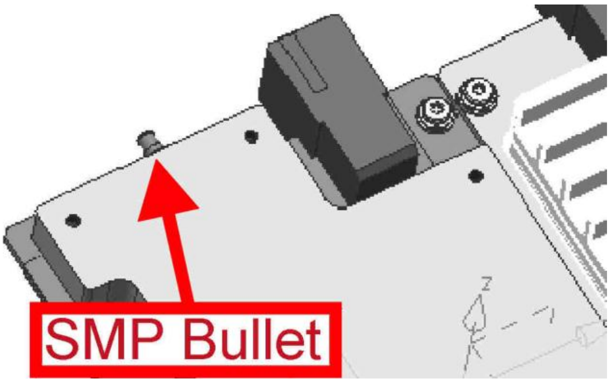
Replacing the wideband ADC board A290

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.

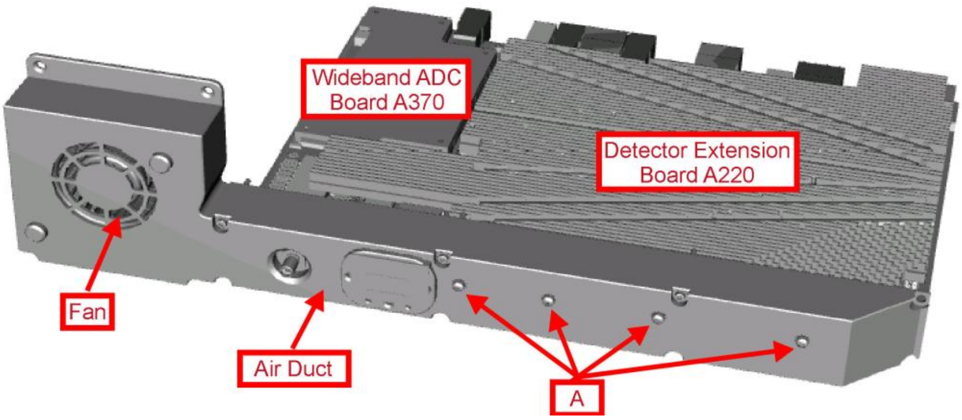
7. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

3.1.3.19 Replacing the Bandwidth Extension (option R&S FSW-B500)

The option R&S FSW-B500 consists of two boards: The wideband ADC board A370 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 eleven screws fastening the option FSW-B500 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 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.

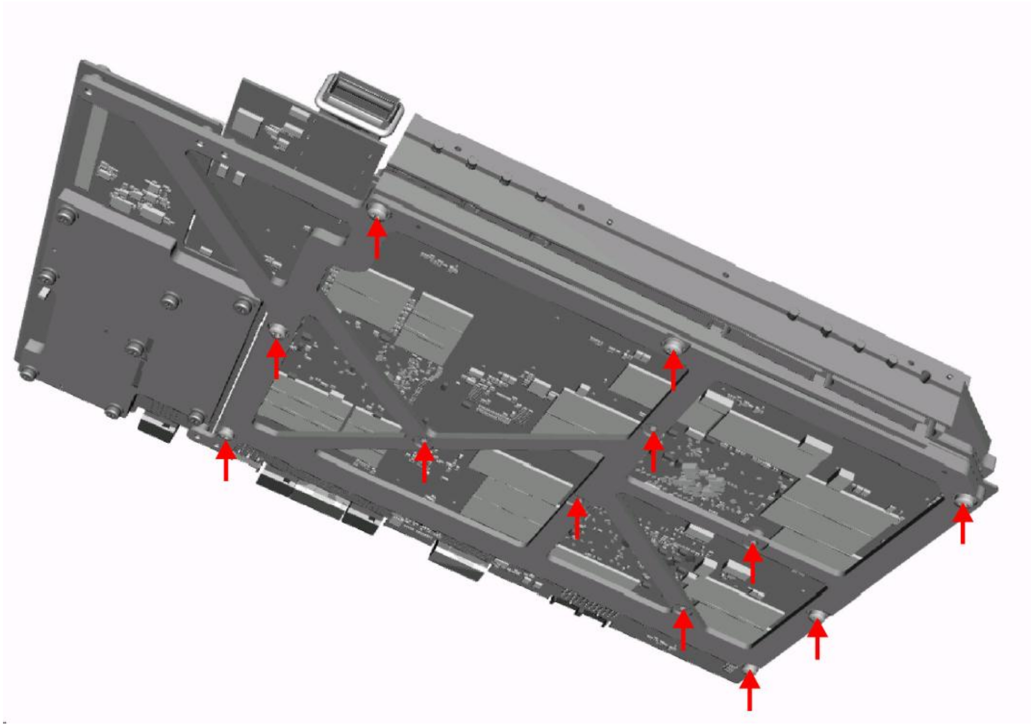


4. Unplug the RF cable at connector X376 and the SMP bullet.

   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.

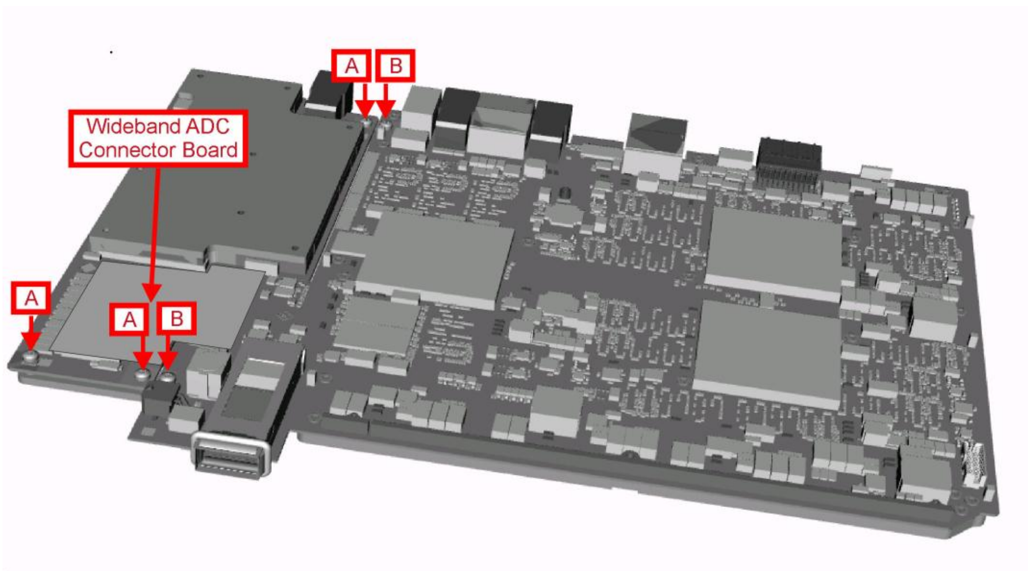
   Note: The fan is still connected to the detector extension board. Be careful not to damage the cable!
6. Carefully remove the air duct from the detector extension board and unplug the fan cable. Be careful not to damage the insulation plate!

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



7. Remove the 12 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 intergrated circuits by the heat conductive film!



9. Unplug the wideband ADC connector board carefully.

   Note: This board is reused! Be careful not to damage the connectors on the detector extension board and wideband ADC board!

Replacing the wideband ADC board A370

a) Remove the three screws marked with A fastening the wideband ADC board to the detector extension board.

b) Replace the wideband ADC board by a new one and reinstall the screws formerly removed.

Replacing detector extension board A220

a) Remove the two screws marked with B fastening the detector extension board to the wideband ADC board.

b) Replace the detector extension board by a new one and reinstall the screws formerly removed.

2. Reinstall the wideband ADC connector.

   Note: Do not damage the connectors on the two boards! Be shure to have the correct position of the board before plugging it in! Be sure to plug in the connectors correctly!

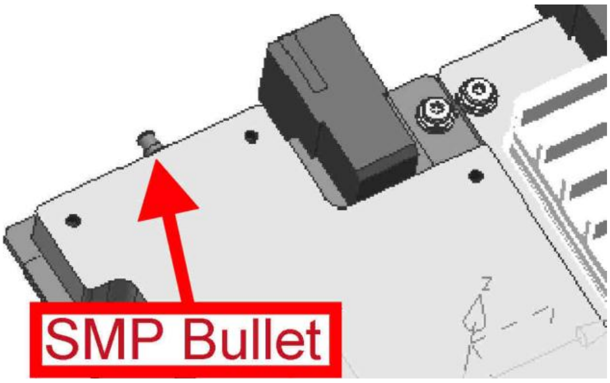
3. Replace the grey heat conductive film on the cooling plate by a new one.

   NOTICE: The grey heat conductive film has always to be replaced if it was in contact with the IC package! 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 ma be destroyed if the heat conductive film is installed incorrectly!

4. Reinstall the eleven screws formerly removed on the bottomside of the detector extension board.

5. 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



6. Reconnect the fan cable.

7. 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.

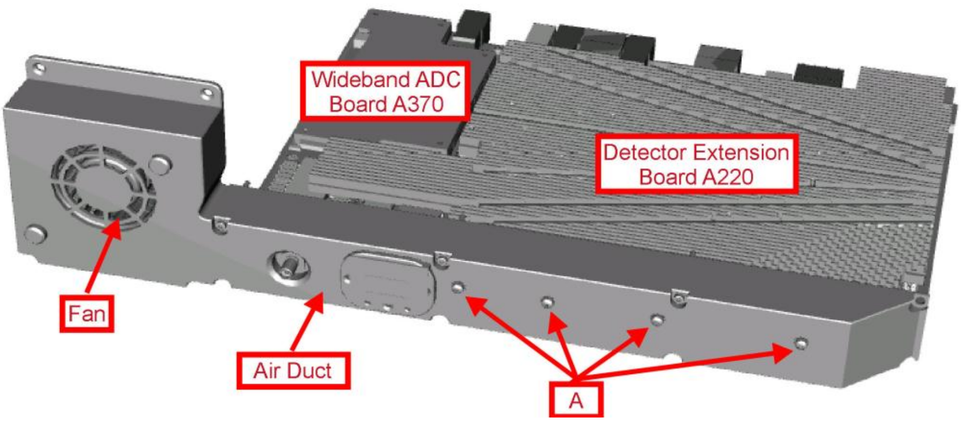
8. Reinstall the boards to the instrument.

9. Reinstall the elevelen screws formerly removed.
10. Perform the Basic Instrument Checks according to chapter Basic Instrument Checks.
11. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing FSW-B500 Fan

1. Switch off the instrument and disconnect the power plug.
2. Unscrew the eleven screws fastening the option FSW-B500 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 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.

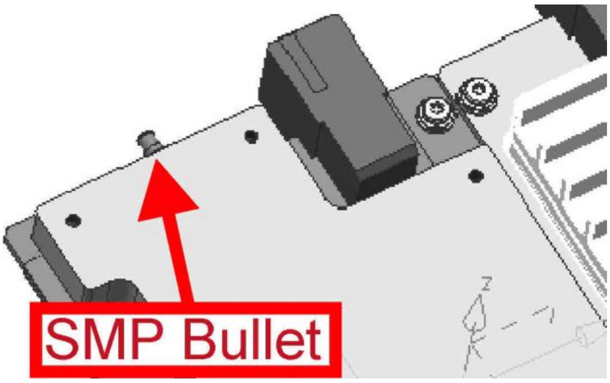
   Note: The SMP bullet is reused for the new ADC board.
5. Unscrew the four screws, marked with A in the picture above, fastening the air duct to the detector extension board ADC board.

   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. 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



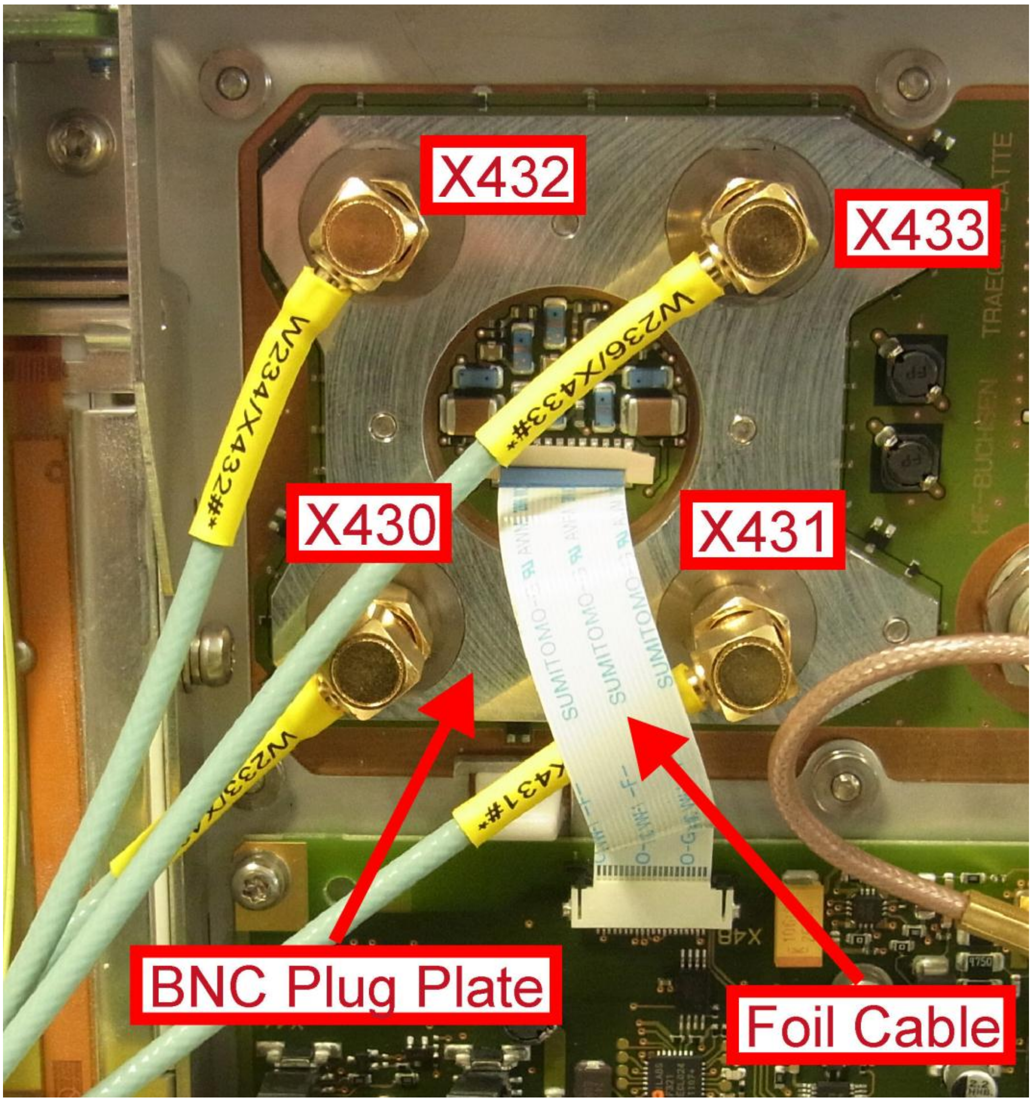
10. Reconnect the fan cable.
11. Reinstall the air duct with the four screws formerly removed.

    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 elevelen screws formerly removed.
14. Perform the Basic Instrument Checks according to chapter Basic Instrument Checks.
15. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.1.3.20 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.

Replacing the BNC plug plate



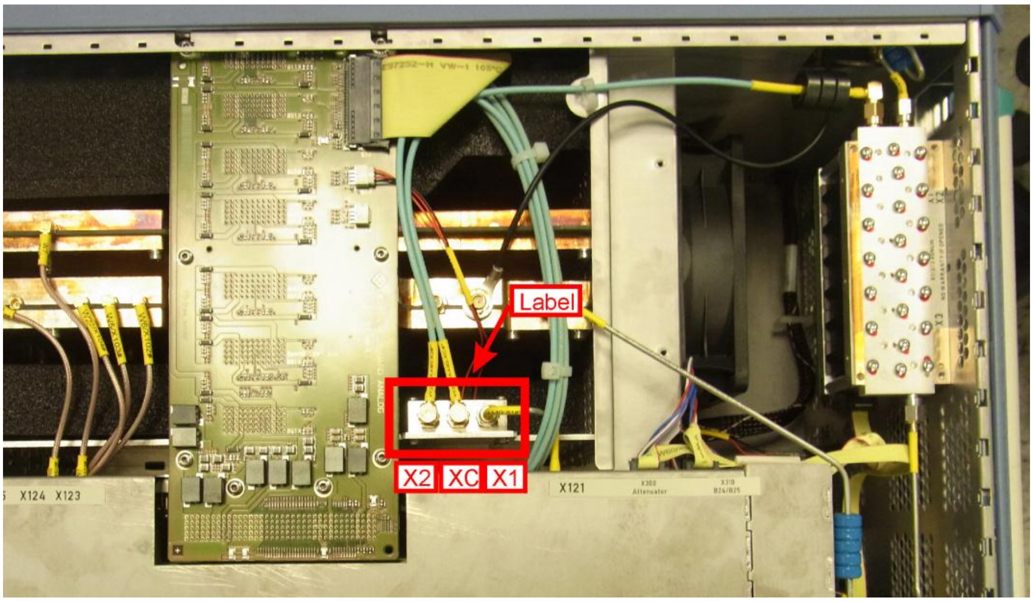
1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).
4. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
5. Unplug the four SMA cables from the BNC plug plate.
6. Remove the label R&S FSW connector around the input connector.
7. Unplug the B71 foil cable at the front panel.
8. Unscrew the six screws fixing the BNC plug plate.
9. Replace the BNC plug plate by a new one.
10. Fasten the six screws previously removed.

11. Replace the label R&S FSW connector around the input connector.
12. Reconnect the foil cable.
13. Reconnect the four SMA cables to the BNC plug plate.

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

6. Mount the frontpanel to the instrument (refer to 3.1.2.5).
7. Mount the right side cover (refer to 3.1.2.5).
8. Mount the upper and lower cover (refer to 3.1.2.5).
9. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
10. Perform the Basic Instrument Checks according to chapter Basic Instrument Checks.
11. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the B71 Coax Relay



1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the inner lid (refer to **Unmounting the Inner Lid**).
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 lid (refer to **Unmounting the Inner Lid**).
12. Mount the upper and lower cover (refer to 3.1.2.5).
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 **Basic Instrument Checks**.

Replacing the Input Connector carrier board

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).
4. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
5. Unplug the four SMA cables from the BNC plug plate
6. Remove the label R&S FSW connector around the input connector.
7. Uninstall the RF input connector (refer to chapter Replacing the RF Input Connector X1)
8. Unplug the foil cable at the front panel
9. Unplug the two RF cables.
10. Unscrew the 6 screws fastening the input connector carrier board.
11. 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.
12. Reinstall the connectors to the new input connector carrier board.
13. Reinstall the input connector carrier board to the front unit.
14. Reconnect the two RF cables.

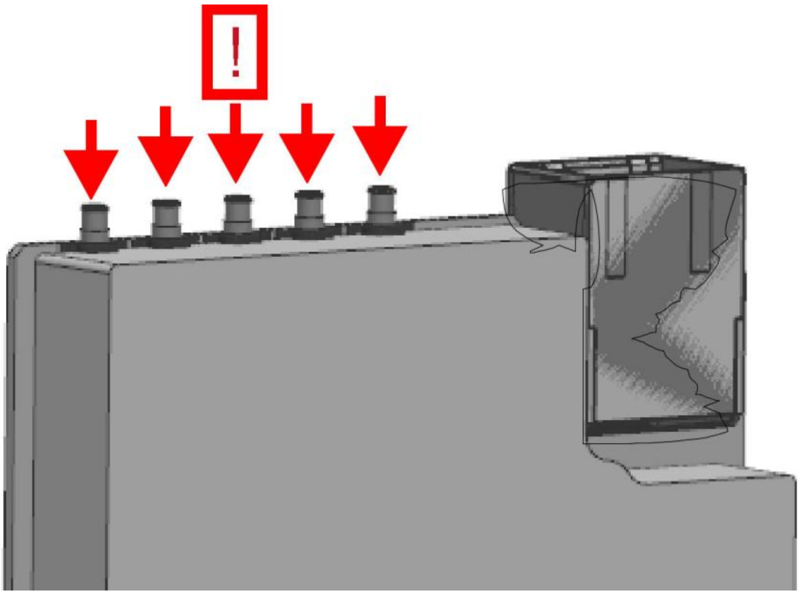
    Tip: The connector to plug in is written on the yellow tube on the cable.
15. Reinstall the B71 foil cable.
16. Reinstall the front unit to the instrument. (refer to chapter 3.1.2.5)

17. Reinstall the label to the input connector carrier board (refer to chapter Replacing the RF Input Connector X1)
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 the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

Replacing the Analog Baseboard 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 **Basic Instrument Checks**.

3.1.3.21 Replacing the External Generator Control 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 **Basic Instrument Checks**.

3.1.3.22 Replacing the LO/IF connections for external mixers (option R&S FSW-B21)

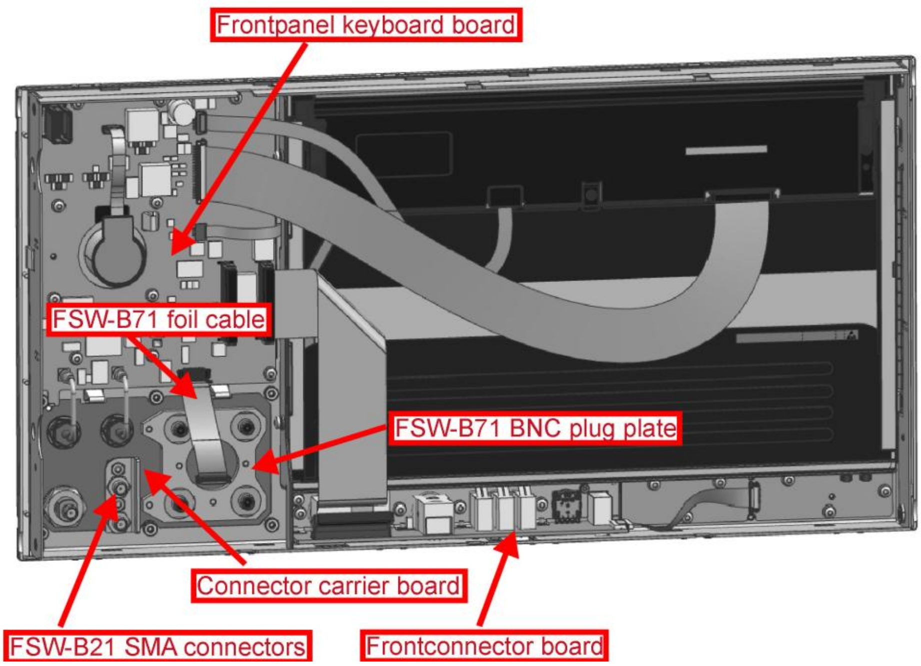
The LO/IF connections for external mixers is located on the microwave converter frontend. If there is any problem except a damaged frontpanel connector, the whole microwave converter frontend has to be replaced.

For R&S FSW13/26 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW13/26).

For R&S FSW43 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW43).

For R&S FSW50 refer to chapter Microwave Converter A160, A162 and A161 (R&S FSW 50).

Replacing the frontpanel connectors



1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).

4. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
5. Replace the B21 SMA input connectors by new ones.
6. Mount the frontpanel to the instrument (refer to 3.1.2.5).
7. Mount the right side cover (refer to 3.1.2.5).
8. Mount the upper and lower cover (refer to 3.1.2.5).
9. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
10. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
11. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.1.4 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 R&S FSW for diagnostic purposes:

- Permanent monitoring of levels and frequencies in the instrument

- Self test
- 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.

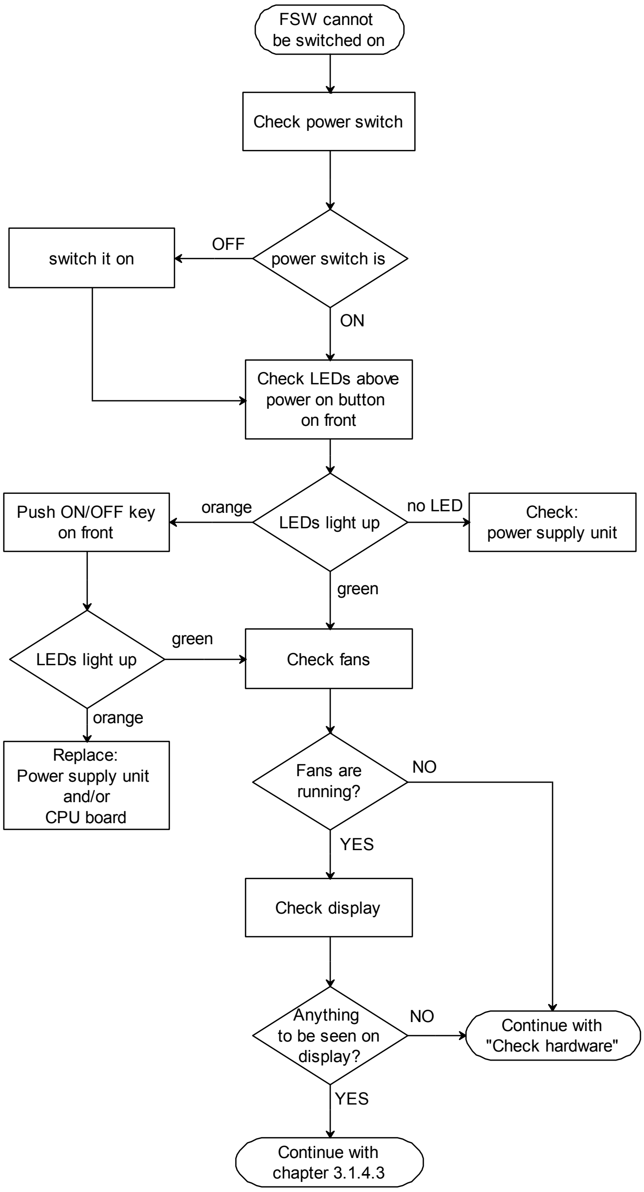
3.1.4.1 Measuring Equipment and Accessories

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

3.1.4.2 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.

Part 1: Basic Checks: Algorithm



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.

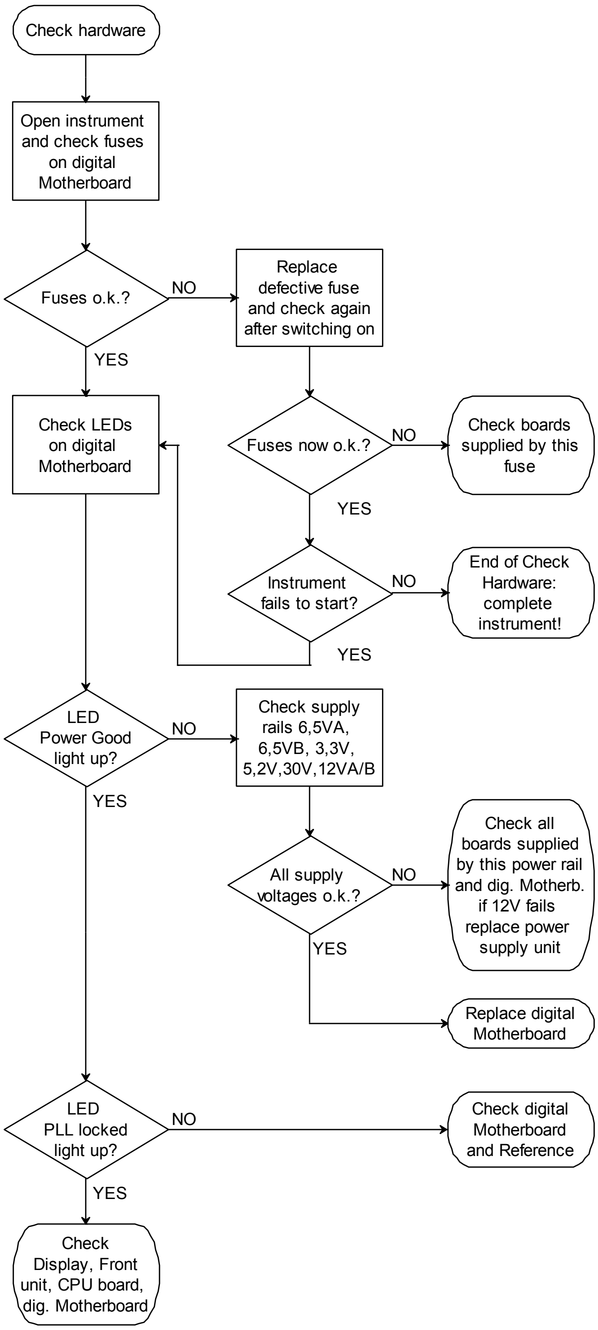
"Check LEDs above power on button on front": The LEDs to check are located above the power on button on the front of the instrument. There is a green LED which lights up when the instrument is switched on, and an orange one which lights up when the instrument is in standby state.

"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 3.1.4.3.

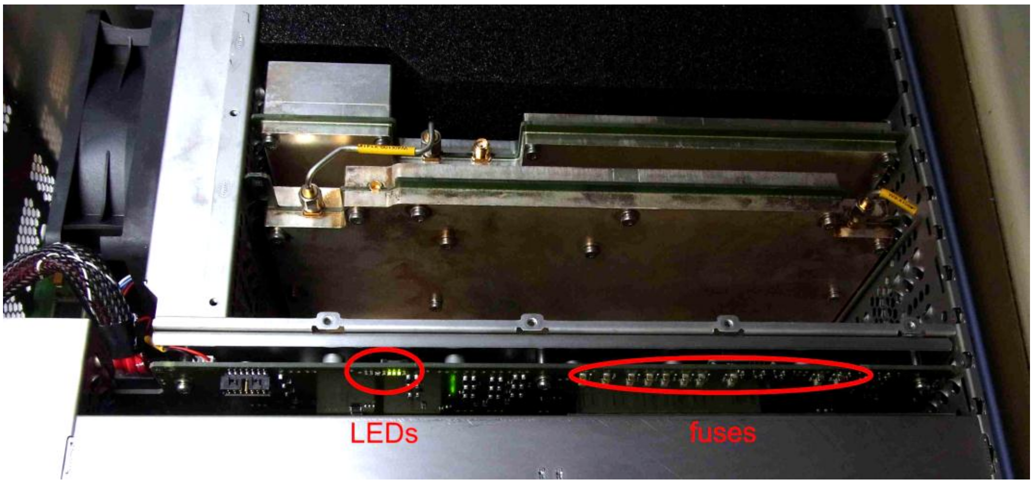
"Check Power Supply Unit": Check the voltages supplied by the power supply (refer to Part 2: Hardware Checks: Detailed Description "Check supply rails") First check the standby voltage. If this is present check the fuse F13 (refer to Part 2: Hardware Checks: Detailed Description "Check fuses on digital 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.

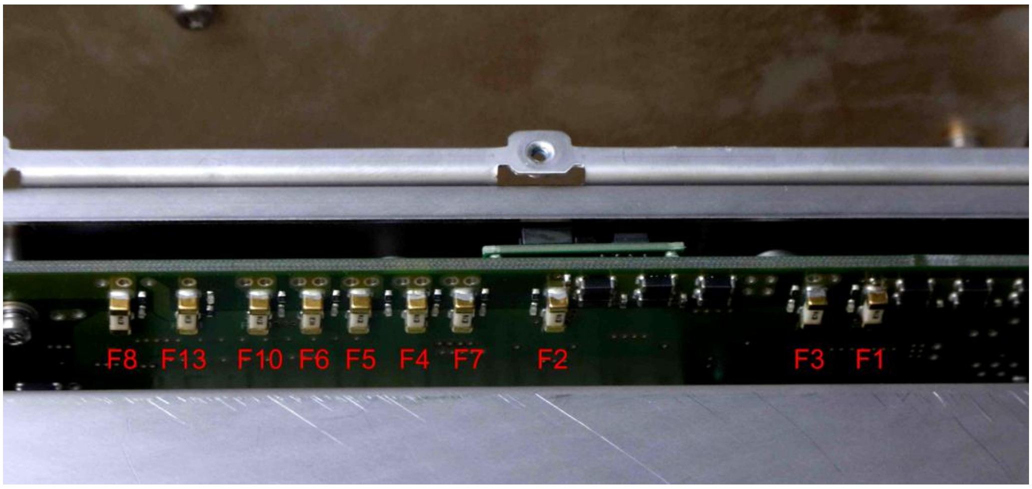
Part 2: Hardware Checks: Algorithm



Part 2: Hardware Checks: Detailed Description

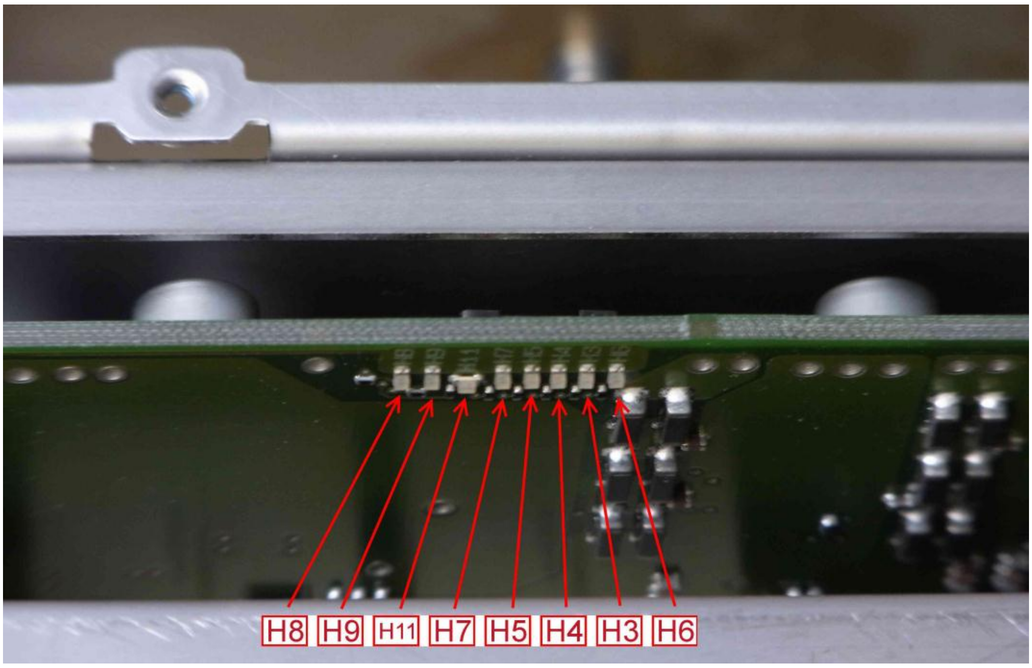
“Check fuses on digital motherboard”: The fuses are located on the upper end of the digital motherboard. You have to disassemble the upper cover (refer to Unmounting the Upper and/or Lower Cover) and the inner lid (refer to **Unmounting the Inner Lid**) to reach the fuses. In case of a blown fuse a LED near the fuse will light up in red to indicate the fuse is defective. For replacing the defective fuse refer to 0.5.2293764.1311144.





F1	7A FF	Power supply rail for DC/DC converter 6,5V A
F2	7A FF	Power supply rail for DC/DC converter 6,5V B
F3	7A FF	Power supply rail for DC/DC converter 3,3V, -6,5V, probe supply, 5V, 30V
F4	7A FF	Power supply rail for digital boards
F5	7A FF	Power supply rail for analog boards
F6	3A FF	Power supply rail for main fans
F7	7A FF	Power supply rail for microwave converter
F8	7A FF	Supply rail for digital option modules
F10	7A FF	Supply rail for CPU Board
F13	3AFF	Standby supply rail

“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:

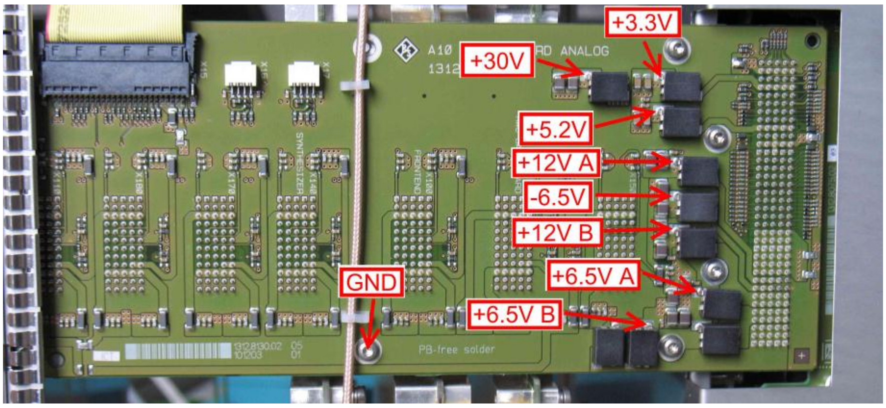
Designation	Function	Color
H3	For future use	
H4	PLL locked: The PLL of the FPGA is locked to the 128 MHz clock signal generated by the reference board	green
H5	Power good: All DC/DC converters on the digital motherboard are within their nominal output voltages	green
H6	Fan fail: one or both of the two 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 ±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 Unmounting the Upper and/or Lower Cover). 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 ± 0.6 V	F3
+3.3V	+3,4 V – 0.1 V + 0.2 V	F3
+5.2V	+5,2 V ± 0.2 V	F3
+12V A	+12 V ± 0.1 V	F7
-6.5V	-6,5 V ± 0.2 V	F3
+12V B	+12 V ± 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 ± 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.

3.1.4.3 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.

Normal Sequence for Starting the Instrument Firmware

Following switch-on, the R&S 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

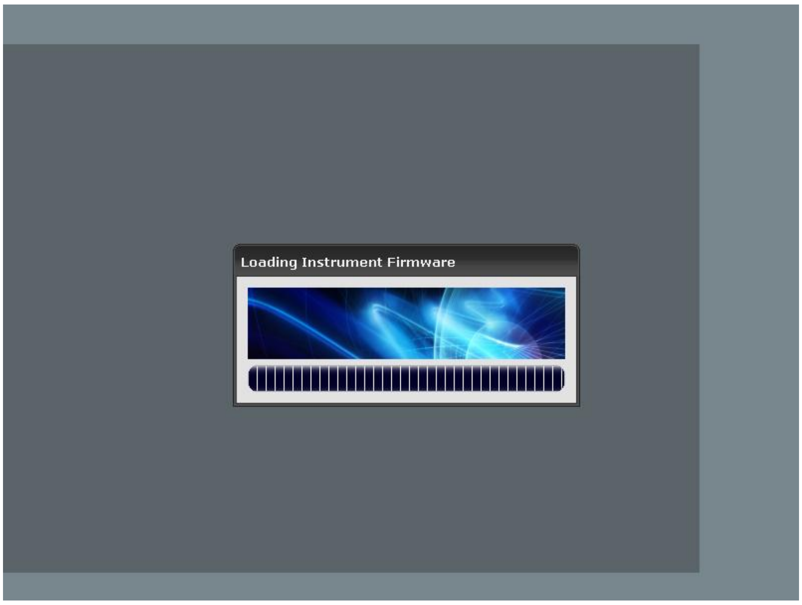
After this test, the BIOS is loaded and the operating system is started.

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.

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 ±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.

3.1.4.4 Troubleshooting Errors on the Analog Hardware

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.

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 R&S FSW8 connect 10 MHz, 500 MHz and 2 GHz to the R&S FSW and measure it with a span = 1 MHz and a resolution bandwidth = 10 kHz. On an R&S 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 2.1 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 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 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:

  a. Perform a selftest; if it fails follow the instructions in Evaluating Selftest Results.

b. 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.

   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.

   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.

c. 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 by

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

   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).

d. Otherwise check the local oscillator signals manually described in 3.1.4.5.

- **Error on frequencies > 8 GHz**

  The troubleshooting procedure described here is applicable for R&S FSW with a frequency range above 8 GHz only.

  a. The first step is to exclude an error on the YIG filter on the microwave converter frontend unit. By

     [**INPUT / OUTPUT** : YIG OFF]

     the YIG filter bypass path is activated. If input signals can be measured with this setting perform a YIG filter adjustment with the frequency response correction tool (see 2.1 Adjustment). If the R&S FSW is not functional after the YIG filter adjustment the YIG filter should be changed.

  b. Check the IF signal as described in Checking the IF Signal Path.

3.1.4.5 Troubleshooting Performance Test

For a successful performance test follow the instructions in chapter 1 Performance Test. The internal self-alignment is started by

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

and is mandatory for all tests.

Troubleshooting Checking the Reference Frequency Accuracy

When the reference frequency accuracy is out of range:

1. Repeat the reference frequency adjustment described in 2.2.2 Adjustment Sequence or by using the adjustment tool described in 2.1.
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.

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.

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 1.8 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. When changing the frontend board for R&S FSW13/26 or the triplexer for R&S FSW43/50 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 1.8 Checking the Level uncertainty and the Frequency Response.
2. Change the input attenuation of the R&S FSW to 10 dB by
   [AMPT : RF Atten Manual : 10 dB].
3. 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 x 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 is defective. For an error at 2 x f_{in} > 8 GHz the microwave converter frontend is defective.

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.

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 3.1.2.4 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.

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 1.8 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 2.1 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.

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 2.1 Adjustment).

Frequency Response

When the frequency response is out of range also a frequency response correction with the R&S FSW service tool (see 2.1 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.

Troubleshooting Checking the Display Nonlinearity

When the check "display nonlinearity" is out of specification verify the step attenuator (see chapter 1.1 Test Equipment, item 9) used.

When the step attenuator is functional then change the detector board A200.

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 1.1 Test Equipment, item 9) used.

When these measures do not solve the problem, the RF attenuator needs to be changed.

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 1.11 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.

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 "3.1.4.1 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.

   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.
3. The return loss is too low for higher attenuations only:
   In this case a defect on the attenuator is expected.

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 MHz < f_{CENTER} < 8 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_{CENTER} ± 80 MHz, f < 8 GHz and signal level P = –20 dBm should be visible at the IF WIDE output of the R&S FSW-B160 with an IF-frequency 250 ± 80 MHz and a level of -30 dBm to -10 dBm.

Note: For 300 MHz < f_{CENTER} < 8 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 3.1.3.18 Replacing the Bandwidth Extension (option R&S FSW-B160 and 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.

3.1.4.6 Troubleshooting Tests

This chapter describes the tests required for troubleshooting the analog hardware of an R&S FSW.

Checking the LO1

Test equipment:	Spectrum analyzer (chapter "3.1.4.1 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 ± 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 0. 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 ± 30 MHz is possible. The measured signal must be a CW signal without modulation.

Checking the LO2

Test equipment: Spectrum analyzer (chapter "3.1.4.1 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.

R&S 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 ± 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 R&S 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.

Checking the LO3

Test equipment:

Spectrum analyzer (chapter 3.1.4.1 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.

R&S 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 ± 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 R&S 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 R&S FSW and the test equipment are connected, the frequency should be exactly 1280 MHz.

The synthesizer board uses the LO3 signal as a reference.

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 or the input section on the frontend board.

When signals below 8 GHz cannot be measured perform the following test:

Test equipment: Multimeter (chapter 3.1.4.1 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.

R&S 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 MHz, 500 MHz, 2 GHz, 4.5 GHz, 6 GHz}

The expected input resistances are

for f_{IN} = 10 MHz: 40 Ω < R_{IN} < 80 Ω

for f_{IN} > 100 MHz: 500 Ω < R_{IN} < 2000 Ω

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:

Measure the DC input resistance R_{IN} for

f_{IN} = {10 MHz }

The expected input resistances are

for f_{IN} = 10 MHz: 40 Ω < R_{IN} < 80 Ω

If the input resistance R_{IN} is out of range, the microwave converter frontend is expected to be defective.

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 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 "3.1.4.1 Measuring Equipment and Accessories", item 2):

- Center frequency: 64 MHz
- Frequency span: 128 MHz
- Reference level: 10 dBm
- Resolution bandwidth: auto

Signal Generator (chapter "3.1.4.1 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.
R&S 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 R&S 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 is expected to be defective.

Note:

This test may be repeated at any other frequency with the same R&S FSW settings. For frequencies > 2 GHz an insertion loss up to 5 dB is expected.

For frequencies > 8 GHz the R&S 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 R&S FSW is set to a frequency below 40 MHz then the direct path will be activated. With this setting on an R&S FSW with microwave converter, the input signal is fed via X112 into the frontend board.

Checking the IF Signal Path

Test equipment: Spectrum analyzer (chapter "3.1.4.1 Measuring Equipment and Accessories", item 2):

- center frequency:	50 MHz
- frequency span:	100 MHz
- reference level:	10 dBm
- resolution bandwidth	auto

Signal generator (chapter "3.1.4.1 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.

R&S 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 R&S 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 R&S 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.

Checking the IF Signal Path for Input Frequencies > 8 GHz

Test equipment: Spectrum analyzer (chapter "3.1.4.1 Measuring Equipment and Accessories", item 2):

- center frequency: 1330 MHz
- frequency span: 100 MHz
- reference level: 10 dBm
- resolution bandwidth auto

Signal generator (chapter "3.1.4.1 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.

R&S 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

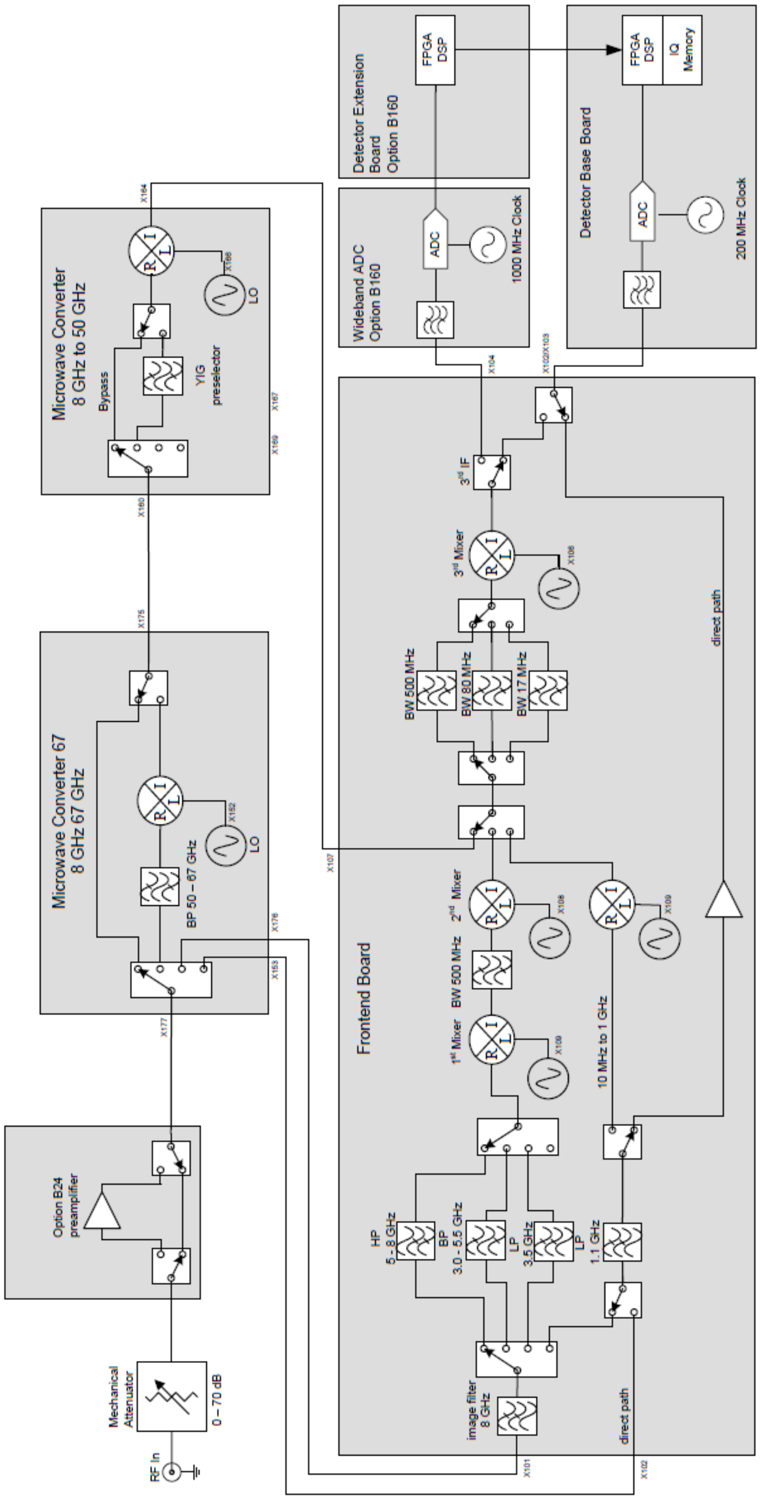
When the R&S FSW under test contains a microwave converter and the error is in the direct path (f_{IN} < 40 MHz) then the direct path input signal on the frontend board at X112 should be checked.

3.2 Repair for R&S FSW67

The following chapter describes how to replace modules in the R&S FSW67.

3.2.1 Functional Description

The following figure shows a block diagram of the R&S FSW67.



The R&S 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 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 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 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.

3.2.1.1 Attenuator A60

The attenuator switches in 5 dB steps and has a maximum total attenuation of 75 dB, it contains an AC coupling that can be bypassed and a switch for the internal calibration sources to the input.

3.2.1.2 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.

3.2.1.3 Microwave Converter Unit 67

The high frequency models of the R&S FSW (frequency range > 8 GHz) 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 frequencyrange 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 FSW-67 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.

3.2.1.4 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.

3.2.1.5 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.

3.2.1.6 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.

3.2.1.7 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.

3.2.1.8 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.

3.2.1.9 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.

3.2.1.10 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.

3.2.1.11 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.

3.2.1.12 Options

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.

Preamplifier R&S FSW-B24

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

Analysis Bandwidth Extension R&S FSW-B160, FSW-B320, FSW-B500

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 500 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.

LO/IF connections for external mixers R&S FSW-B21

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.

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. In the FSW-67 the second RF input over the FSW-B71 input connector I is not available.

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.

3.2.2 Basic Steps and Information for Module Replacement

3.2.2.1 Location of the Modules

On the rear side of the instrument:

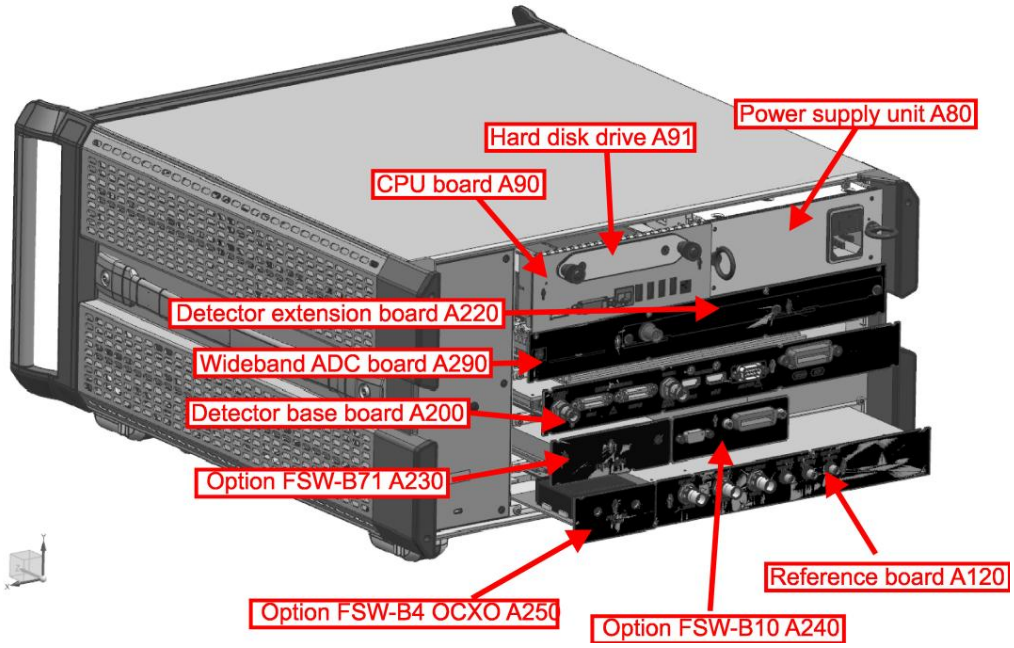


Figure 3-21: Instruments equipped with R&S FSW-B160 or FSW-B320

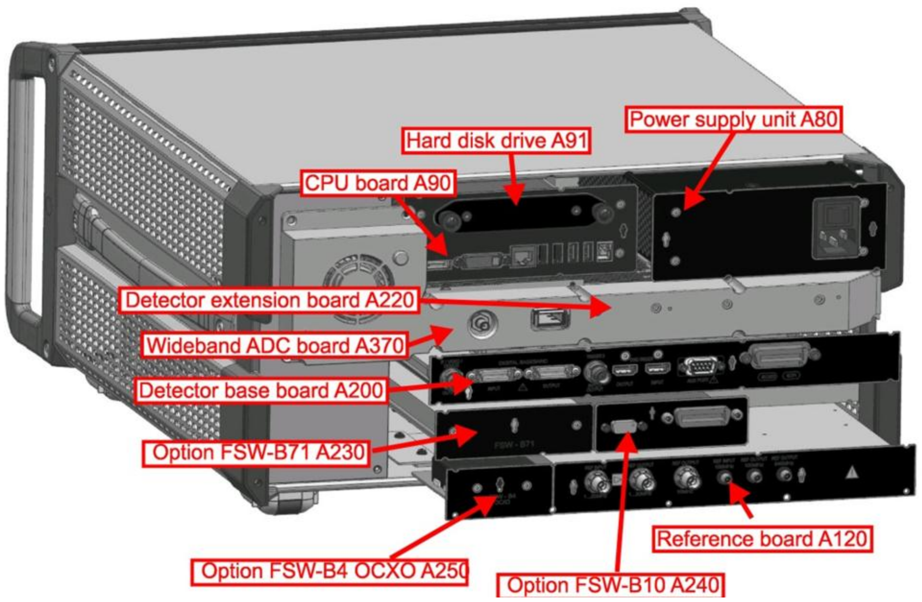
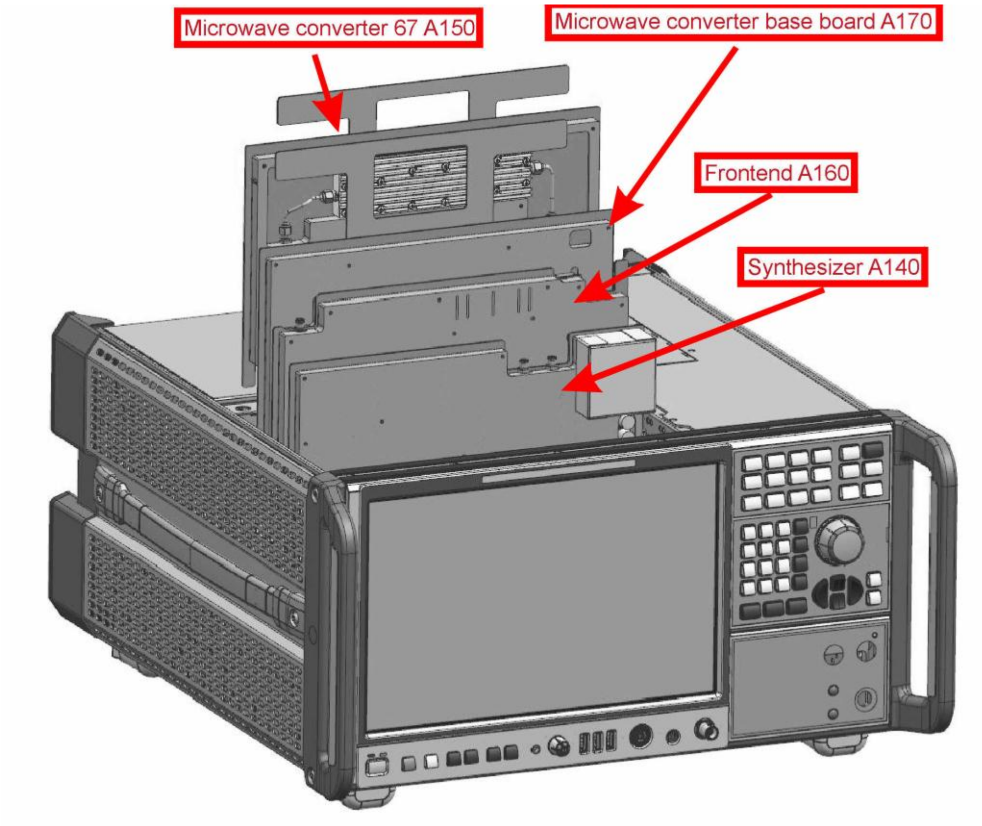
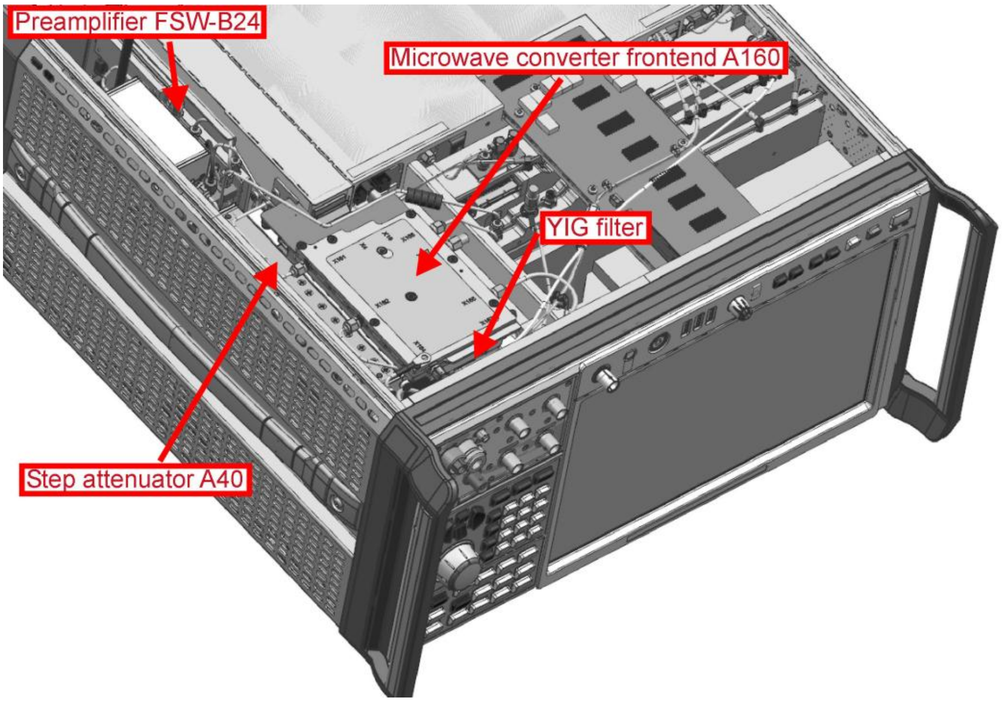


Figure 3-22: Instruments equipped with R&S FSW-B500

On the front side of the instrument:



On the bottom of the instrument :



3.2.2.2 Basic Cable Routing

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.

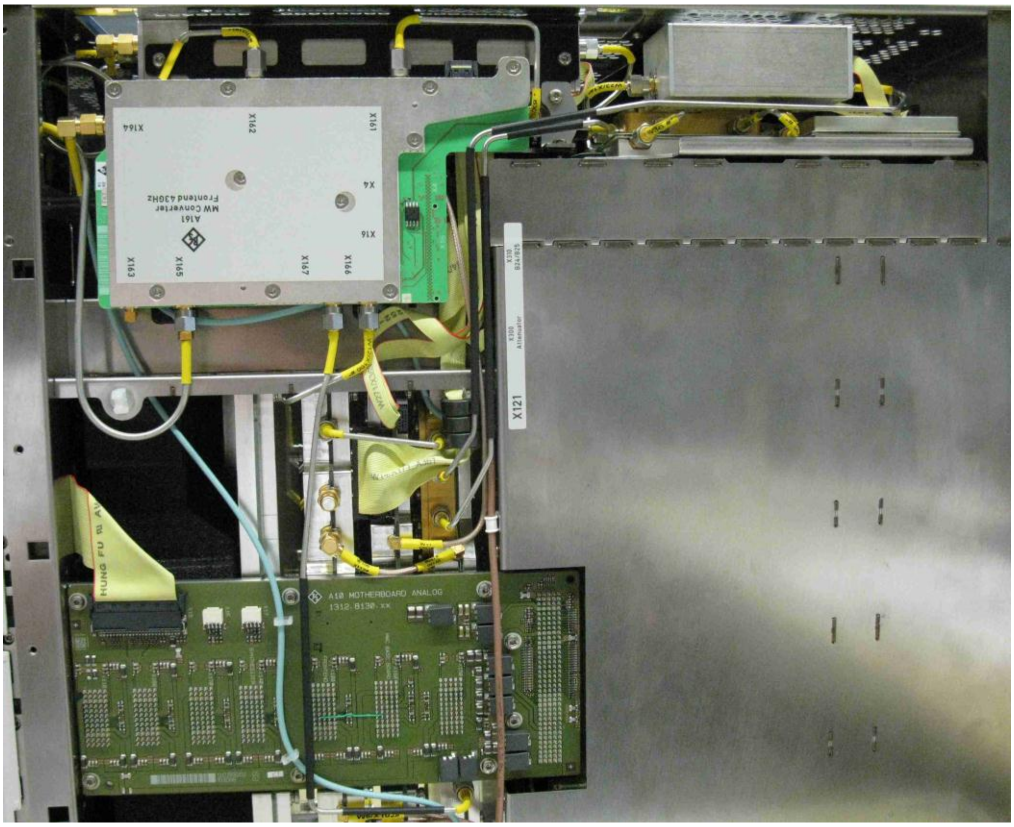


Figure 3-23: Cable routing on the lower side of an R&S FSW67 with option R&S FSW-B24 installed

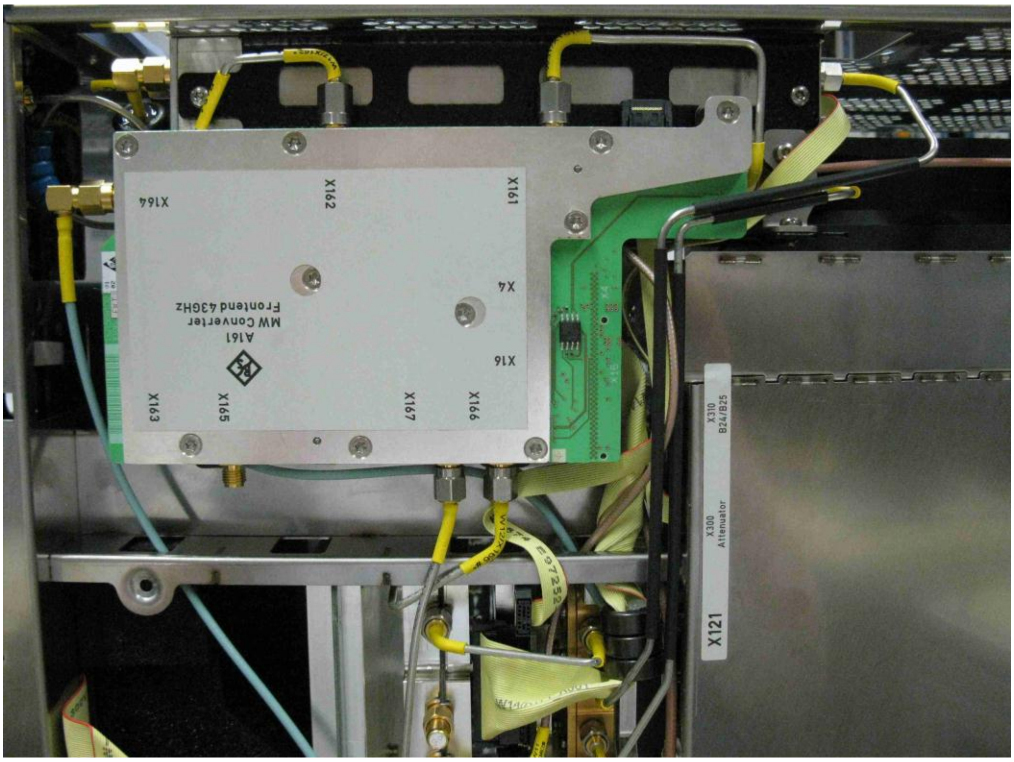


Figure 3-24: Cable routing on the lower side of an R&S FSW67 without option R&S FSW-B24 installe

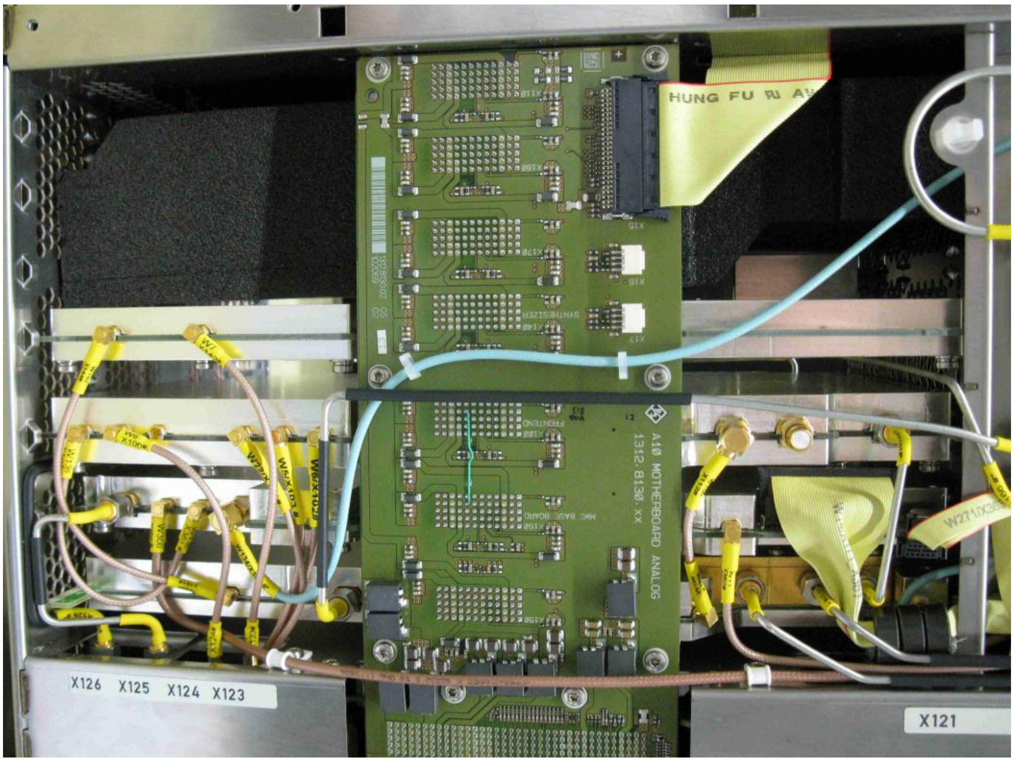


Figure 3-25: Cable routing on the lower side of an R&S FSW67

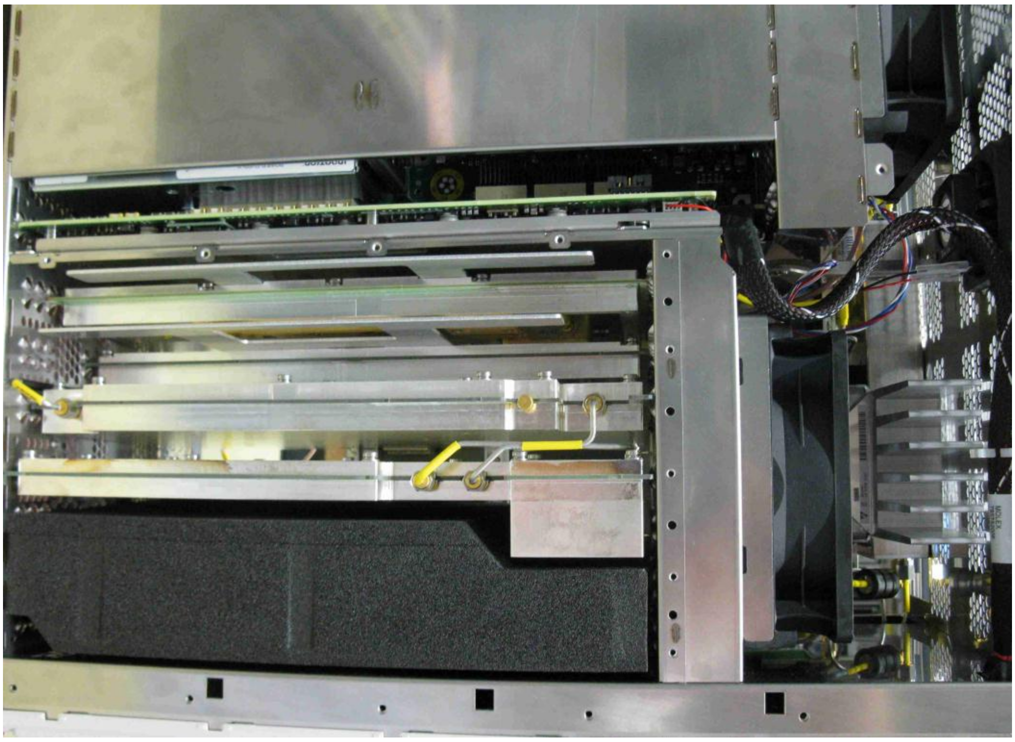


Figure 3-26: Cable routing on the top side of an R&S FSW67

3.2.2.3 Connector types

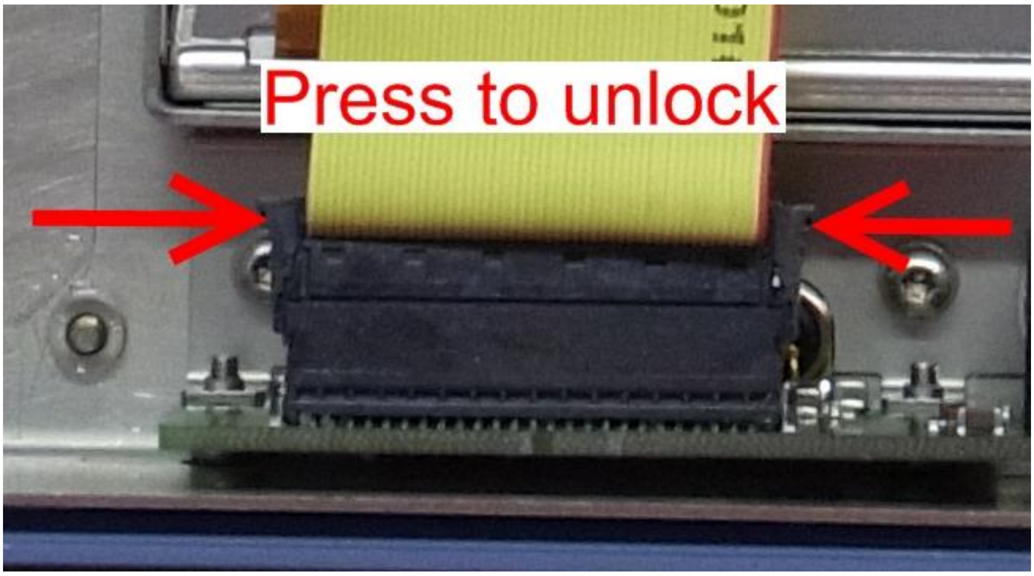
To connect the boards in the instrument different type of connectors are used. In the following releasing and plugging of the different types of connectors are described. The pictures illustrate the handling of the connectors in principle.

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.

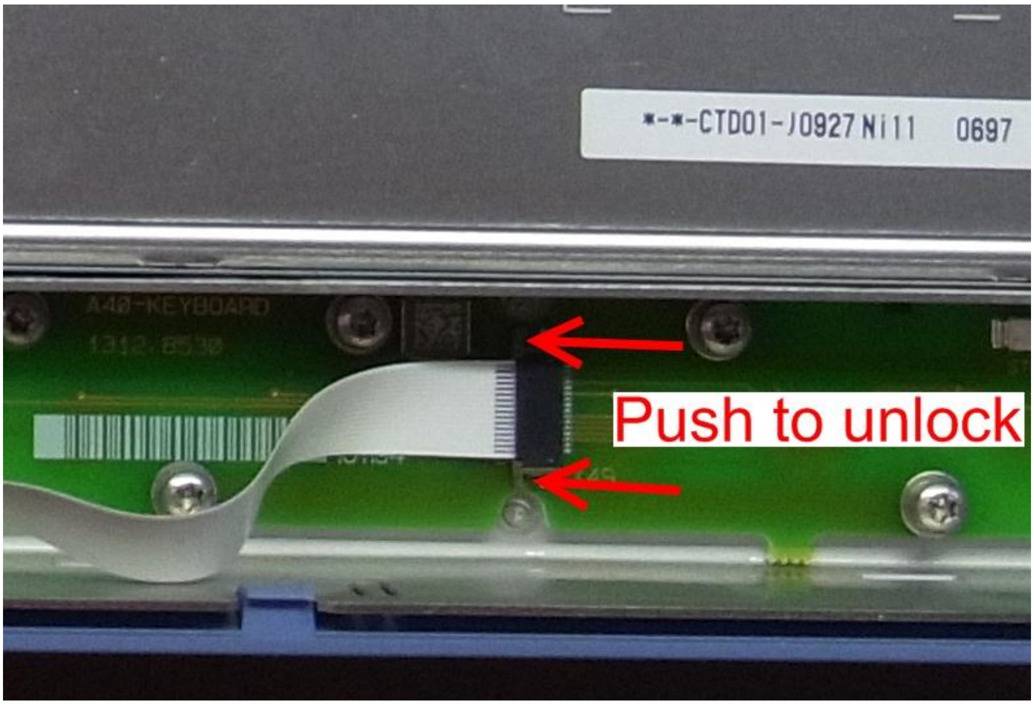
Be careful when unlocking and unplugging the connector. The connector can be damaged easily when it is not proper unlocked or not straight unplugged.

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



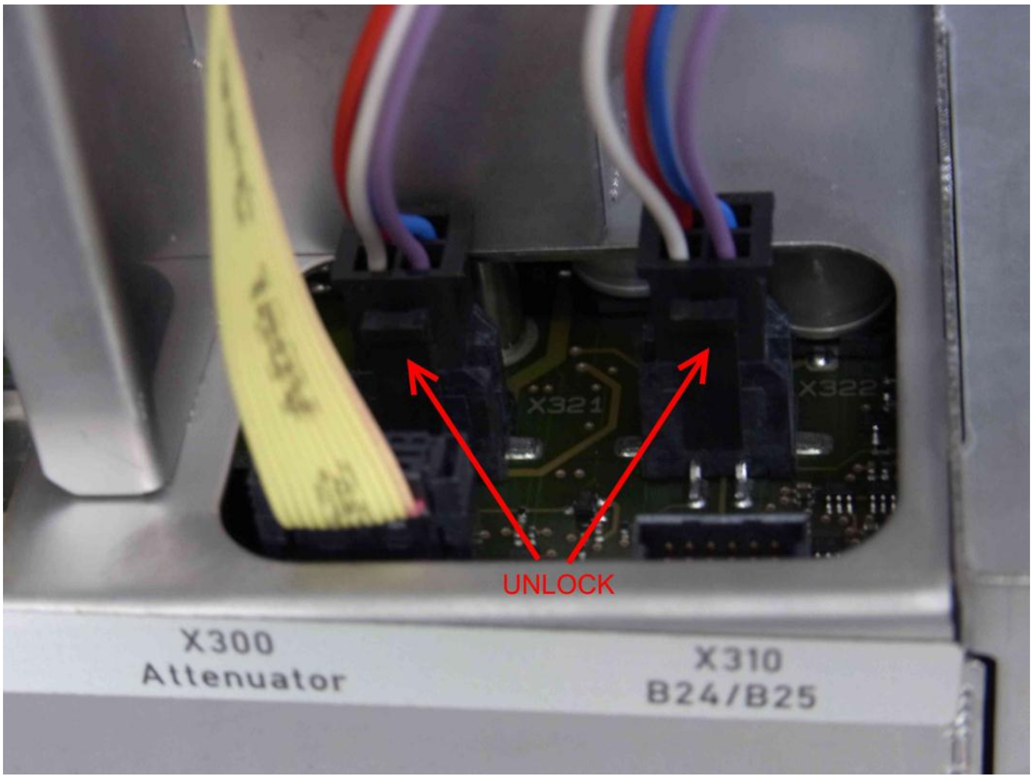
Foil Cable Connector

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.



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.



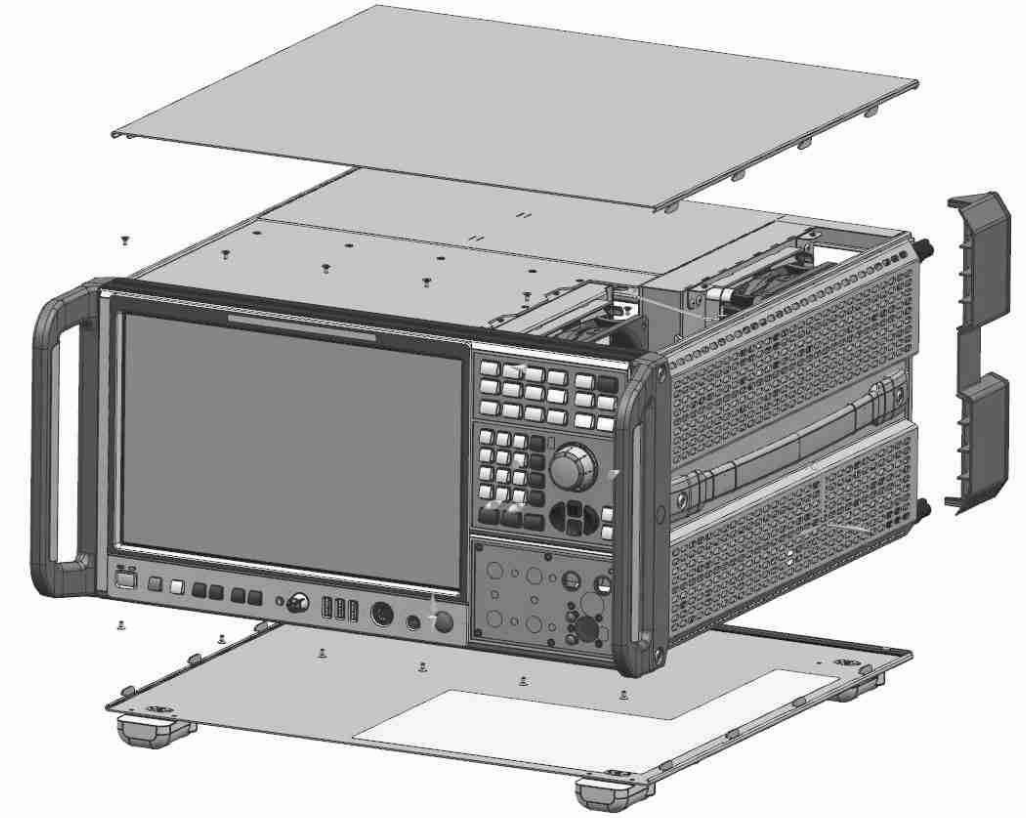
3.2.2.4 Disassembling the Instrument

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	2	-	-
Digital motherboard A20	X	X	1 + 2	-	-
Analog motherboard A10	-	X	-	-	-
Microwave converter A160 A161 A162 A150	X	X	1 + 2	X	-

Module or part of module to replace	Unmount Upper cover	Unmount lower cover	Unmount inner lid 1or 2	Unmount right side cover	Unmount frontpanel
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/B-320 A220 and A290	-	-	-	-	-
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	-	-	-	-	-

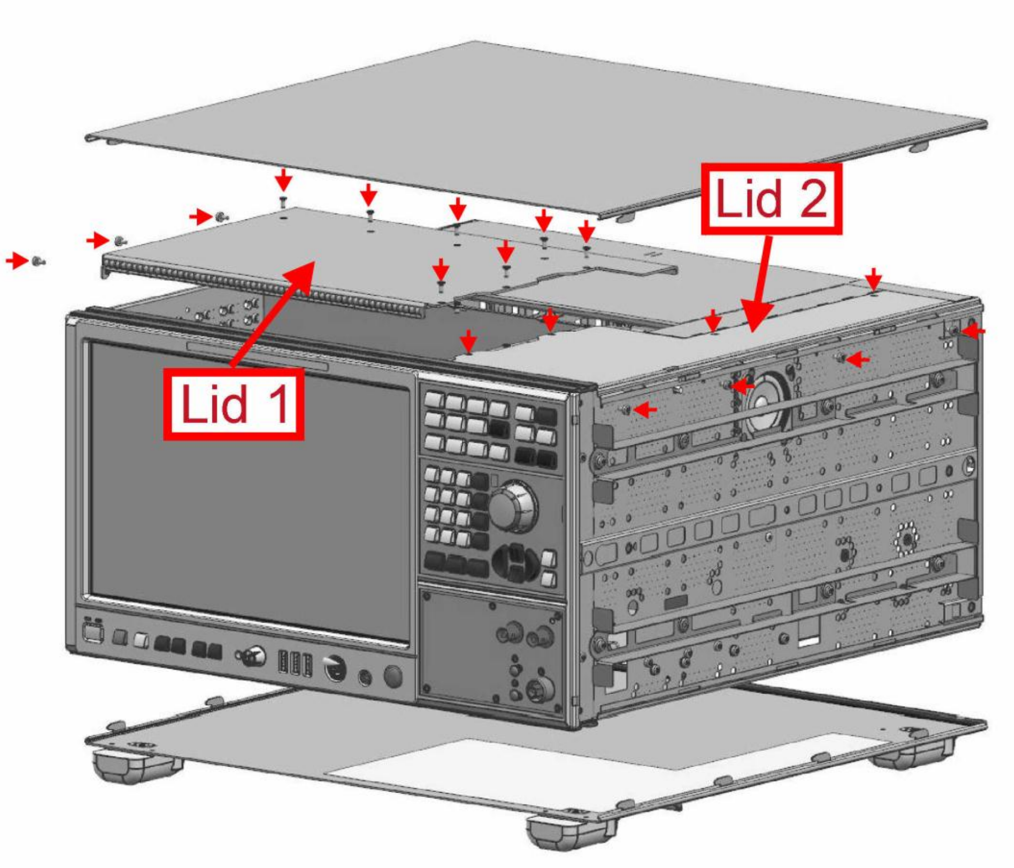
Unmounting the Upper and/or Lower Cover



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.

Unmounting the Inner Lids 1 and 2



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. Loose 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 Unmounting the Side Cover

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 to damage the EMI shielding gaskets!

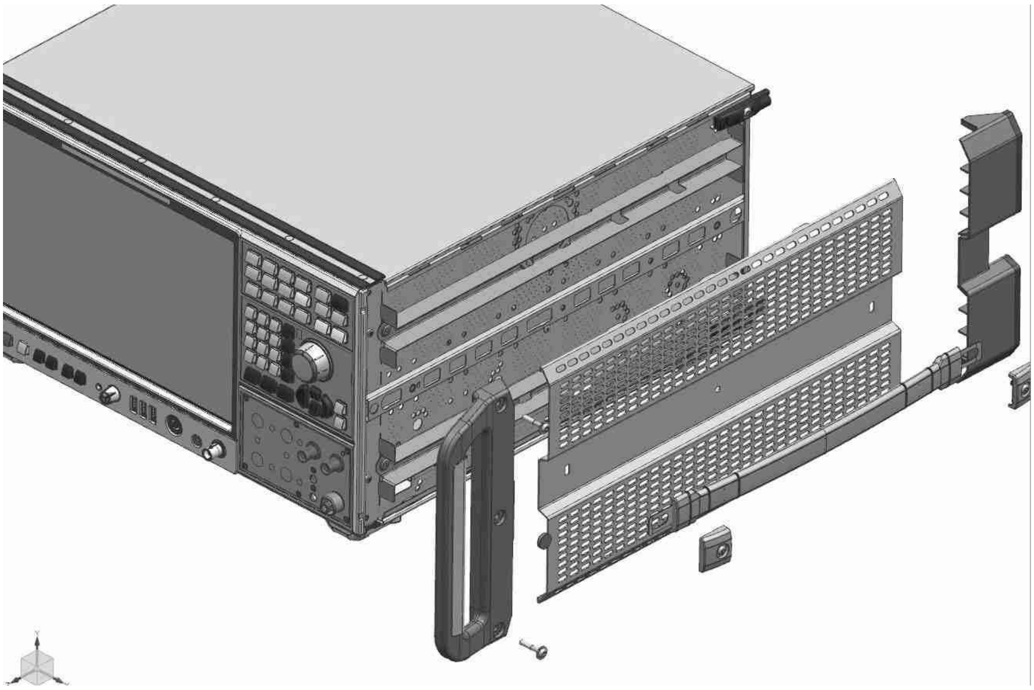
Unmounting lid 2:

d) Remove the right side cover as described in chapter Unmounting the Side Cover

e) Unscrew the four screws on the top of the instrumentand the four screws on the right side of the instrument.

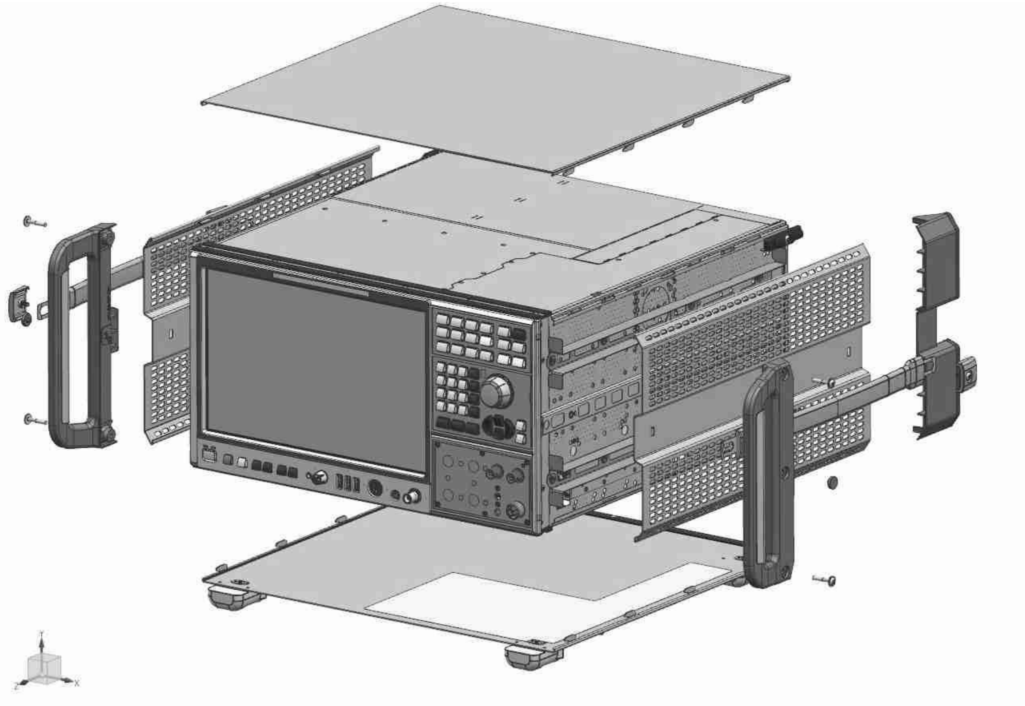
f) Carefully remove the lid

Unmounting the Side Cover



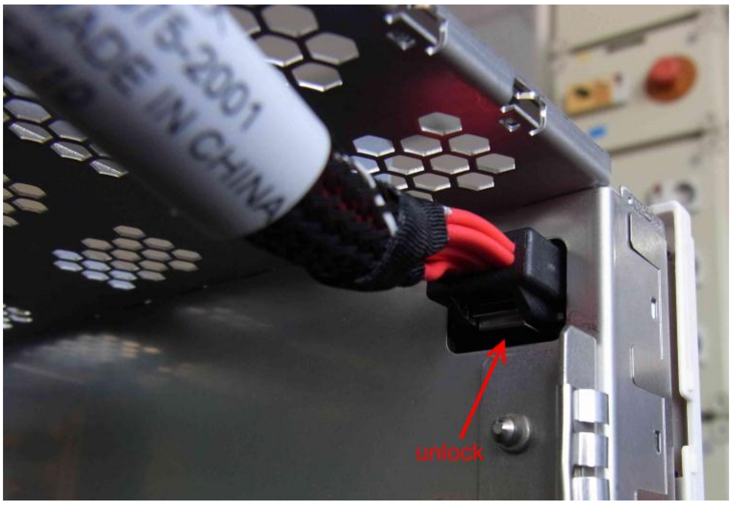
1. Switch off the instrument and disconnect the power plug.
2. Unscrew the two screws in the rear wall foot and remove the foot.
3. Unscrew the two screws fastening the flexible side handle and remove the flexible side handle.
4. Unscrew the two screws in the side handle and remove the handle.
5. Remove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

Unmounting the Frontpanel



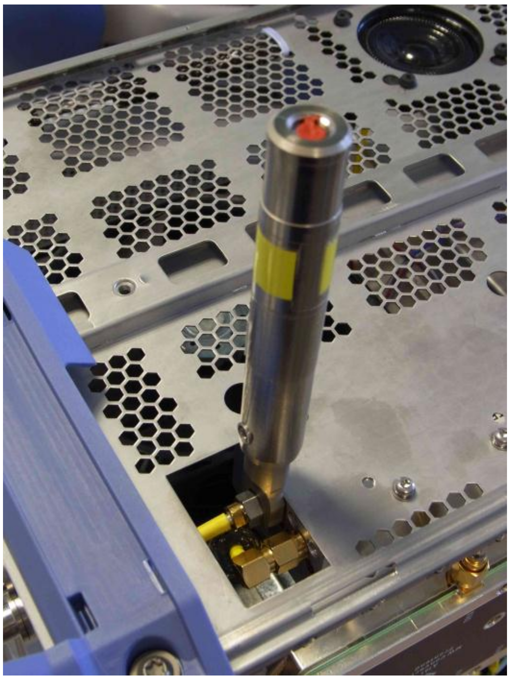
1. Switch off the instrument and disconnect the power plug.
2. Unscrew the four screws in the rear wall feet and remove them.
3. Remove the upper and the lower housing as described in chapter Unmounting the Upper and/or Lower Cover
4. Remove the right side cover as described in chapter Unmounting the Side Cover
5. Unmount the inner lid 2 as described in chapter Unmounting the Inner Lids 1 and 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:

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

3.2.2.5 Assembling the Instrument

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

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 4 SMA connectors on 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 eigth 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 3.2.2.6 Putting into Operation.

3.2.2.6 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 1 to verify the functionality of the instrument.

Replaced Module	**Basic Instrument Checks (refer to Basic Instrument Checks)**	**Frequency response correction (refer to Performing a Frequency Response Correction)**	**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 A340	X	X	-

Replaced Module	Basic Instrument Checks (refer to Basic Instrument Checks)	Frequency response correction (refer to Performing a Frequency Response Correction)	Additional Tests/Tasks (refer to corresponding chapter)
Microwave converter 67 A150	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	X	-
Input Cable	X	X	-
Preamplifier (R&S FSW-B24)	X	X	X
OCXO B4 A260	X	Reference frequency adjustment only	-
Wideband ADC board A290 (R&S FSW-B160/B320)	X	-	-
Detector extension board A220 (R&S FSW-B160/B320)	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	-	-

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 Massages

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.

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 2.1 Adjustment.

3.2.3 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.

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.

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!

Tools recommended for module replacement:

Tool	Part to replace
BW2010 KEY (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)	Microwave converter frontend unit, YIG Filter, R&S FSW43/50: Preamplifier, triplexer, R&S FSW13/26/4350: step attenuator
USB Keyboard and USB Mouse	Front board, Display
SMP Connector removal Tool (e.g. Rosenberger extraction tool Order No. 11W101-000)	Digital Motherboard

3.2.3.1 CPU Board A90

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.

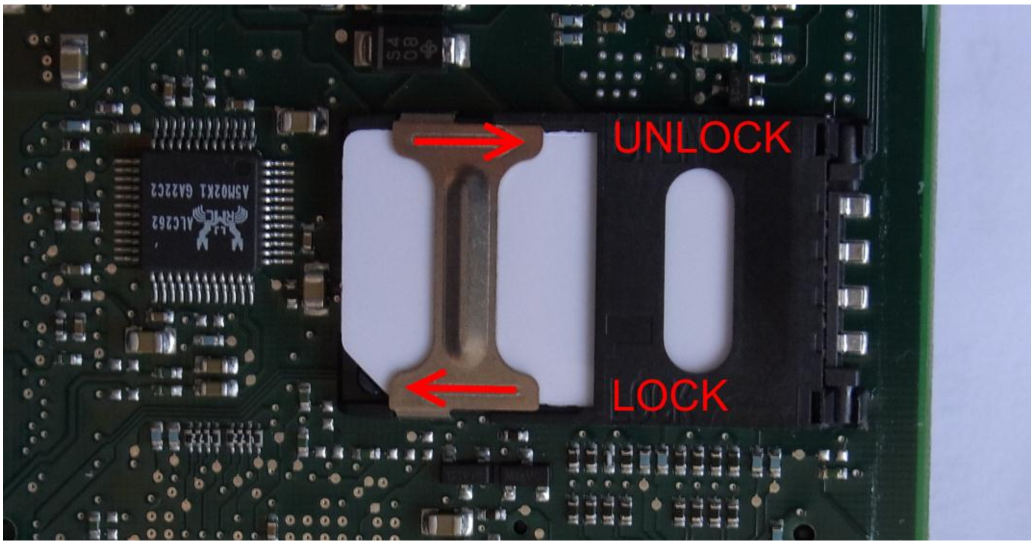
Note: You can easily remove the CPU board using the BW2010 KEY tool. To remove the CPU board push the BW2010 KEY tool in the corresponding holes on the rear side of the module. The top side of the tool is marked with the sign “TOP”. After inserting the tool gently turn the tool on the right side of the 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.

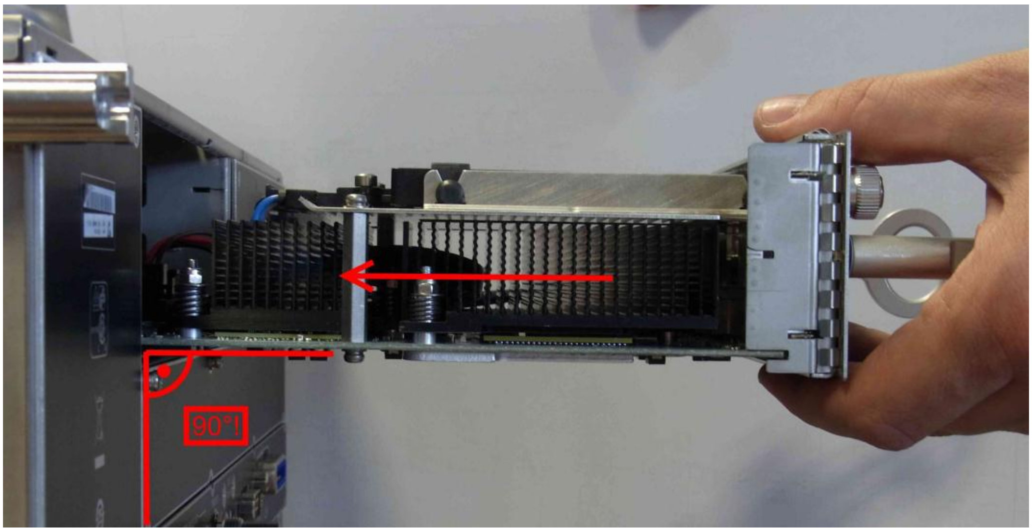


6. Insert the smart card in the new controller board. First open the holder as described above and put in the smart card properly. Then close the holder and lock it.

   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. Insert the new controller board in the instrument.

   NOTICE! Risk of damage to the controller 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.



8. 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.

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`**`IPC11`**`-x-x.xx_R&S FSW.msi` **for IPC11 CPU boards**. 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.

9. Perform the Basic Instrument Checks according to chapter Basic Instrument Checks.

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.

1. Switch off the instrument and disconnect the power plug.
2. Remove the CPU board as described in chapter Replacing the whole CPU Board
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 (Replacing the whole CPU Board).

   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 Basic Instrument Checks.

Replacing SATA Hard Drive A91

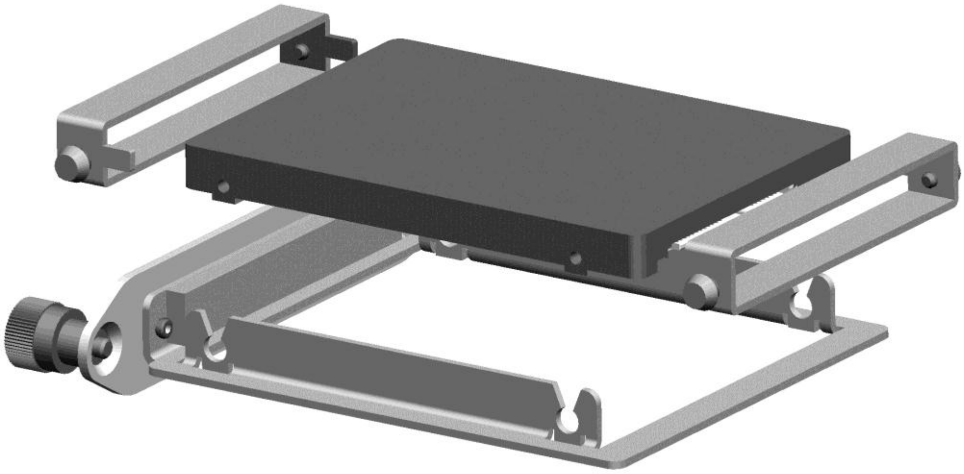
The spare part is already formatted for the R&S FSW and contains the complete software.

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.
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.

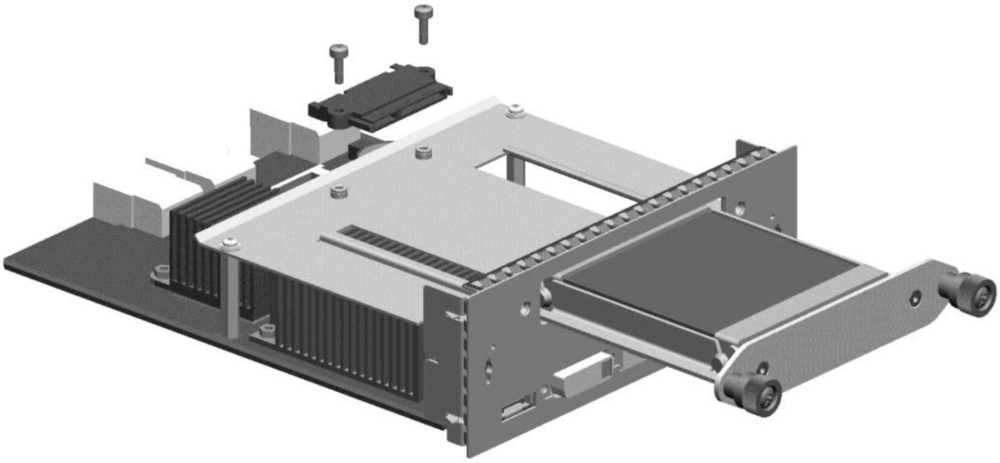
NOTICE

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 Basic Instrument Checks.
10. If needed, update the FW to the latest version.

Replacing the SATA Adaptor A92



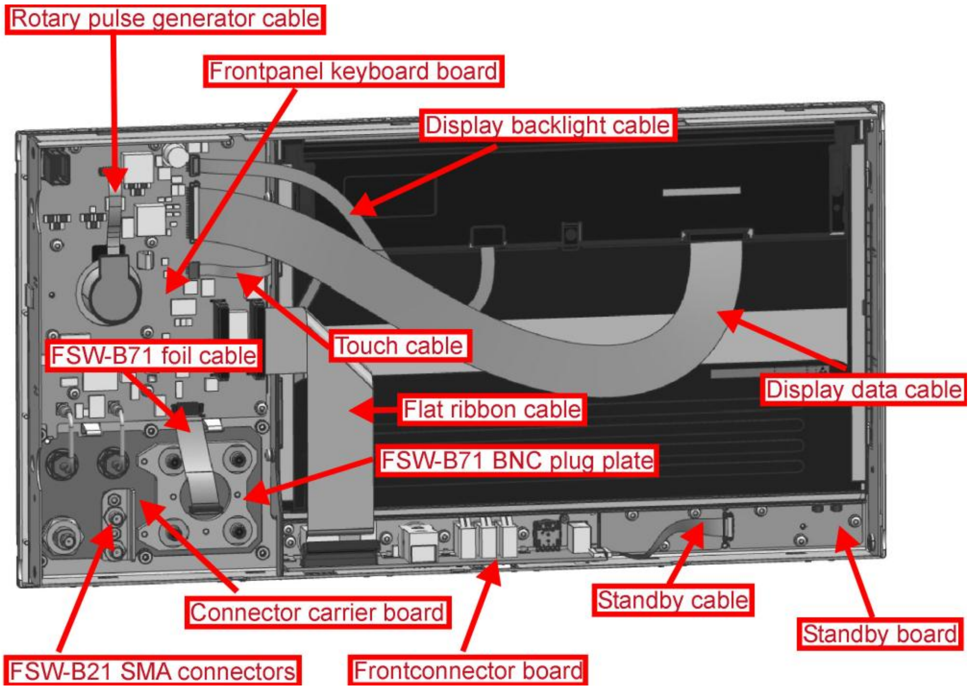
1. Switch off the instrument and disconnect the power plug.
2. Remove the CPU Board as described in chapter Replacing the whole CPU Board.
3. Unplug the SATA data cable and the SATA power cable from the SATA adaptor.
4. Unscrew the two screws fastening the adaptor.
5. Fix the new adaptor with the two 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.

3.2.3.2 Front Unit



Replacing the Display with Touch Screen A70

1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to Unmounting the Side Cover).
3. Unmount the frontpanel (refer to Unmounting the Frontpanel).
4. Unplug the display data cable and display backlight cable at the plugs on the display.
5. Unplug touch cable.
6. Unplug flat ribbon cable on both sides and remove it.
7. Loose 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.
8. 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.
9. 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!

10. Reinstall the flat ribbon cable.
11. Plug in the display data cable and the display backlight cable.
12. Plug in the touch cable.
13. Mount the frontpanel to the instrument (refer to 3.2.2.5).
14. Mount the right side cover (refer to 3.2.2.5).
15. Mount the upper and lower cover (refer to 3.2.2.5).
16. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
17. 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.
18. Perform the Basic Instrument Checks according to chapter Basic Instrument Checks
19. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

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 upper and lower cover (refer to Replacing the whole CPU Board).
2. Unmount the right side cover (refer to Unmounting the Side Cover).
3. Unmount the frontpanel (refer to Unmounting the Frontpanel).
4. Unplug display data cable and display backlight cable at the plugs on the frontpanel keyboard.
5. Unplug touch cable and rotary pulse generator cable on the frontpanel keyboard.
6. Unplug flat ribbon cable on frontpanel keyboard.
7. Unplug the two RF cables.

If Option R&S FSW-B71 is installed:

1. Unplug the B71 foil cable on the frontpanel keyboard board
2. Loosen the eight screws fastening the frontpanel keyboard and remove the board.
3. 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.
4. Replug the display data cable and display backlight cable.
5. Replug the touch cable and rotary pulse generator cable.

6. Replug the flat ribbon cable.
7. Replug the two RF cables.

If Option R&S FSW-B71 is installed:

8. Replug the B71 foil cable on the frontpanel keyboard board
9. Mount the frontpanel to the instrument (refer to 3.2.2.5).
10. Mount the right side cover (refer to 3.2.2.5).
11. Mount the upper and lower cover (refer to 3.2.2.5).
12. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
13. 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.
14. Perform the Basic Instrument Checks according to chapter Basic Instrument Checks
15. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
16. Press any hard key twice until every key on the key test program lights up green.
17. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

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 upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug standby cable at the plug on the standby board.
5. Unscrew the five screws fastening the standby board.
6. Replace standby board by the new one.

   Note: Be sure the push button board is inserted properly.
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 3.2.2.5).
10. Mount the right side cover (refer to 3.2.2.5).
11. Mount the upper and lower cover (refer to 3.2.2.5).
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 **Basic Instrument Checks**
14. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
15. Press any hard key twice until every key on the key test program lights up green.
16. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Front Connector Board A30

1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug flat ribbon cable at the plug on the front connector board.
5. Unplug standby cable at the plug on the front connector board.
6. Remove headphone volume adjust knob.
7. Unscrew the four screws fastening the front connector board.
8. Replace front connector board by the new one.
9. Fasten the four screws previously removed.
10. Plug in standby cable.

    Note: The plug is contacting the cable on the top side!
11. Plug in flat ribbon cable.
12. Remount headphone volume adjust knob.
13. Mount the frontpanel to the instrument (refer to 3.2.2.5).
14. Mount the right side cover (refer to 3.2.2.5).
15. Mount the upper and lower cover (refer to 3.2.2.5).
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 **Basic Instrument Checks**.
18. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
19. Press any hard key twice until every key on the key test program lights up green.
20. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Rotary Pulse Generator A42

1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug rotary pulse generator cable at the plug on the rotary pulse generator.
5. Remove knob from rotary pulse generator.
6. Unscrew the nut on the rotary pulse generator.
7. Replace rotary pulse generator by a new one.
8. Fasten the nut.
9. Plug in rotary pulse generator cable.

    Note: The plug is contacting the cable on the bottom side!
10. Reinstall the knob.
11. Mount the frontpanel to the instrument (refer to 3.2.2.5).
12. Mount the right side cover (refer to 3.2.2.5).
13. Mount the upper and lower cover (refer to 3.2.2.5).
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 Basic Instrument Checks.
16. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
17. Press any hard key twice until every key on the key test program lights up green.
18. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the RF Input Connector X1

1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
   a. Unscrew the nut fastening the input connector.
   b. Replace the input connector to a new one.
   c. Fasten the nut previously removed.
4. Mount the frontpanel to the instrument (refer to 3.2.2.5).
5. Mount the right side cover (refer to 3.2.2.5).
6. Mount the upper and lower cover (refer to 3.2.2.5).
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 Basic Instrument Checks.

9. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

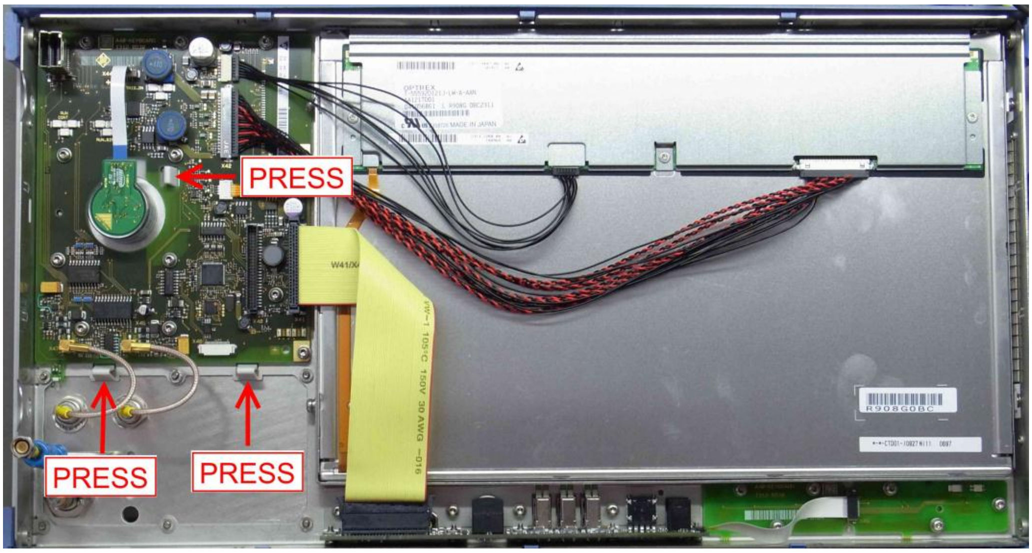
Replacing the Frontcover

1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug display data cable and display backlight cable at the plugs on the front board.
5. Unplug touch cable and rotary pulse generator cable on the frontpanel keyboard.
6. Unplug flat ribbon cable on front board.

If Option R&S FSW-B71 is installed:

7. Unplug the B71 foil cable on the frontpanel keyboard board
8. Unscrew the eight screws fastening the frontpanel keyboard and remove it.
9. 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.



10. Snap the new front cover onto the sheet metal.
11. Reinstall the frontpanel keyboard and fasten the eight screws.

    Note: Be sure the push-button board is inserted correctly in the front bezel.
12. Replug the display data cable and display backlight cable.
13. Replug the touch cable and rotary pulse generator cable.
14. Replug the flat ribbon cable.

If Option R&S FSW-B71 is installed:

15. Replug the B71 foil cable on the frontpanel keyboard board
16. Mount the frontpanel to the instrument (refer to 3.2.2.5).
17. Install the new labels on the front cover.

    Note: Be sure to mount the labels properly. They can only be installed once!
18. Mount the right side cover (refer to 3.2.2.5).
19. Mount the upper and lower cover (refer to 3.2.2.5).
20. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
21. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
22. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
23. Press any hard key twice until every key on the key test program lights up green.
24. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Pushbutton Board Upper Half

1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug display data cable and display backlight cable at the plugs on the front board.
5. Unplug touch cable and rotary pulse generator cable on the frontpanel keyboard.
6. Unplug flat ribbon cable on frontpanel keyboard.
7. Unplug the two RF cables.

If Option R&S FSW-B71 is installed:

8. Unplug the B71 foil cable on the frontpanel keyboard board
9. Unscrew the eight screws fastening the frontpanel keyboard and remove the board.
10. Replace the pushbutton board by a new one.
11. 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.
12. Replug the display data cable and display backlight cable.

13. Replug the touch cable and rotary pulse generator cable.
14. Replug the flat ribbon cable.
15. Replug the two RF cables.

If Option R&S FSW-B71 is installed:

16. Replug the B71 foil cable on the frontpanel keyboard board
17. Mount the frontpanel to the instrument (refer to 3.2.2.5).
18. Mount the right side cover (refer to 3.2.2.5).
19. Mount the upper and lower cover (refer to 3.2.2.5).
20. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
21. 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.
22. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
23. Start the key test program by

    [SETUP : Service : Enter Password = 894129]
    [SETUP : Service : Enter Service Function: 2.0.14.0]
24. Press any hard key twice until every key on the key test program lights up green.
25. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Pushbutton Board Lower Half

1. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
2. Unmount the right side cover (refer to **Unmounting the Side Cover**).
3. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
4. Unplug standby cable at the plug on the standby board.
5. Unscrew the five screws fastening the standby board.
6. Remove the standby board.
7. Replace push button board by a new one.
8. 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.
9. Fasten the five screws previously removed.

10. Plug in standby cable.

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

11. Mount the frontpanel to the instrument (refer to 3.2.2.5).
12. Mount the right side cover (refer to 3.2.2.5).
13. Mount the upper and lower cover (refer to 3.2.2.5).
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 Basic Instrument Checks
16. Start the key test program by

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

17. Press any hard key twice until every key on the key test program lights up green.
18. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.2.3.3 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. Insert the new power supply carefully.
5. Reinstall the six screws formerly 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 **Basic Instrument Checks**.

3.2.3.4 Replacing the Frontend Board A100

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the inner lid (refer to Unmounting the Inner Lids 1 and 2).
4. Unplug all RF cables and the grounding cable 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 and the grounding cable (if previously installed) at the frontend board (for detailed cable routing refer to chapter 3.2.2.2).

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

8. Mount the inner lid (refer to 3.2.2.5).
9. Mount the upper and lower cover (refer to 3.2.2.5).
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 **Basic Instrument Checks**.
12. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

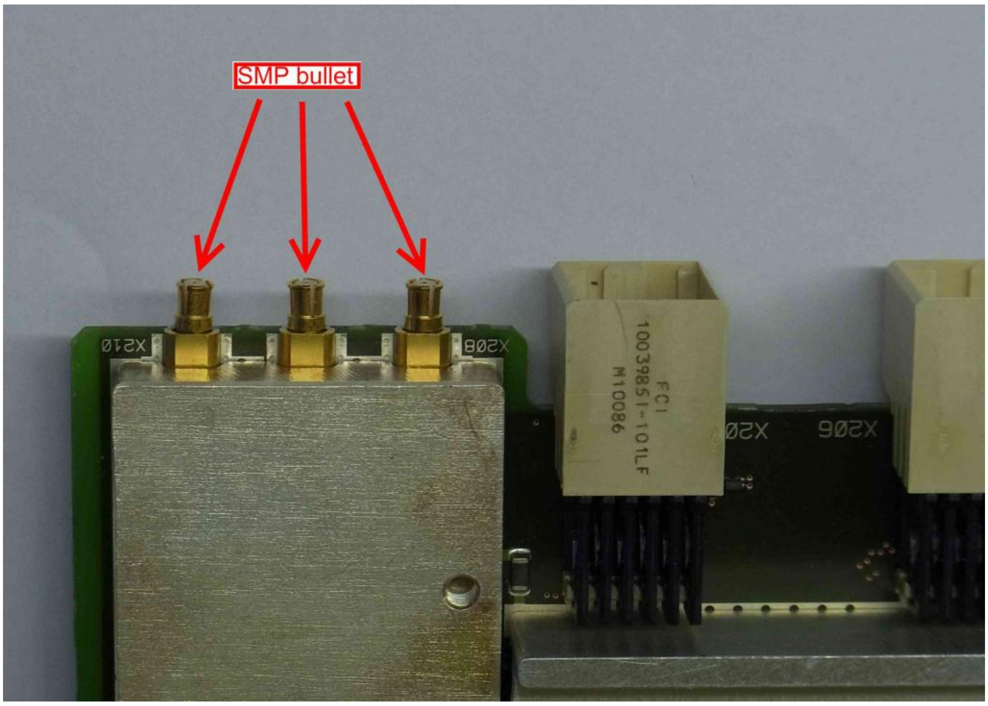
3.2.3.5 Replacing the Detector Board A200

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 KEY 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 **Basic Instrument Checks**.

   Note: If the firmware shows a "DCM unlock" error (refer to Errors During Startup of the Instrument) when booting the instrument check the SMP bullets in the detector board for proper installation!

3.2.3.6 Replacing the Attenuator A40

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).
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.
6. Remove the microwave converter frontend unit. For removing the microwave converter frontend unit refer to chapter Unmounting the Microwave converter frontend unit.
7. Remove RF cable to the microwave converter frontend.
8. Unscrew the screws fastening the attenuator to the microwave converter frontend unit.
9. 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.
10. Carefully remove the attenuator.
11. 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!
12. Reinstall the step attenuator to the microwave converter frontend unit by fastening the screws formerly removed.
13. Reinstall the RF cable to the microwave converter frontend.
14. Reinstall the microwave converter frontend unit. For reinstalling the microwave converter frontend unit refer to chapter Installing the microwave converter frontend unit.
15. Fasten the four screws previously removed.
16. Reconnect the RF cable to the frontpanel at the step attenuator side.
17. Reconnect the calibration signal cable at the step attenuator side.
18. Mount the right side cover (refer to 3.2.2.5).
19. Mount the lower cover (refer to 3.2.2.5).

20. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
21. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
22. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.2.3.7 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.

Replacing the Digital Motherboard

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the inner lid (refer to Unmounting the Upper and/or Lower Cover).
4. Remove the CPU Board using the BW2010 tool (refer to Replacing the whole CPU Board).
5. Remove the power supply unit using the BW2010 tool (refer to Replacing the Power Supply Unit A80).

If option R&S FSW-B71 is installed:

a. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).

   Note: For details on how to route the R&S FSW-B71 cables refer to chapter 3.2.2.2.

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 according to chapter Unmounting the Microwave converter frontend unit.
7. Unplug the two fans.

   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.

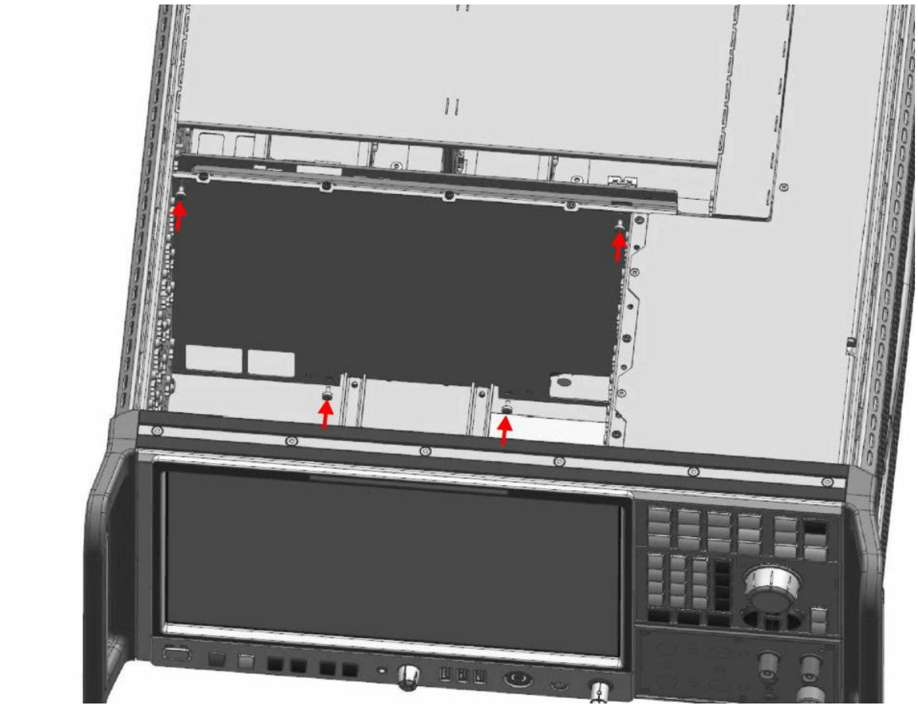
   Note: The connector is locked. To unlock the connector press the two clamps on the small side of the connector at the same time and remove the connector.

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!

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.

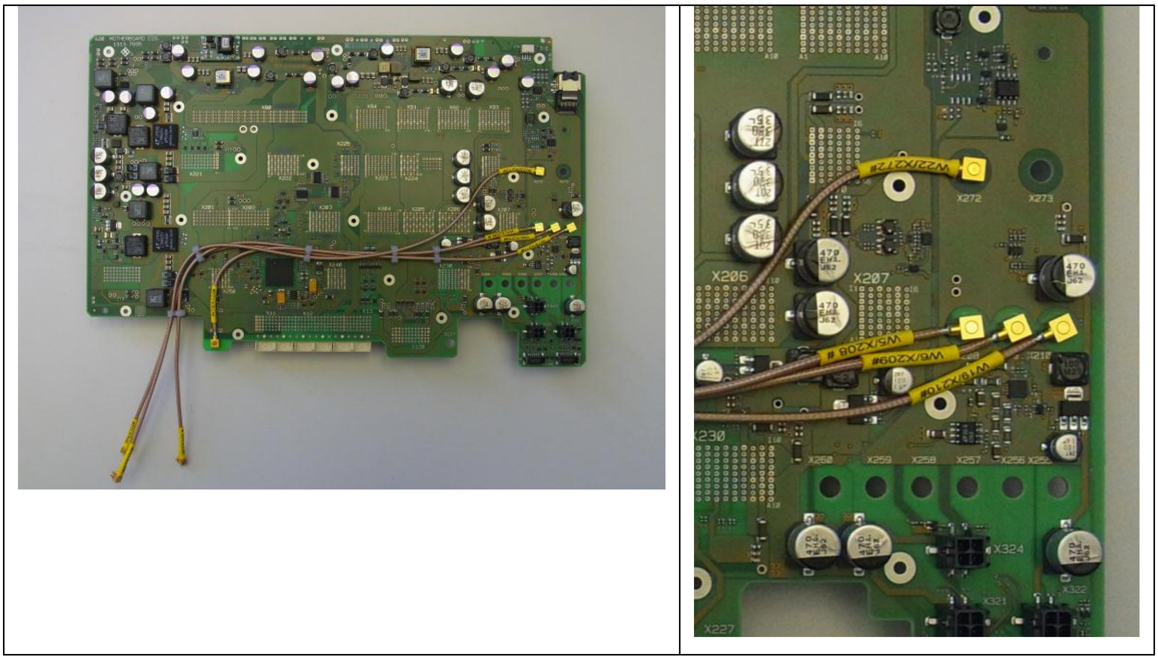


Figure 3-27: Cable routing without option R&S FSW-B71 installed

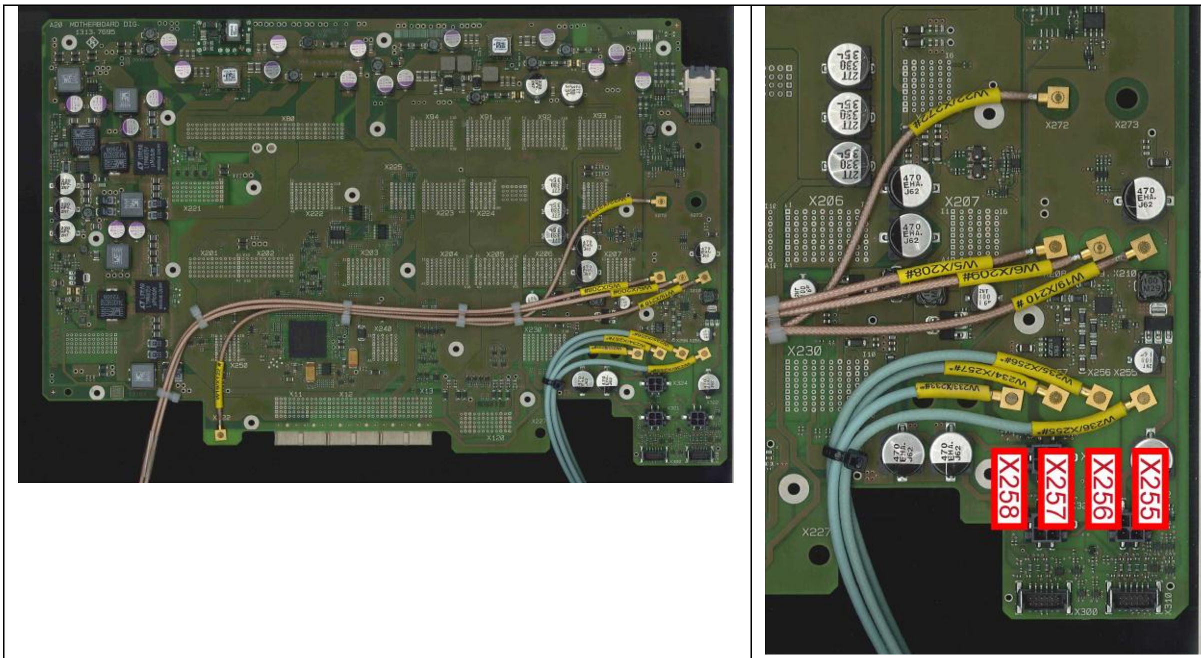


Figure 3-28: Cable routing with option R&S FSW-B71 installed

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 3-29: Cable routing without option R&S FSW-B71 installed

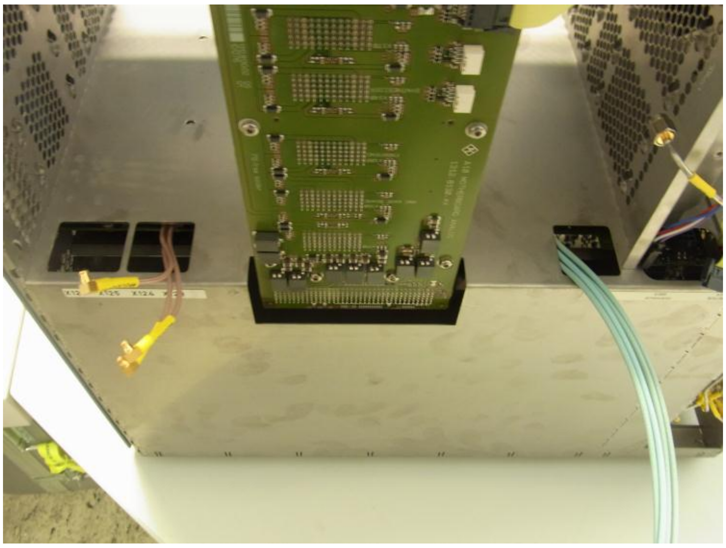


Figure 3-30: Cable routing with option R&S FSW-B71 installed

17. Remount the motherboard to the instrument frame using the previously removed screws.
18. Reinstall the CPU Board (Replacing the whole CPU Board).
19. Reinstall the power supply unit (refer to Replacing the Power Supply Unit A80).

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 Replacing the BNC plug plate)
   c. Reinstall the front panel (refer to chapter 3.2.2.5)
   d. Reinstall the cable ties to R&S FSW-B71 cables.

20. Plug in the two fans as described in chapter Replacing the Fans

    Note: Be sure to connect the fans to correct connector.

21. Plug in the attenuator and, if installed, the preamplifier.
22. Reinstall the microwave converter frontend unit as described in chapter Unmounting the Microwave converter frontend unit.
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 3.2.2.5).
25. Mount the upper and lower cover (refer to 3.2.2.5).
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 **Basic Instrument Checks**.
29. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

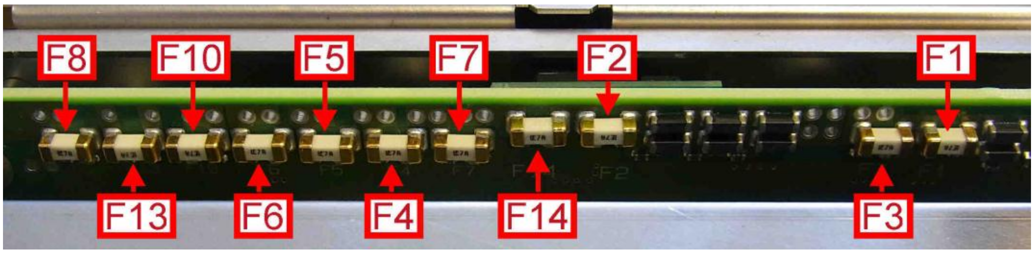
Replacing a Defective Fuse

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the inner lid (refer to **Unmounting the Inner Lid**).
4. The fuses are located on the upper side of the digital motherboard.
5. To identify the blown fuse refer to chapter 3.2.4.
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 ± 5 %.

    Tip: If the fuse is blown again check the boards supplied by this power rail. See chapter 3.2.4 for further details.

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

12. Mount the inner lid 1 (refer to 3.2.2.5).
13. Mount the upper cover (refer to 3.2.2.5).
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 **Basic Instrument Checks**.

3.2.3.8 Replacing the Analog Motherboard

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Remove the eight screws fastening the analog motherboard.
4. Carefully remove the analog motherboard.
5. Carefully plug in the new module.
6. Fasten the eight screws previously removed.
7. Mount the lower cover (refer to 3.2.2.5).
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 **Basic Instrument Checks**.

3.2.3.9 Microwave Converter A160, A162, A161 and A150

The microwave converter consist of three parts: the microwave converter base board, the microwave converter frontend unit and the microwave converter 67. The 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.

Replacing the Base Board

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the inner lid (refer to **Unmounting the Inner Lid**).
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

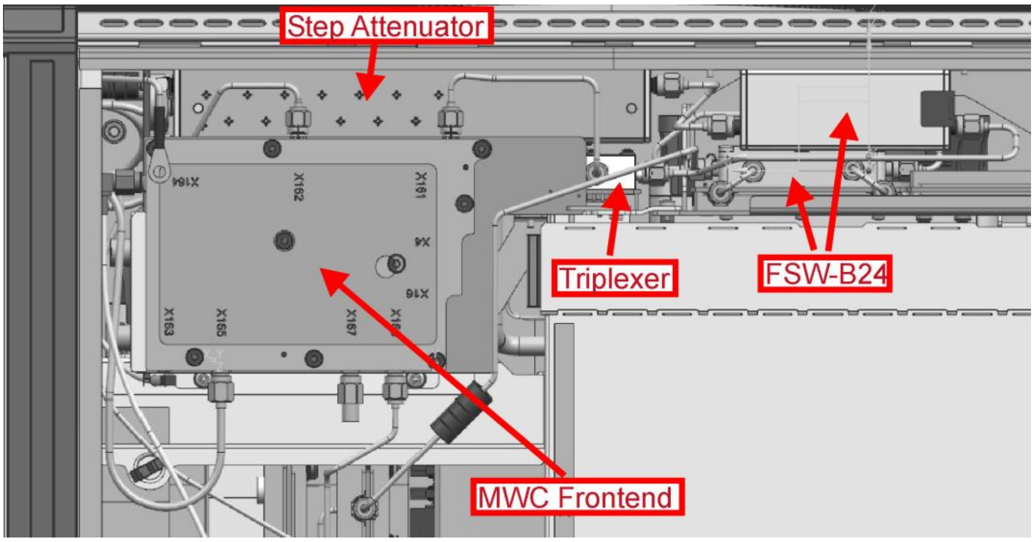
Make sure you plug in the flat ribbon cable connectors in a right angle. Otherwise, the contacts inside the connector may be damaged.

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 3.2.2.5).
12. Mount the inner lid (refer to 3.2.2.5).
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 **Performing a Frequency Response Correction**.
15. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

Unmounting the Microwave converter frontend unit

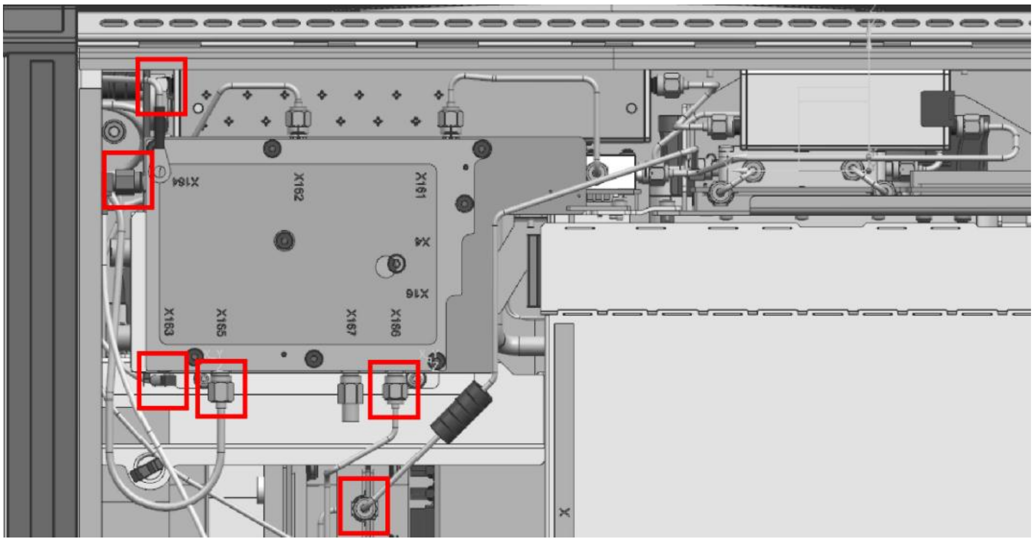


1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).
4. Unplug the flat ribbon cable at the microwave converter frontend side.

   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.

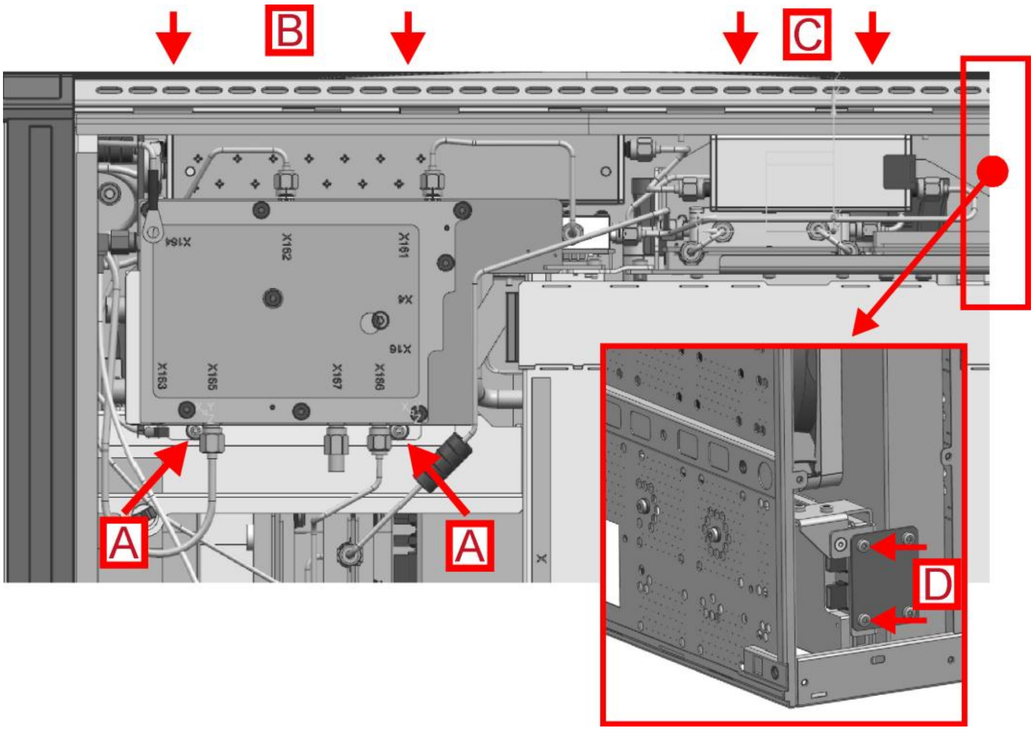


7. Unscrew the two screws marked with A fastening the microwave converter frontend unit.

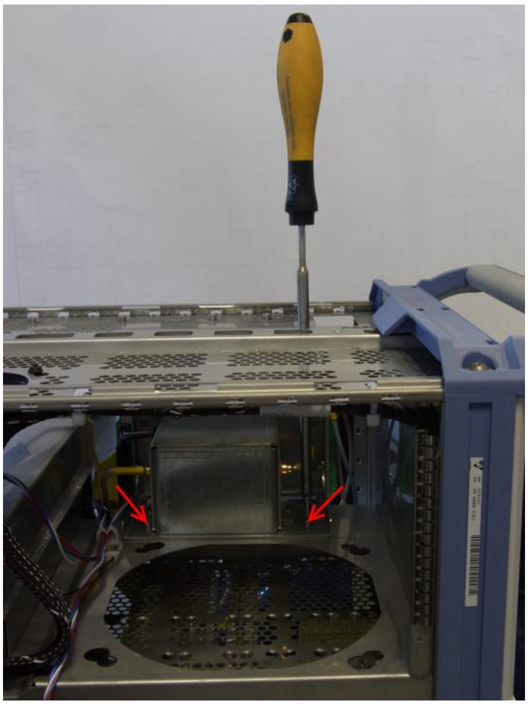
   Note: The picture shows an instrument with option R&S FSW-B24 installed.

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. Unscrew the two screws fastening the microwave converter frontend unit to the instrument as shown in the picture below using the extra long TX8 screw driver. The screws can be reached through the right side wall of the instrument. (To uninstall the microwave converter frontend unit, there is no need to unmount the fan!)



10. Carefully remove the microwave converter frontend unit from the instrument chassis.

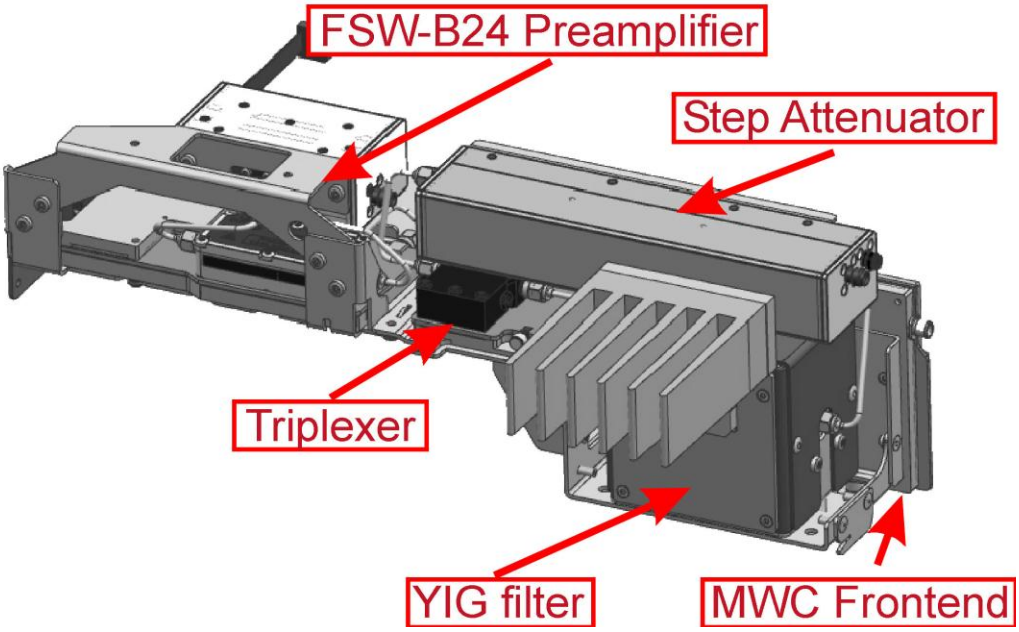
Installing the microwave converter frontend unit

1. Carefully insert the microwave converter frontend unit 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 upper and lower cover (refer to 3.2.2.5).
7. Mount the right cover (refer to 3.2.2.5).
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 **Basic Instrument Checks**.

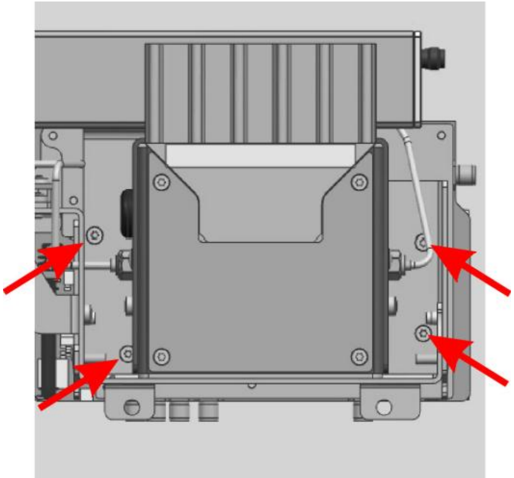
10. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Microwave Converter Frontend

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 Unmounting the Microwave converter frontend unit . The picture below shows a R&S FSW 67 microwave converter frontend unit with installed option R&S FSW-B24.

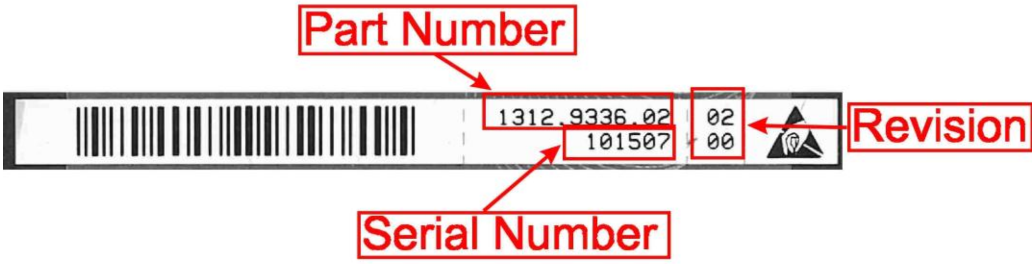


1. Unmount the microwave converter frontend unit as described in chapter Unmounting the Microwave converter frontend unit.
2. Unplug the RF cables at connector X161 and X162 at the microwave converter frontend side.
3. Unscrew the four screws fastening the microwave converter frontend to the frontend 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 partnumber 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 Eprom!)



8. Reconnect the RF cables at connector X161 and X162

   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 Unmounting the Microwave converter frontend unit.
10. Mount the right side cover (refer to 3.2.2.5).
11. Mount the upper and lower cover (refer to 3.2.2.5).

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 partnumber, 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

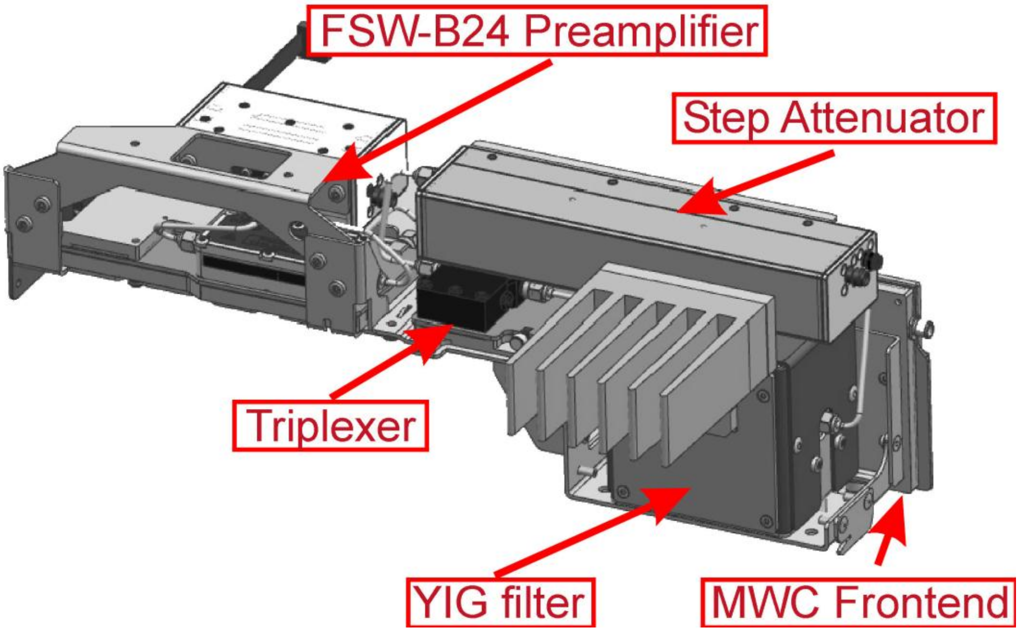
    [3.7.7.0.FRONTEND]

    and verify the displayed data with the data of the new installed hardware.
15. Reset the service password

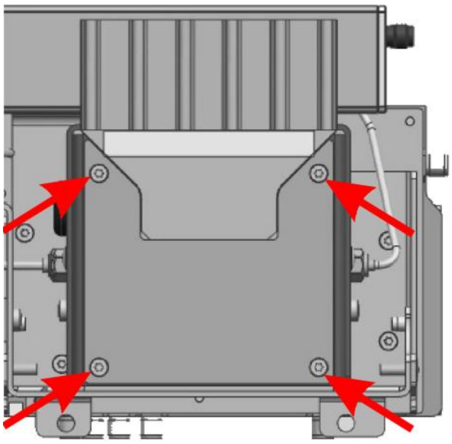
    [SETUP : MORE : SERVICE : SERVICE FUNCTION]
    [Reset Password]
16. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
17. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the YIG Filter

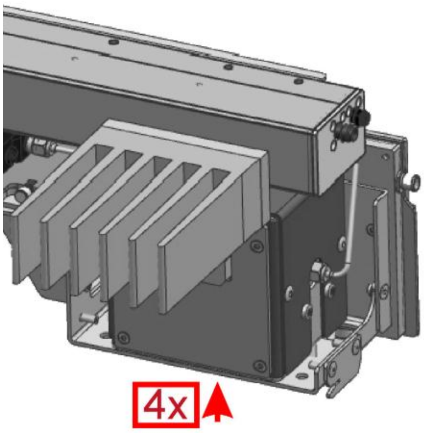
The YIG filter is mounted on the microwave converter frontend unit. To replace it the whole microwave converter frontend unit has to be removed from the instrument.



1. Unmount the microwave converter frontend unit as described in chapter Unmounting the Microwave converter frontend unit
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 heat sink on the YIG filter by removing the four screws fastening the heat sink.

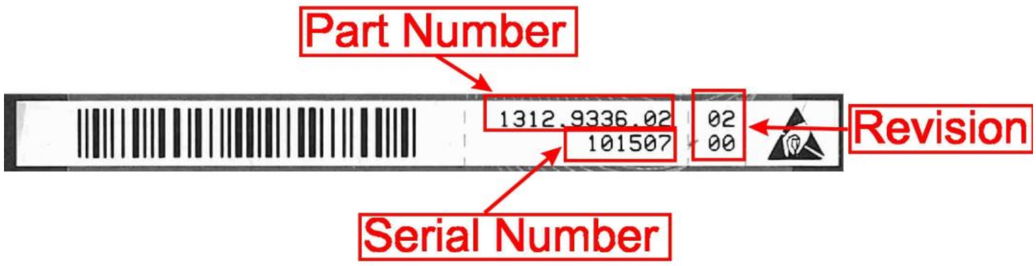


6. Uninstall the shielding cap with the YIG filter by unscrewing the four screws fixing the YIG filter shielding cap.



7. Disconnect the RF cable at the step attenuator.
8. Unmount the step attenuator from the Microwave converter frontend unit by removing the screws fastenint the step attenuator.
9. Unmount the shielding cap from the YIG filter.
10. Replace the YIG filter by a new one.
11. Write down the serial number, the partnumber 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 Eprom!)



12. Reinstall the YIG filter with the shielding cap to the frontend unit frame.
13. Replace the thermal conductive pad if it was installed formerly and reinstall the heat sink.
14. Replug the YIG filter control cable to the microwave converter frontend.

15. Mount the step attenuator to the microwave converter frontend unit.
16. Reconnect the RF cable to the step attenuator.

    Tip: The connector to plug in is written on the yellow tube on the cable.
17. 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.
18. Reinstall the microwave converter frontend unit to the instrument as described in chapter Unmounting the Microwave converter frontend unit
19. Mount the right side cover (refer to 3.2.2.5).
20. Mount the upper and lower cover (refer to 3.2.2.5).
21. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
22. 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]

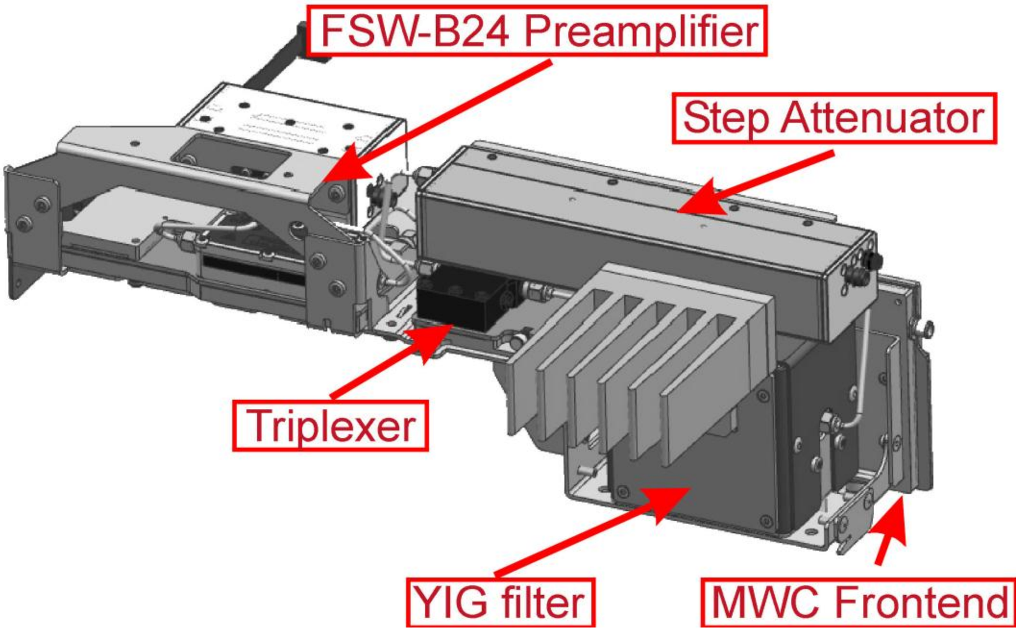
       where: xxxx.xxxx.xx is the partnumber, yyyyyy is the serial number and zz.zz is the product revision of the new installed board. Use the information you wrote down in step 9.
23. Enter the service function

    [3.7.7.0.YIG_UNIT]
    and verify the displayed data with the data of the new installed hardware.
24. Reset the service password

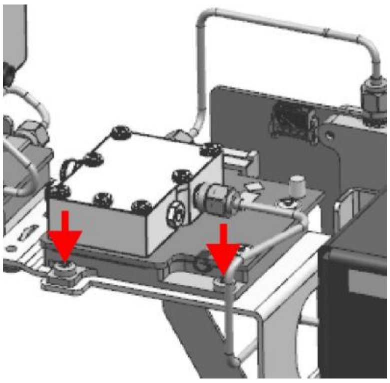
    [SETUP : MORE : SERVICE : SERVICE FUNCTION]
    [Reset Password]
25. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.
26. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

Replacing the Triplexer

The triplexer is located on the microwave converter frontend unit.

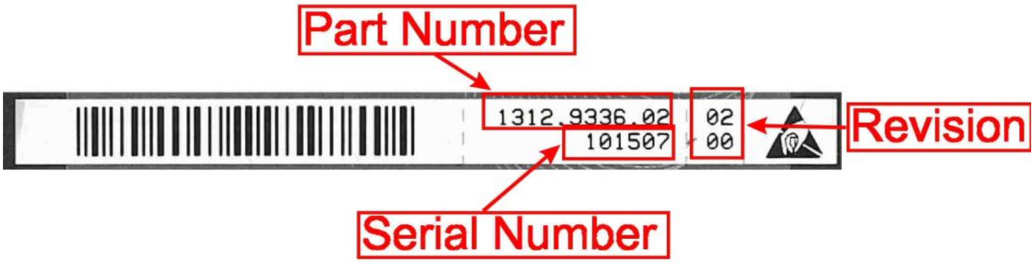


1. Unmount the microwave converter frontend unit as described in chapter Unmounting the Microwave converter frontend unit
2. Unconnect the RF cables to the step attenuator.
3. Unmount the step attenuator from the microwave converter frontend unit.
4. Uninstall the three RF cables to the triplexer.
5. 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 partnumber 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 Eprom!)



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 Unmounting the Microwave converter frontend unit
15. Mount the right side cover (refer to 3.2.2.5).
16. Mount the upper and lower cover (refer to 3.2.2.5).
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 partnumber, 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.

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 **Basic Instrument Checks**.
22. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Microwave Converter 67

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the inner lid 1 (refer to **Unmounting the Inner Lid**).
4. Unplug the RF cables from the microwave converter 67 board.
5. Carefully replace the microwave converter 67 board by a new one.
6. Reconnect the RF cables.

   Tip: The connector to plug in is written on the yellow tube on the cable.
7. Mount the inner lid 1 (refer to 3.2.2.5).
8. Mount the upper and lower cover (refer to 3.2.2.5).
9. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
10. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
11. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.2.3.10 Parts Mounted on the Instrument Chassis

Replacing the Speaker B1

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the inner lid 1 and 2 (refer to **Unmounting the Inner Lid**).
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 3.2.2.5).
11. Mount the upper cover (refer to 3.2.2.5).
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 **Basic Instrument Checks**.
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.

Replacing the Fans

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover)
3. Unmount the inner lid 2 (refer to **Unmounting the Inner Lid**).
4. Uninstall the microwave converter frontend unit according to chapter **Unmounting the Microwave converter frontend** unit.
5. Unplug the fan to be replaced.

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

6. Remove the fan from its holder.

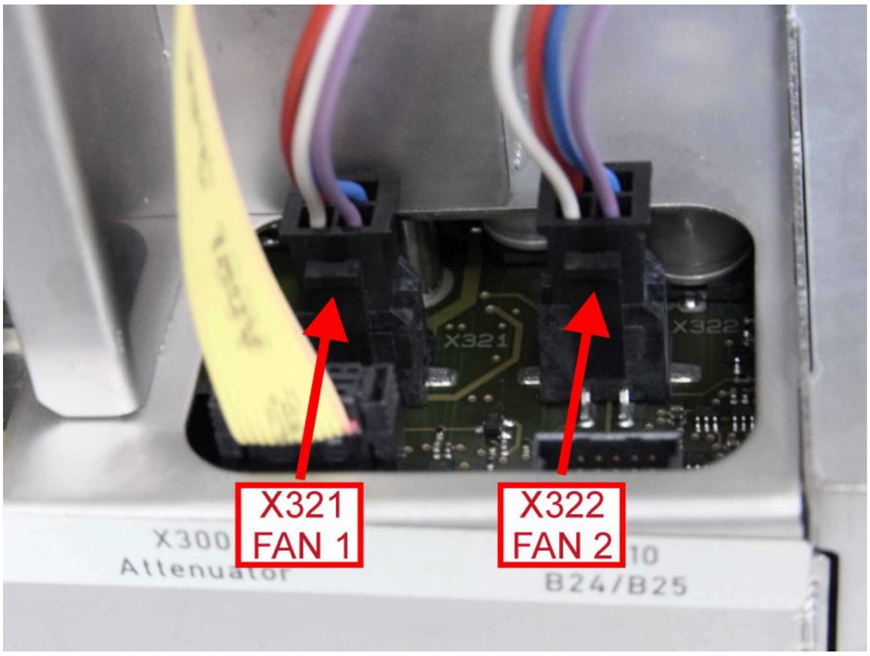
   Tip: you can pull at the lever on the rubber holder while pushing out the fan.

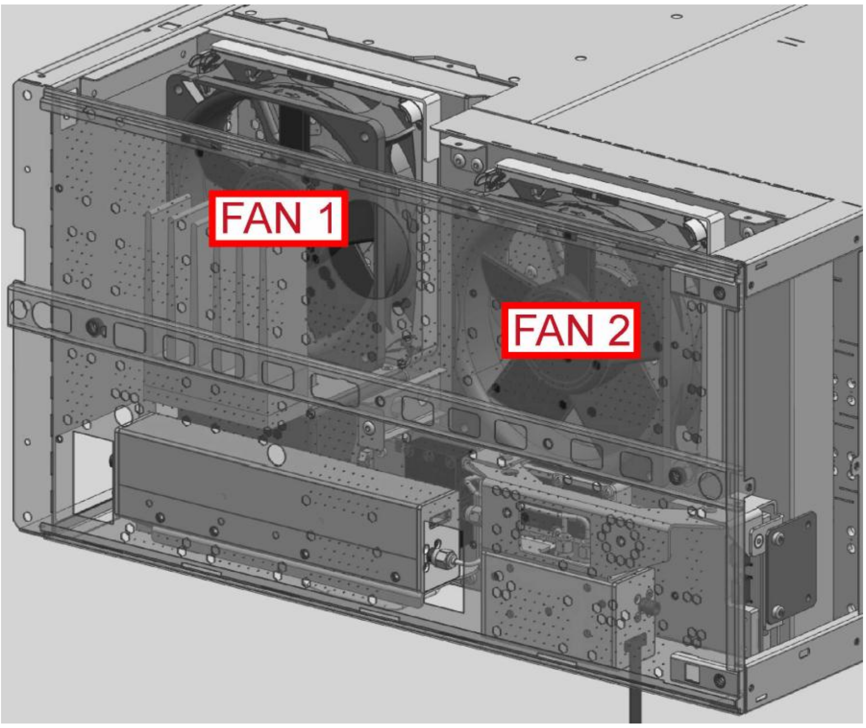
7. Install the new fan. Insert the lower corner of the fan in the holder, then press the other two corners in the holder. The fourth corner can be inserted in the holder by pulling the lever at that corner.

   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!

8. Plug in the fan 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.





9. Remount the microwave converter frontend unit according to chapter Unmounting the Microwave converter frontend unit.
10. Mount the upper and lower cover (refer to 3.2.2.5).
11. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
12. Check if both fans are running.

    Note: The fans start several seconds after powering up the instrument! This is no malfunction of the fans or the instrument!
13. Open the file C:\r_s\instrument\eeprom\motherboard\config.ini in the texteditor.
14. 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 Funktion: 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!
15. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

16. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.2.3.11 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 **Basic Instrument Checks**.
7. Adjust the reference frequency according to chapter 2.1 or perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.2.3.12 Replacing the Synthesizer Board A140

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the inner lid (refer to **Unmounting the Inner Lid**).
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 3.2.2.2).

   Tip: The connector to plug in is written on the yellow tube on the cable.
8. Mount the inner lid (refer to 3.2.2.5).
9. Mount the upper and lower cover (refer to 3.2.2.5).
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 **Basic Instrument Checks**.
12. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.2.3.13 Replacing the Reference Board A120

1. Switch off the instrument and disconnect the power plug.
2. Unmount the lower cover (refer to Unmounting the Upper and/or Lower Cover)
3. Unscrew the eight screws fastening the reference board.

Without R&S FSW-B4 installed:

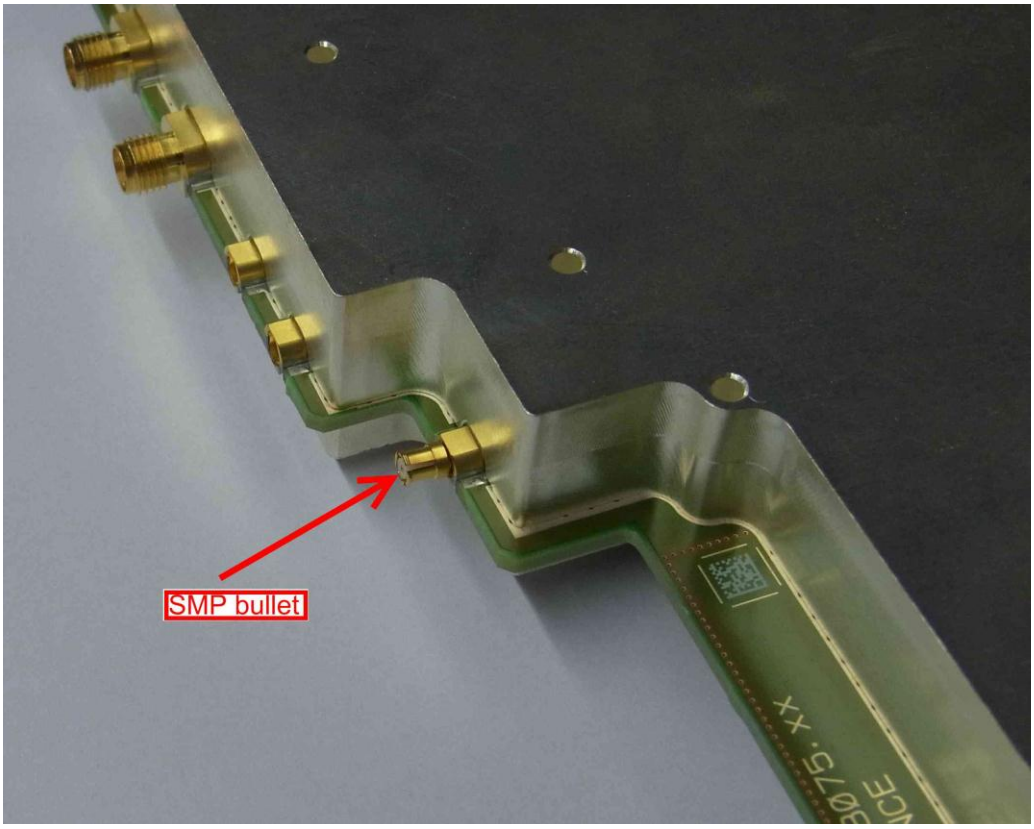
► Unscrew the four screws fastening the metal sheet covering the R&S FSW-B4 slot and remove the cover.

With R&S FSW-B4 installed:

► Uninstall the R&S FSW-B4 according to chapter 3.2.3.11.

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 3.2.2.2).

   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 3.2.3.11.

8. Fasten the reference board by installing the eight screws previously removed.
9. Mount the lower cover (refer to 3.2.2.5).
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 **Basic Instrument Checks**.
12. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

    Note: If the firmware shows a "DCM unlock" Error (refer to Errors During Startup of the Instrument) when starting the instrument check the SMP bullet for proper installation!

3.2.3.14 Replacing the Preamplifier

The preamplifier can only be replaced as a whole unit.

1. Unmount the microwave converter frontend unit as described in chapter Unmounting the Microwave converter frontend unit.
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.

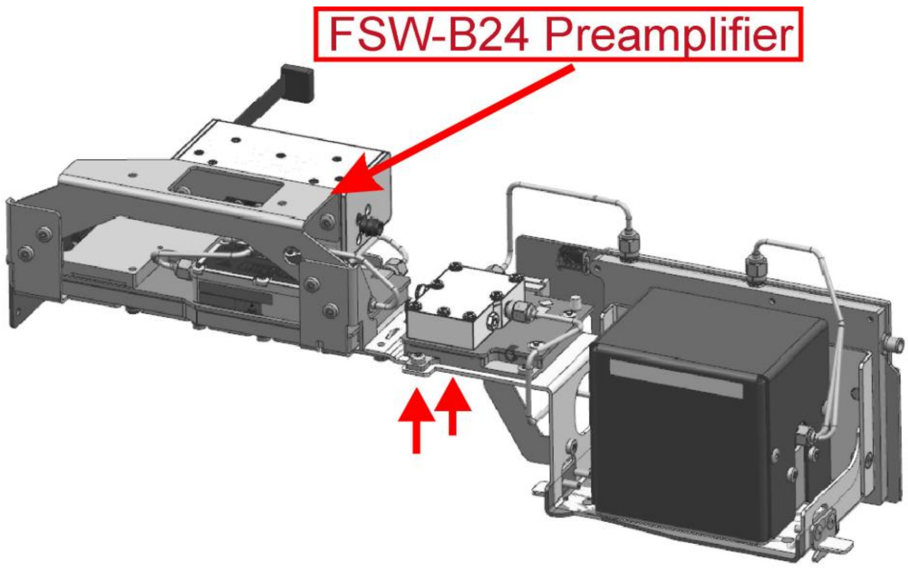


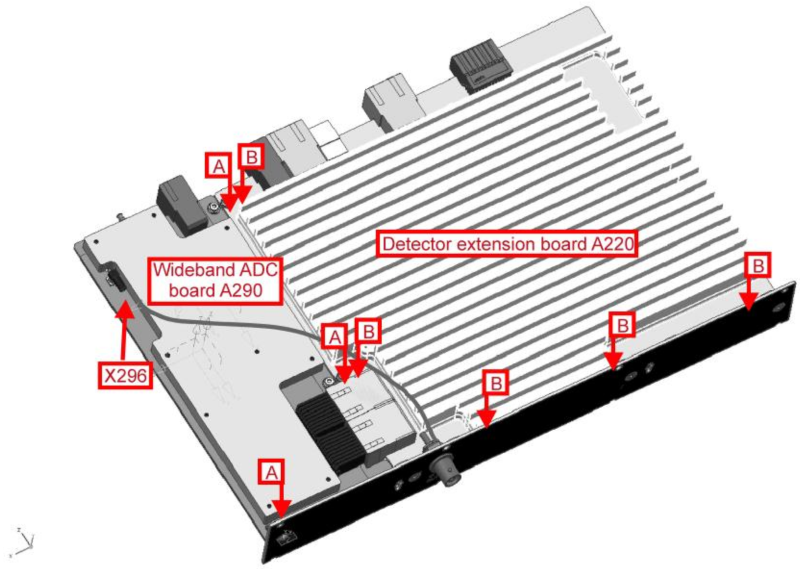
Figure 3-31: Microwave converter frontend

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 Installing the microwave converter frontend unit
8. Mount the right side cover (refer to 3.2.2.5).
9. Mount the upper and lower cover (refer to 3.2.2.5).
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 **Basic Instrument Checks**.
12. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.2.3.15 Replacing the Bandwidth Extension (option R&S FSW-B160 and R&S FSW-B320)

The option R&S FSW-B160/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

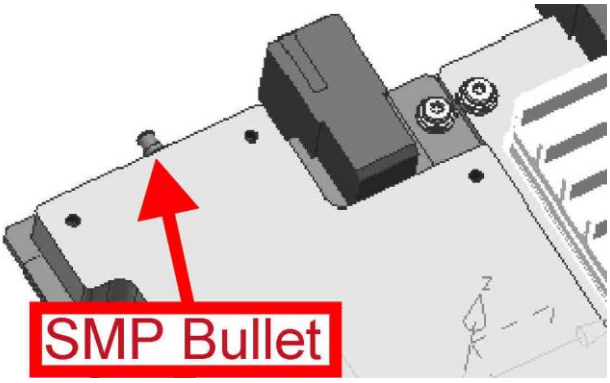
a) Unscrew the six screws, marked with B in the picture above, fastening the detector extension board as shown in the picture above

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.

8. Be sure the SMP bullet is installed properly to the wideband ADC board



9. 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.

10. Reinstall the eight screws previously removed.

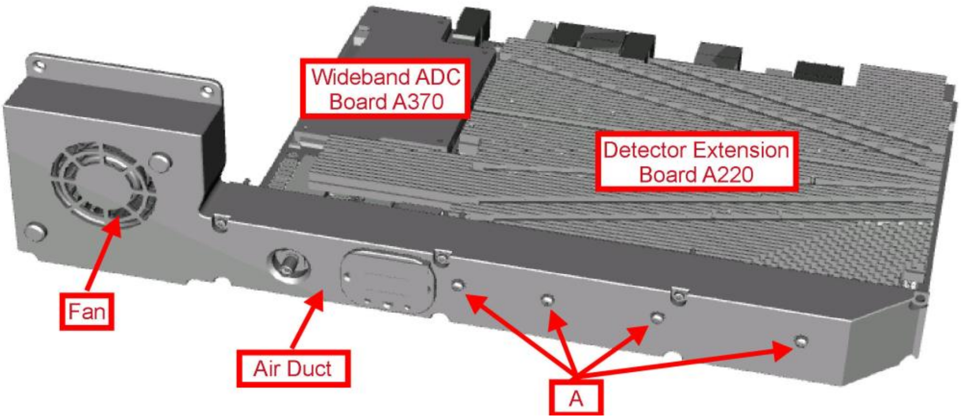
11. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

3.2.3.16 Replacing the Bandwidth Extension (option R&S FSW-B500)

The option R&S FSW-B500 consists of two boards: The wideband ADC board A370 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 eleven screws fastening the option FSW-B500 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 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.

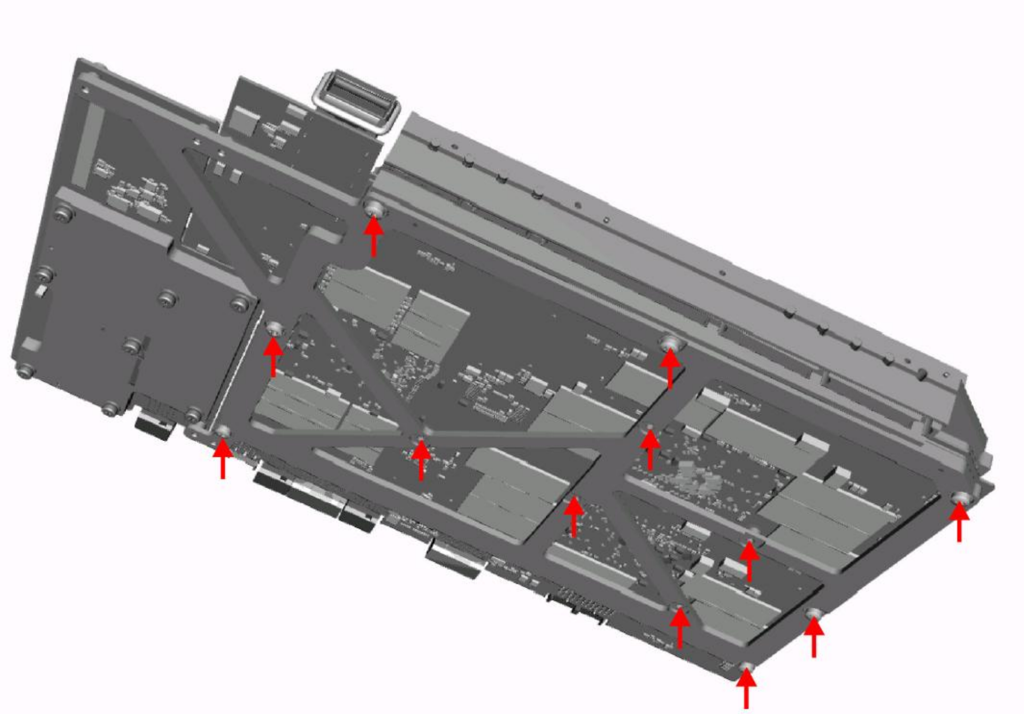


4. Unplug the RF cable at connector X376 and the SMP bullet.

   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.

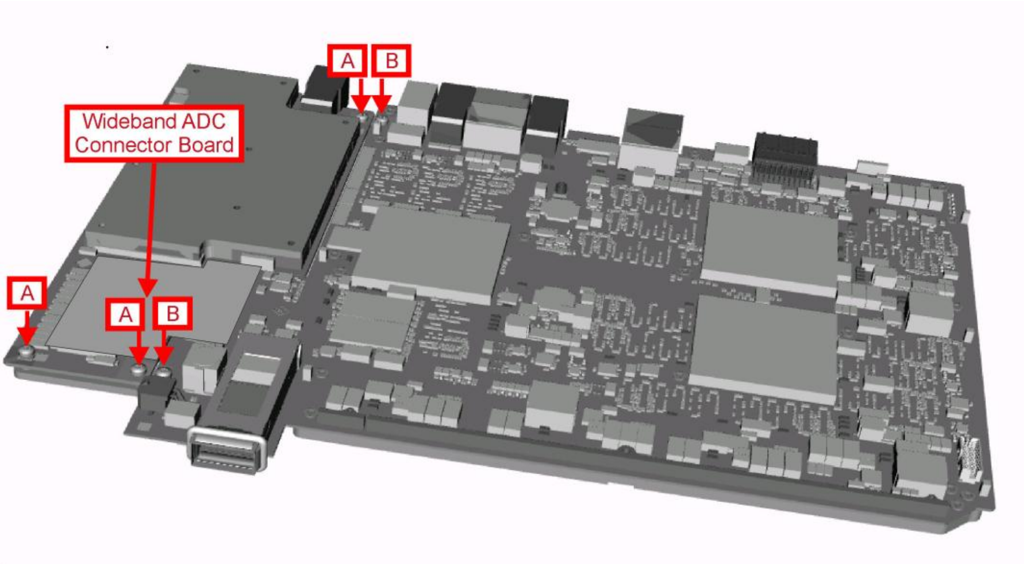
   Note: The fan is still connected to the detector extension board. Be careful not to damage the cable!
6. Carefully remove the air duct from the detector extension board and unplug the fan cable. Be careful not to damage the insulation plate!

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



7. Remove the 12 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 intergrated circuits by the heat conductive film!



9. Unplug the wideband ADC connector board carefully.

   Note: This board is reused! Be careful not to damage the connectors on the detector extension board and wideband ADC board!

Replacing the wideband ADC board A370

a) Remove the three screws marked with A fastening the wideband ADC board to the detector extension board.

b) Replace the wideband ADC board by a new one and reinstall the screws formerly removed.

Replacing detector extension board A220

a) Remove the two screws marked with B fastening the detector extension board to the wideband ADC board.

b) Replace the detector extension board by a new one and reinstall the screws formerly removed.

12. Reinstall the wideband ADC connector.

    Note: Do not damage the connectors on the two boards! Be shure to have the correct position of the board before plugging it in! Be sure to plug in the connectors correctly!

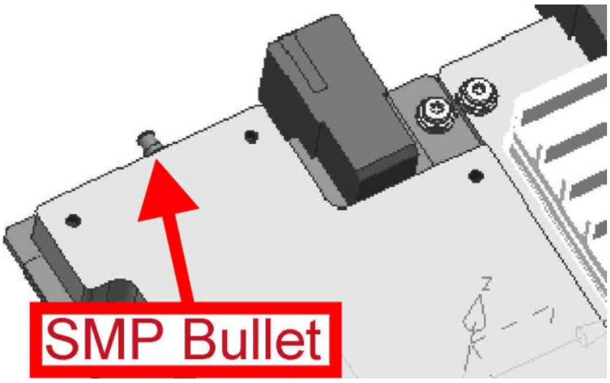
13. Replace the grey heat conductive film on the cooling plate by a new one.

    NOTICE: The grey heat conductive film has always to be replaced if it was in contact with the IC package! 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 ma be destroyed if the heat conductive film is installed incorrectly!

14. Reinstall the eleven screws formerly removed on the bottomside of the detector extension board.

15. 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



16. Reconnect the fan cable.

17. 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.

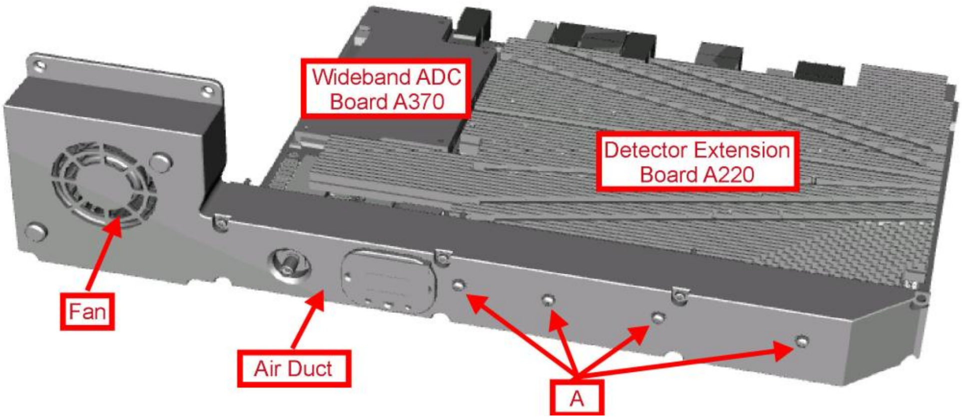
18. Reinstall the boards to the instrument.
19. Reinstall the elevelen screws formerly removed.
20. Perform the Basic Instrument Checks according to chapter Basic Instrument Checks.
21. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing FSW-B500 Fan

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

22. Unscrew the eleven screws fastening the option FSW-B500 on the back cover of the instrument.
23. 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 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.



24. Unplug the RF cable at connector X376 and the SMP bullet.

Note: The SMP bullet is reused for the new ADC board.

25. Unscrew the four screws, marked with A in the picture above, fastening the air duct to the detector extension board ADC board.

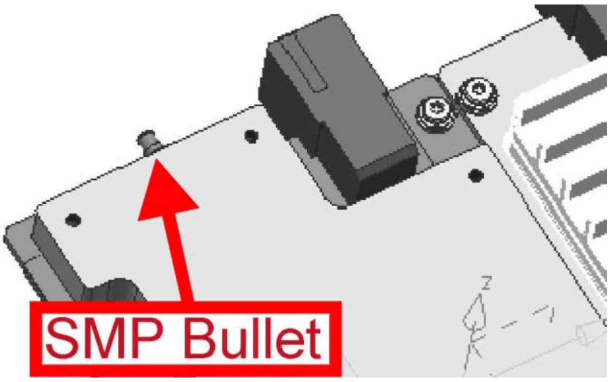
Note: The fan is still connected to the detector extension board. Be careful not to damage the cable!

26. 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!

2. Unscrew the two screws fastening the fan to the air duct.
3. Replace the fan by a new one and fasten it with the two screws formerly removed.
4. 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



5. Reconnect the fan cable.
6. Reinstall the air duct with the four screws formerly removed.

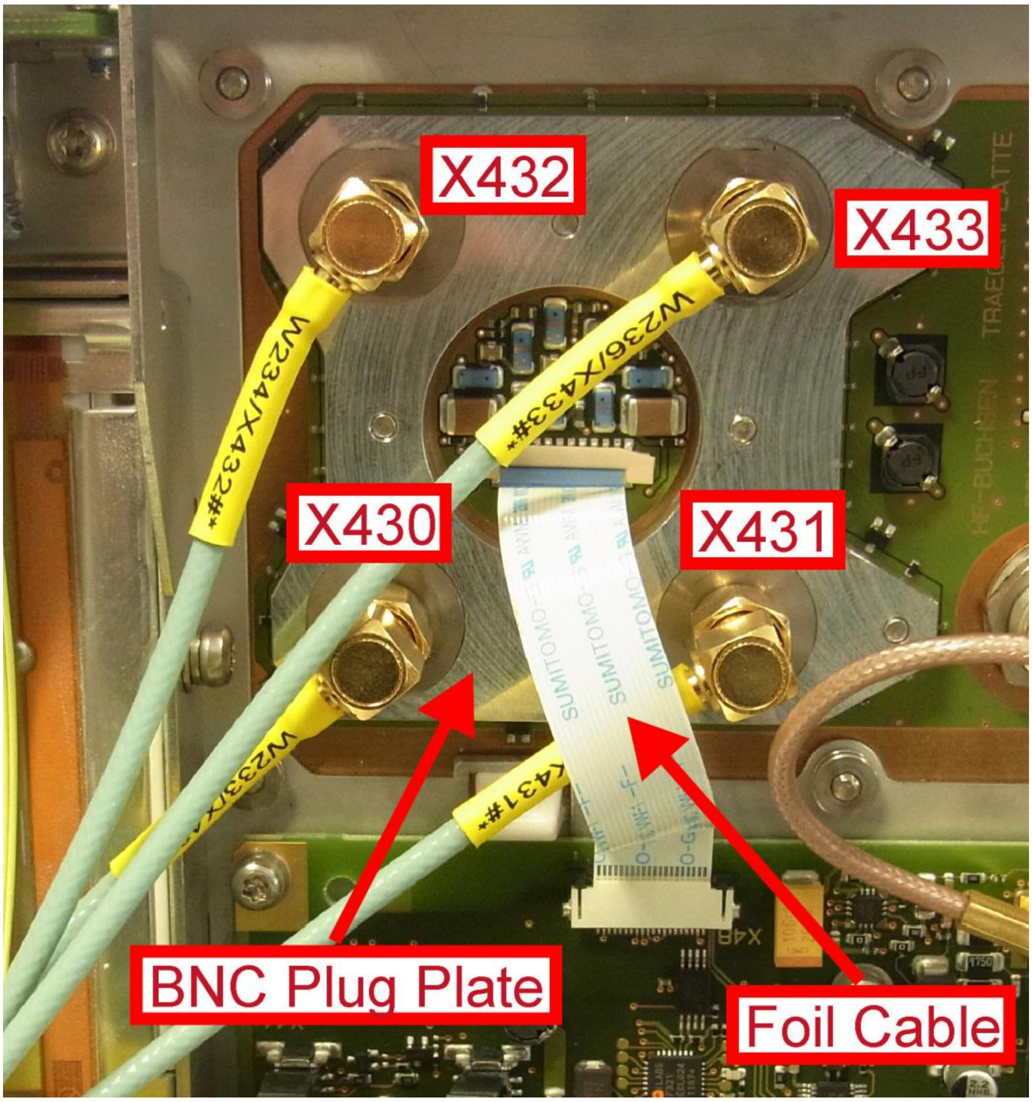
    Note: Be sure to install the insulation sheet between air duct and detector extension board as well as the insulation washers underneath the screws.

7. Reinstall the boards to the instrument.
8. Reinstall the elevelen screws formerly removed.
9. Perform the Basic Instrument Checks according to chapter Basic Instrument Checks.
10. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.2.3.17 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.

Replacing the BNC plug plate



1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).
4. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
5. Unplug the four SMA cables from the BNC plug plate.
6. Remove the label R&S FSW connector around the input connector.
7. Unplug the B71 foil cable at the front panel.
8. Unscrew the six screws fixing the BNC plug plate.
9. Replace the BNC plug plate by a new one.
10. Fasten the six screws previously removed.

11. Replace the label R&S FSW connector around the input connector.
12. Reconnect the foil cable.

    Note: The plug is contacting the cable on the top side!
13. Reconnect the four 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 3.2.2.5).
11. Mount the right side cover (refer to 3.2.2.5).
12. Mount the upper and lower cover (refer to 3.2.2.5).
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 Basic Instrument Checks.
15. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

Replacing the Input Connector carrier board

1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).
4. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
5. Unplug the four SMA cables from the BNC plug plate
6. Remove the label R&S FSW connector around the input connector.
7. Uninstall the RF input connector (refer to chapter Replacing the RF Input Connector X1)
8. Unplug the foil cable at the front panel
9. Unplug the two RF cables.
10. Unscrew the 6 screws fastening the input connector carrier board.
11. 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.
12. Reinstall the connectors to the new input connector carrier board.
13. Reinstall the input connector carrier board to the front unit.
14. Reconnect the two RF cables.

    Tip: The connector to plug in is written on the yellow tube on the cable.
15. Reinstall the B71 foil cable.

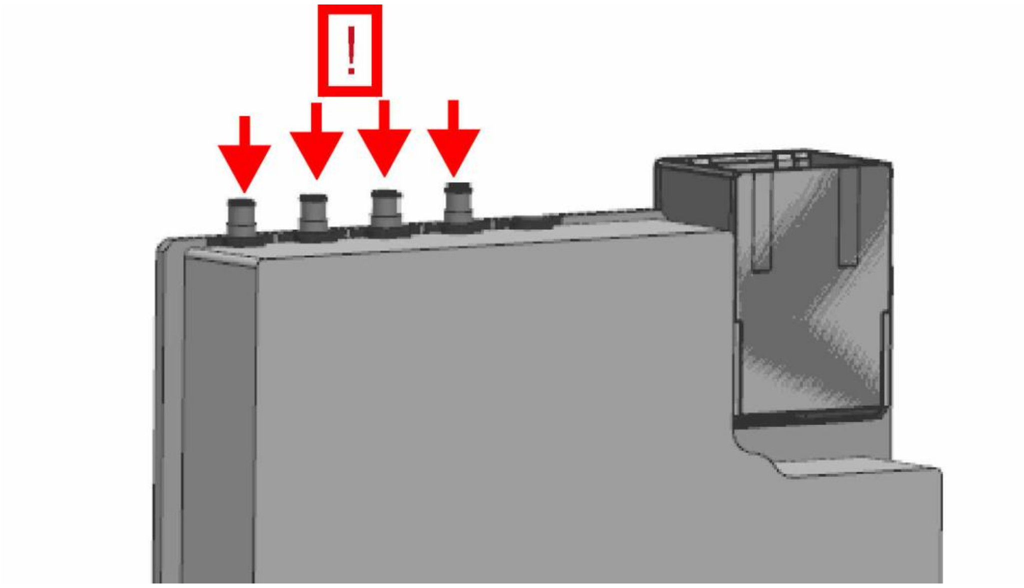
Note: The plug is contacting the cable on the top side!

16. Reinstall the front unit to the instrument. (refer to chapter 3.2.2.5)
17. Reinstall the label to the input connector carrier board (refer to chapter Replacing the RF Input Connector X1)
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 the Basic Instrument Checks according to chapter **Basic Instrument Checks**.

Replacing the Analog Baseboard 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 four 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 **Basic Instrument Checks**.

3.2.3.18 Replacing the External Generator Control A240 (option R&S FSW-B10)

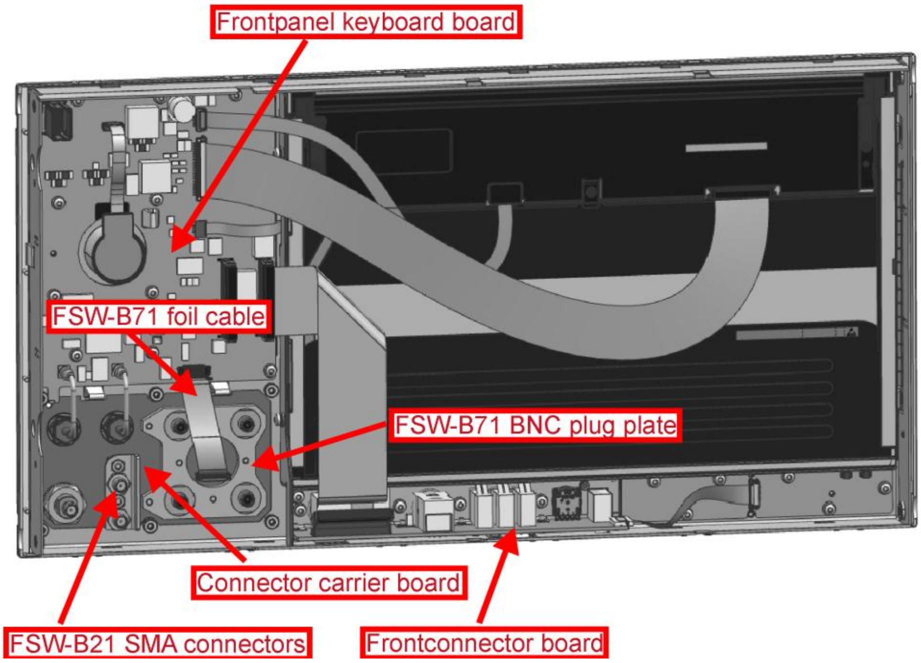
1. Switch off the instrument and disconnect the power plug.

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 **Basic Instrument Checks**.

3.2.3.19 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. In this case refer to chapter 3.2.3.9

Replacing the frontpanel connectors



1. Switch off the instrument and disconnect the power plug.
2. Unmount the upper and lower cover (refer to Unmounting the Upper and/or Lower Cover).
3. Unmount the right side cover (refer to **Unmounting the Side Cover**).
4. Unmount the frontpanel (refer to **Unmounting the Frontpanel**).
5. Replace the B21 SMA input connectors by new ones.
6. Mount the frontpanel to the instrument (refer to 3.2.2.5).

7. Mount the right side cover (refer to 3.2.2.5).
8. Mount the upper and lower cover (refer to 3.2.2.5).
9. Connect the instrument to the mains, switch on the instrument power switch and switch on the instrument with the ON/OFF key.
10. Perform the Basic Instrument Checks according to chapter **Basic Instrument Checks**.
11. Perform a frequency response correction as described in chapter **Performing a Frequency Response Correction**.

3.2.4 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 R&S FSW for diagnostic purposes:

- Permanent monitoring of levels and frequencies in the instrument
- Self test
- 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.

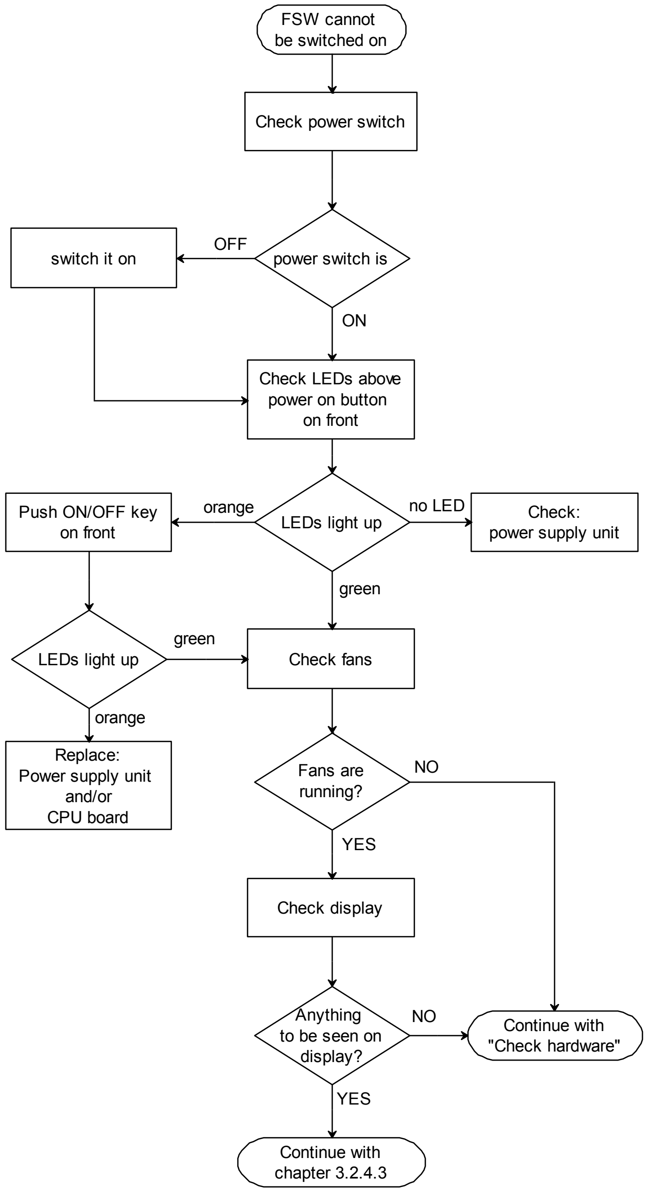
3.2.4.1 Measuring Equipment and Accessories

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

3.2.4.2 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.

Part 1: Basic Checks: Algorithm



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.

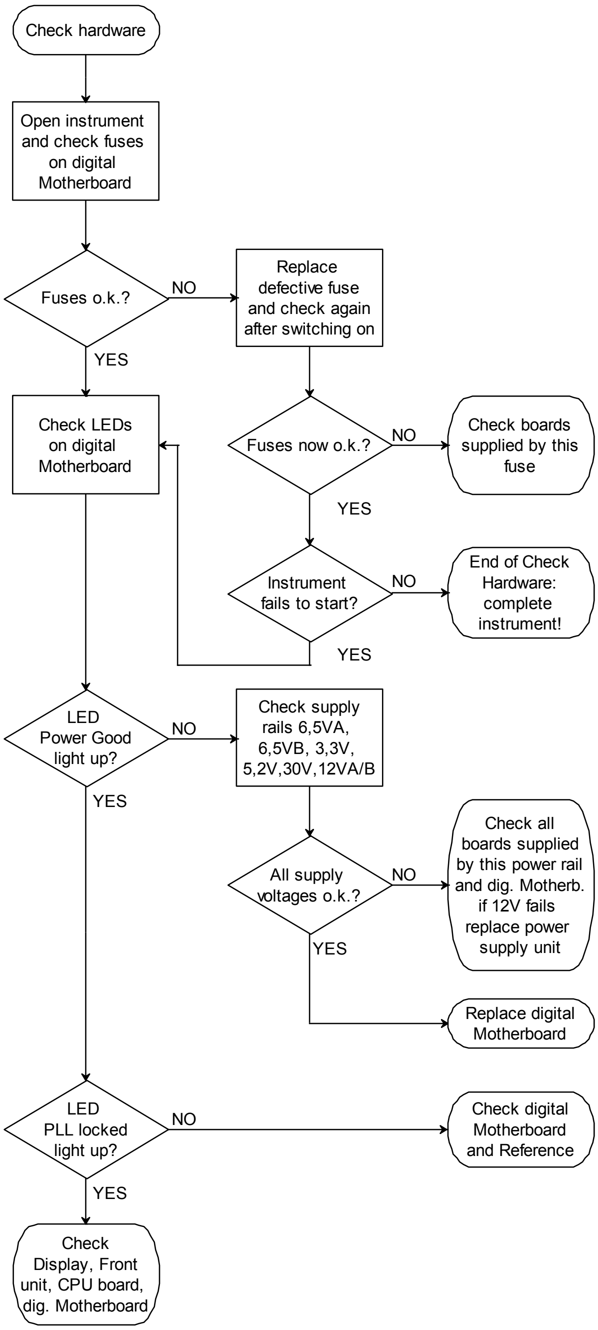
“Check LEDs above power on button on front”: The LEDs to check are located above the power on button on the front of the instrument. There is a green LED which lights up when the instrument is switched on, and an orange one which lights up when the instrument is in standby state.

“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 3.2.4.3.

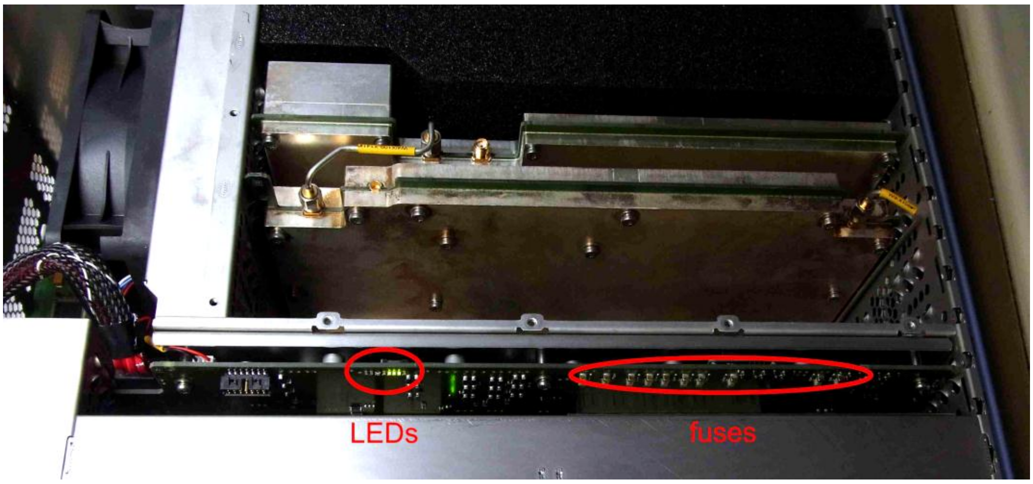
“Check Power Supply Unit”: Check the voltages supplied by the power supply (refer to Part 2: Hardware Checks: Detailed Description “Check supply rails”) First check the standby voltage. If this is present check the fuse F13 (refer to Part 2: Hardware Checks: Detailed Description “Check fuses on digital 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.

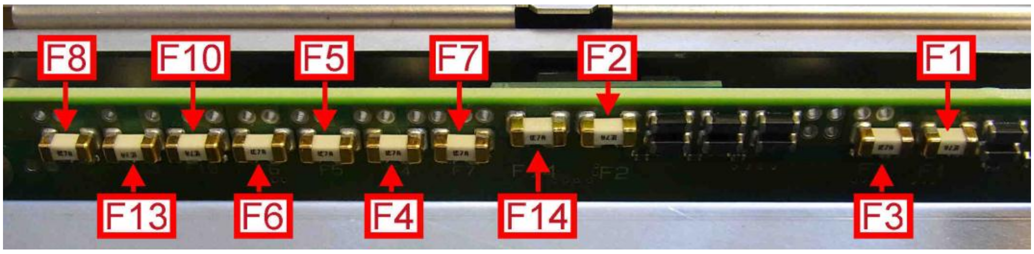
Part 2: Hardware Checks: Algorithm



Part 2: Hardware Checks: Detailed Description

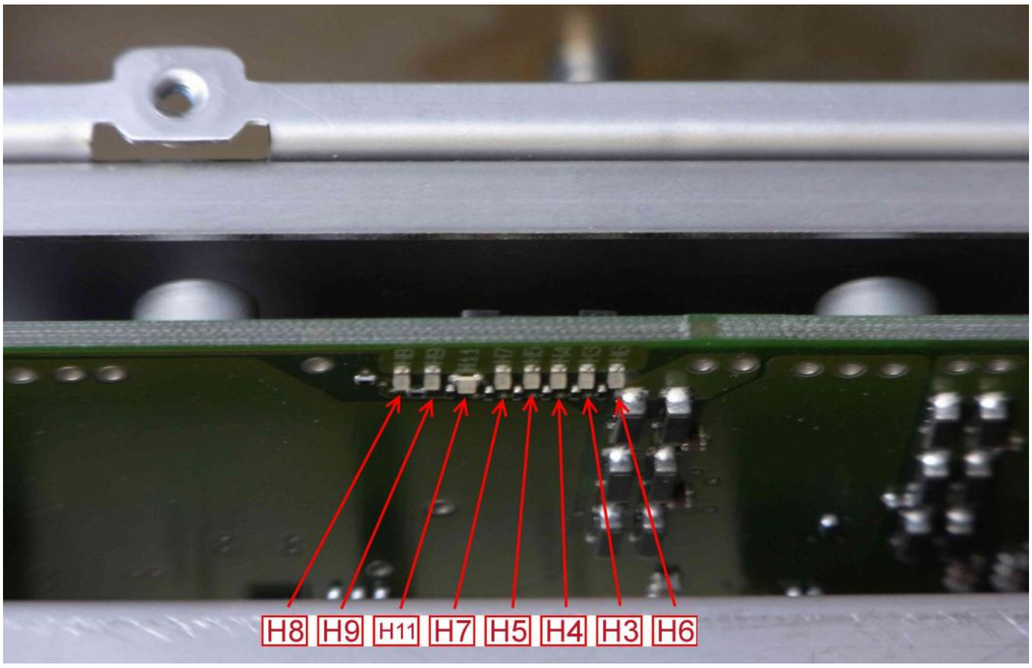
“Check fuses on digital motherboard”: The fuses are located on the upper end of the digital motherboard. You have to disassemble the upper cover (refer to Unmounting the Upper and/or Lower Cover) and the inner lid 1 (refer to Unmounting the Inner Lids 1 and 2) to reach the fuses. In case of a blown fuse a LED near the fuse will light up in red to indicate the fuse is defective. For replacing the defective fuse refer to Replacing a Defective Fuse.





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

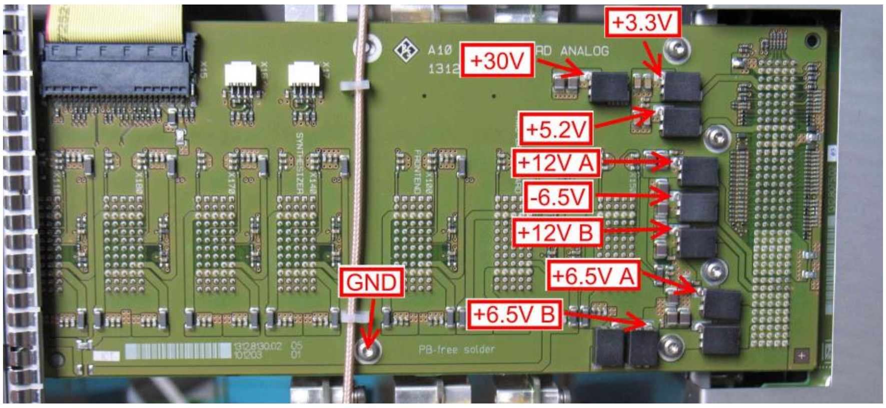
Designation	Function	Color
H3	For future use	
H4	PLL locked: The PLL of the FPGA is locked to the 128 MHz clock signal generated by the reference board	green
H5	Power good: All DC/DC converters on the digital motherboard are within their nominal output voltages	green
H6	Fan fail: one or both of the two 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 ±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 Unmounting the Upper and/or Lower Cover). 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 ± 0.6 V	F3
+3.3V	+3,4 V – 0.1 V + 0.2 V	F3
+5.2V	+5,2 V ± 0.2 V	F3
+12V A	+12 V ± 0.1 V	F7
-6.5V	-6,5 V ± 0.2 V	F3
+12V B	+12 V ± 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 ± 0,1 V	F13

* The standby voltage can be measured at fuse F13 on the top of the instrument. 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 the measured 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.

3.2.4.3 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.

Normal Sequence for Starting the Instrument Firmware

Following switch-on, the R&S 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.

Hardware check

Subsequently, BIOS starts the hardware check and and outputs the result with beepcodes. Is there any beepcode on startup without an successful start of the operating system check the CPU board.Operating system start

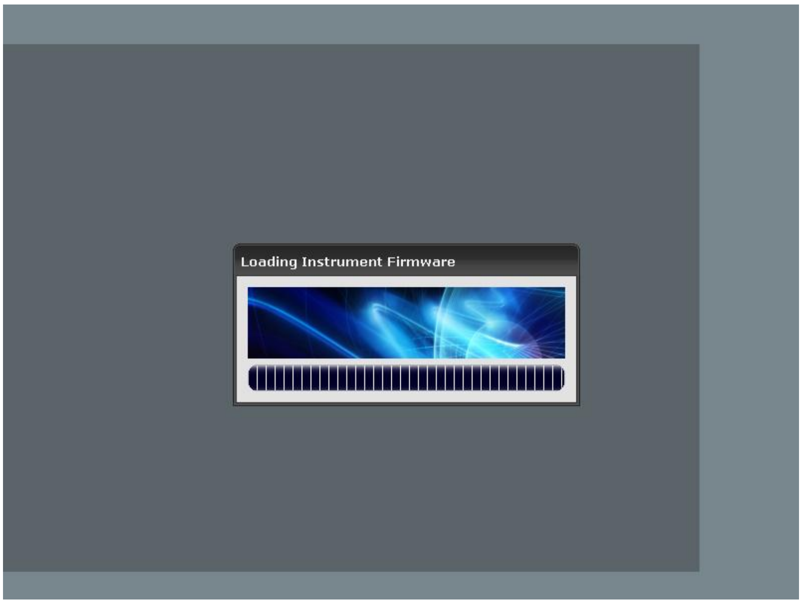
After this test, the BIOS is loaded and the operating system is started.

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.

Errors During Startup of the Instrument

Errors when Starting the BIOS:

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 ±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.

3.2.4.4 Troubleshooting Errors on the Analog Hardware

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.

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 R&S FSW8 connect 10 MHz, 500 MHz and 2 GHz to the R&S FSW and measure it with a span = 1 MHz and a resolution bandwidth = 10 kHz. On an R&S 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 2.1 Adjustment). When the frequency response correction is not successful perform the following steps:

12. Perform a selftest; if it fails follow the instructions in Evaluating Selftest Results.
13. 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 from RF Input to the Frontend Board).
14. 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 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 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:

  a. Perform a selftest; if it fails follow the instructions in Evaluating Selftest Results.
  b. 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.

     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.

     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.

  c. 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 by

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

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).

d. Otherwise check the local oscillator signals manually described in 3.2.4.6.

- **Error on frequencies > 8 GHz**

  The troubleshooting procedure described here is applicable for R&S FSW with a frequency range above 8 GHz only.

  a. The first step is to exclude an error on the YIG filter on the microwave converter frontend unit. By

     [**INPUT / OUTPUT** : YIG OFF]

     the YIG filter bypass path is activated. If input signals can be measured with this setting perform a YIG filter adjustment with the frequency response correction tool (see 2.1 Adjustment). If the R&S FSW is not functional after the YIG filter adjustment the YIG filter should be changed.

  b. Check the IF signal as described in Checking the IF Signal Path.

3.2.4.5 Troubleshooting Performance Test

For a successful performance test follow the instructions in chapter 1 Performance Test. The internal self-alignment is started by

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

and is mandatory for all tests.

Troubleshooting Checking the Reference Frequency Accuracy

When the reference frequency accuracy is out of range:

1. Repeat the reference frequency adjustment described in 2.2.2 Adjustment Sequence or by using the adjustment tool described in 2.1.
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.

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.

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 1.8 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 LO2and 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. When changing the frontend board for R&S FSW13/26 or the triplexer for R&S FSW43/50 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 1.8 Checking the Level uncertainty and the Frequency Response.
2. Change the input attenuation of the R&S FSW to 10 dB by
   [AMPT : RF Atten Manual : 10 dB].
3. 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 x 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 is defective. For an error at 2 x f_{in} > 8 GHz the microwave converter frontend is defective.

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.

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 3.2.2.4 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.

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 1.8 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 LO-signals fed into the frontend board as described in Checking the LO1, Checking the LO2and 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 2.1 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.

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 2.1 Adjustment).

Frequency Response

When the frequency response is out of range also a frequency response correction with the R&S FSW service tool (see 2.1 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.

Troubleshooting Checking the Display Nonlinearity

When the check “display nonlinearity” is out of specification verify the step attenuator (see chapter 1.1 Test Equipment, item 9) used.

When the step attenuator is functional then change the detector board A200.

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 1.1 Test Equipment, item 9) used.

When these measures do not solve the problem, the RF attenuator needs to be changed.

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 1.11 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.

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 "3.2.4.1 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.

   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.

3. The return loss is too low for higher attenuations only:

   In this case a defect on the attenuator is expected.

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 MHz < f_{CENTER} < 8 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 $f = f_{CENTER} \pm 80$ MHz, f < 8 GHz and signal level P = –20 dBm should be visible at the IF WIDE output of the R&S FSW-B160 with an IF-frequency 250 ± 80 MHz and a level of -30 dBm to -10 dBm.

Note: For 300 MHz < f_{CENTER} < 8 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

4. Check the SMP bullet on the wideband ADC board (depicted in 3.2.3.15 Replacing the Bandwidth Extension (option R&S FSW-B160 and R&S FSW-B320)).
5. If the bullet is OK then 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.

3.2.4.6 Troubleshooting Tests

This chapter describes the tests required for troubleshooting the analog hardware of an R&S FSW.

Checking the LO1

Test equipment: Spectrum analyzer (chapter "3.2.4.1 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 ± 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 0. 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 ± 30 MHz is possible. The measured signal must be a CW signal without modulation.

Checking the LO2

Test equipment:

Spectrum analyzer (chapter "3.2.4.1 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.

R&S 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 ± 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 R&S 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.

Checking the LO3

Test equipment: Spectrum analyzer (chapter 3.2.4.1 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.

R&S 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 ± 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 R&S 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 R&S FSW and the test equipment are connected, the frequency should be exactly 1280 MHz.

The synthesizer board uses the LO3 signal as a reference.

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 or the input section on the frontend board.

When signals below 8 GHz cannot be measured perform the following test:

Test equipment:

Multimeter (chapter 3.2.4.1 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.

R&S 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 MHz, 500 MHz, 2 GHz, 4.5 GHz, 6 GHz}

The expected input resistances are

for f_{IN} = 10 MHz: 40 Ω < R_{IN} < 80 Ω

for f_{IN} > 100 MHz: 500 Ω < R_{IN} < 2000 Ω

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:

Measure the DC input resistance R_{IN} for

f_{IN} = {10 MHz }

The expected input resistances are

for f_{IN} = 10 MHz: 40 Ω < R_{IN} < 80 Ω

If the input resistance R_{IN} is out of range, the microwave converter frontend is expected to be defective.

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 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 "3.2.4.1 Measuring Equipment and Accessories", item 2):

- Center frequency: 64 MHz
- Frequency span: 128 MHz
- Reference level: 10 dBm
- Resolution bandwidth: auto

Signal Generator (chapter "3.2.4.1 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.

R&S 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 R&S 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 is expected to be defective.

Note:

This test may be repeated at any other frequency with the same R&S FSW settings. For frequencies > 2 GHz an insertion loss up to 5 dB is expected.

For frequencies > 8 GHz the R&S 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 R&S FSW is set to a frequency below 40 MHz then the direct path will be activated. With this setting on an R&S FSW with microwave converter, the input signal is fed via X112 into the frontend board.

Checking the IF Signal Path

Test equipment:	Spectrum analyzer (chapter "3.2.4.1 Measuring Equipment and Accessories", item 2):	
	- center frequency:	50 MHz
	- frequency span:	100 MHz
	- reference level:	10 dBm
	- resolution bandwidth	auto
	Signal generator (chapter "3.2.4.1 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.

R&S 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 R&S 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 R&S 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.

Checking the IF Signal Path for Input Frequencies > 8 GHz

Test equipment:

Spectrum analyzer (chapter "3.2.4.1 Measuring Equipment and Accessories", item 2):

- center frequency: 1330 MHz
- frequency span: 100 MHz
- reference level: 10 dBm
- resolution bandwidth auto

Signal generator (chapter "3.2.4.1 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.

R&S 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 R&S 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 Software Update / Installing Options

This chapter contains information on updating software, restoring the operating-system installation and installing options to the R&S FSW. Additional manuals obtained together with a software/firmware update or with subsequently acquired options can be filed here.

4.1 Installation of new R&S 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. You can also follow the link on the CD supplied with the instrument.

4.2 Installing Options

A list of all available hardware and software options is provided on our Internet site at www.rohde-schwarz.com. You can also follow the link on the CD supplied with the instrument.

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 3.1.2.1 and 3.1.2.4)
3. Plug in the option and fix it, if required, using the screws previously removed.
4. Complete the instrument as described in 3.1.2.5
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.

5 Documents

5.1 Documents for R&S FSW8/13/26/43/50

This chapter provides information on the ordering of spare parts and contains the spare part list and the documents for the complete R&S FSW8/13/26/43/50 unit.

5.1.1 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	1313.4021.00
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
25	MZ FAN SHEET	1311.0812.00
30	EV FAN COLLAR 119-60-10 (T0.7)	1304.9947.00
32	MZ FAN LOCKING R&S FSW	1313.4821.00
35	DZ CABLE-HOLDER	1130.0941.00
40	EL SPEAKER 2W/8 OHM IP65	6148.3244.00
50	EL SPEAKER HOLDER 50	1313.0110.00
60	LAUTSPRECHER KABEL	1313.0284.00
70	ED MOTHERBOARD DIGITAL VAR 08 13 26 43 50	1313.2070.02
650	DV RF CABLE W5	1312.9642.00
655	DV RF CABLE W6	1312.9659.00

ItemNo.	Designation	Stock No.
703	DV RF CABLE W19	1313.0290.00
705	DV RF CABLE W22	1313.0755.00
78	DZ CABLE HOLDER	6124.0368.00
80	ZN HOLDER MOTHERBOARD DIGITAL	1312.8975.00
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
3A FF	F6 Power supply rail for main fans	6100.7862.00
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
110	ED MOTHERBOARD ANALOG R&S FSW	1312.8130.02
125	DZ CABLE-HOLDER	1093.9045.00
135	NJ POWER SUPPLY UNIT PSU600	1174.9580.00
136	MZ BW2010 SHIELDING R&S FSW	1313.0590.00
140	NR IPC 10/6 WITH AUDIO	1206.0223.00
160	ZN MODULE BACKPLANE IPC10	1313.7720.00
180	FP SATA ADAPTOR	1308.0280.00
190	MB SPECIAL SCREW M3	1304.9199.00
194	EK EMC TEXTILE GASKET	3589.0309.00
200	DG SATA DATACABLE 265	1091.3440.00
210	DS SATA POWER CABLE 100 IPC10	1313.0103.00
220	ZM SOLID STATE DRIVE R&S FSW	1312.9320.02
250	CHIPCARD SERVICE KIT SLE66 V4.4 SIM FORMAT REMOTE ACTIVATION	1201.5610.03
300	ZE ATTENUATOR 6-STEP	1137.0599.03
320	ZE 6-STEP ATTENUATOR 75DB 43GHZ C	1170.0107.02

ItemNo.	Designation	Stock No.
321	ZE 6-STEP ATTENUATOR 75DB 43GHZ C	1170.0107.04
322	ZE 6-STEP ATTENUATOR 75DB 67GHZ C	1170.0107.03
340	DY ATTENUATOR CABLE	1312.9607.00
350	EE SYNTHESIZER 17G	1312.8100.02
355	FJ COAXIAL TERMINATION FEMALE	5354.1422.00
356	FJ COAXIAL TERMINATION FEMALE	5354.1422.00
357	TERMINATION 50 OHM	0249.7823.00
360	EE FRONTEND 8 GHZ	1312.8046.02
370	EE DETECTORBOARD	1312.8175.02
380	EE REFERENCE	1312.8075.02
	is replaced by 1312.8075.04	
380	EE REFERENCE	1312.8075.04
Drawing MWC Frontend 1312.8298.01		
400	ZE MWC FRONTEND UNIT 26.5GHZ	1312.8298.26
405	MZ INSULATING FOIL YIG HOLDER	1313.2912.00
1300	MW CONVERTER FRONTEND 26.5 GHZ	1312.8300.02
1310	MW CONVERTER FRONTEND 26.5 GHZ	1312.8300.03
1340	ZE YIF-FILTER 3-30GHZ	1301.1022.07
1360	ZN YIG HOLDER	1312.9759.00
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
Drawing MWC Frontend 1312.8323.01 Sheet 1 (43GHz)		
410	ZE MW CONVERTER UNIT 43GHZ	1312.8323.43
1600	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

ItemNo.	Designation	Stock No.
1710	MZ FIXING SHEET MWC 43 FRONTEND	1313.5757.00
1720	DW RF CABLE W17 (YIG 43GHZ)	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 1312.8323.01 Sheet 2 (50GHz)		
411	ZE MW CONVERTER UNIT 43GHZ	1312.8323.50
1611	ZE YIG-BANDPASS FILTER WITH CABLES	1321.5069.02
1612	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
None	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
425	AZ INSULATING	3587.8225.00
430	EE MWC BASE BOARD	1312.9294.02
430	EE MWC50 BASE BOARD	1313.4215.02
436	EE MWC50 BASE BOARD	1313.4215.03
450	DG IPASS CABLE 26 PIN	1313.1680.00
455	DZ CABEL TIE	1308.1028.00
498	EK EMC-SHIELDING SPRING PLUGGABLE BW2010	1174.9850.00
520	DY FRONT CABLE W40	1312.9588.00
530	AZ LIGHT PIPE	3586.5216.00
560	DV RF-CABLE W50	1312.9388.00
570	DW RF CABLE W1 (8GHZ)	1312.9394.00
580	RF CABLE W1 (13.6GHZ)	1312.9620.00
570	DW RF-CABLE W1 (8GHZ)	1312.9394.00
None	DW RF-CABLE W1 (43GHZ)	1312.9459.00
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
625	DW RF CABLE W2 (8GHZ)	1312.9536.00
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
645	DW RF CABLE W4	1312.9471.00
650	DW RF CABLE W5	1312.9642.00
655	DW RF CABLE W6	1312.9659.00
660	DV RF CABLE W7	1312.9507.00
665	DV RF CABLE W8	1312.9513.00
670	DW RF CABLE W9 (LO2)	1312.9520.00
671	DW RF CABLE W9 (LO2) 50GHZ	1313.5886.00
675	DW RF CABLE W10	1312.9665.00
676	DW 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
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
708	DY CABLE W34	1313.5286.00
709	DV RF CABLE W360	1313.6682.00
710	KB REAR PANEL R&S FSW PRINTED	1313.0510.00
713	MP COVER	1313.6624.00
714	MP COVER	1313.6624.00

ItemNo.	Designation	Stock No.
715	KB REAR PANEL COVER 1 PRINTED	1313.0410.00
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
740	MZ COVER ANALOG	1313.0355.00
770	OS INLAYLABEL KEYBOARD R&S FSW	1312.9788.00
780	OS INLAYLABEL JACKPANEL R&S FSW	1312.9594.00
775	OS INLAYLABEL JACKPANEL R&S FSW	1313.0232.00
900	KN BW2010 5U FRONT GRIP CPL.	1174.6516.00
	is replaced by 1174.3981.00 + 1096.4996.00	
910	KN BW2010 5U GRIP COVER	1174.6997.00
	not applicable	
Drawing MWC Frontend 1312.8323.01		
900	KN BW2010 5U FRONT GRIP	1174.3981.00
905	VS SCREW M4X21-ISR-PA	1096.4996.00
910	MM CAP	1174.5378.00
915	KN BW2010 FRAME 1/1	1174.1014.00
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
930	MZ BW2010 5U T450 SIDE PANEL	1176.3672.00
935	MM BW2010 3E HANDLE T450	1174.6322.00
940	MM BW2010 3E COVERHANDLE	1174.6397.00
945	ZN COVER TOP INCL CONDUCTIVE FOAM	1313.2964.00
950	ZN COVER BOTTOM INCL CONDUCTIVE FOAM	1313.2970.00
None	MZ BW2010 ADJUSTMENT SPRING	1174.0860.00
Drawing Welding Frame 1313.4021.00		
220	MZ BW2010 SHIELDING R&S FSW	1313.0590.00

ItemNo.	Designation	Stock No.
240	MZ BW2010 SHIELDING TOP L=151.2	1174.9421.00
1000	RF CABLE W131	1313.3019.00
1010	RF CABLE W132	1313.3025.00
1020	CERAMIC LOWPASS FILTER	3587.8331.00
1026	RF-CABLE W134	1313.5905.00
1027	RF CABLE W135	1313.5957.00
1030	GROUNDING CABLE FRONTEND 8GHZ	1313.3119.00
1090	GROUNDING CABLE MWC 26GHZ	1313.3102.00
1120	SUPPORT RAIL	1313.3790.00
1130	SCREW M2.5X5-ISR-PA	1096.4973.00
1140	GROUNDING CABLE	1313.3748.00
1150	TERMINATION 50 OHM	0249.7823.00
1160	PROTECTION CAP	1066.2095.00
1180	TERMINATION 50 OHM	0249.7823.00
None	LITHIUM BATTERY CR2032	0858.2049.00
None	SYSTEM DRIVE WITH SOFTWARE R&S FSW replaced by 1312.9336.03	1312.9336.02
None	HS SYSTEM DRIVE WITH SOFTWARE R&S FSW	1312.9336.03
Drawing Frontpanel 1312.8023.01		
1000	KB FRONTCOVER R&S FSW (PRINTED) #	1312.9613.00
	# order also	
	OS INLAYLABEL KEYBOARD R&S FSW	1312.9788.00
	VAR 08	1313.0649.00
	VAR 26	1312.9794.00
	VAR 43	1313.0661.00
	VAR 50	1313.5705.00
1020	SF RUBBER KEYPAD SET	1312.8523.00
1030	ED FRONTPANEL KEYBOARD R&S FSW	1312.8530.02
1050	ED FRONTCONNECTOR R&S FSW	1312.8275.02

ItemNo.	Designation	Stock No.
1100	ZM DISPLAY WITH TOUCHSCREEN 12.1 INCH	1313.1268.00
1150	EM ROTARY PULS-GENERATOR 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
Drawing R&S FSW-B8		
370	DETECTOR BOARD	1312.8175.08
Drawing FSW-B10 1313.7489.00		
	EE EXT GEN CONTROL	1313.1751.02
Drawing FSW-B21 1313.1116.00		
2600	ZE MWC FRONTEND UNIT 26.5GHZ	1312.8298.27
2605	ZE MW CONVERTER UNIT 43GHZ	1312.8323.43
Drawing FSW-B24 Preamp Unit 1313.0903.01		
2330	ZE RELAIS UNIT	1164.6113.26
2310	MW PREAMP 26.5GHZ	1312.9113.02
Drawing R&S FSW-B24 1313.0855.00 incl. R&S FSW-B25		
2330	RELAY UNIT	1164.6113.26
2310	MW PREAMP 26.5GHZ	1312.9113.02
	ELECTRICAL ATTENUATOR	1313.0203.02
	GM FSW-B24 RF PREAMPLIFIER 43GHZ	1313.0832.43
	GM FSW-B24 RF PREAMPLIFIER 50GHZ	1313.0832.50
Drawing R&S FSW-B71 Analog Base Band Inputs 1313.1651.01		
2710	EE BASE BAND ADC	1313.1722.02

ItemNo.	Designation	Stock No.
2720	ED CARRIER PLATE RF-JACKS 8GHZ	1313.3077.02
2721	OS INLAYLABEL JACKPANEL R&S FSW B71 8/13 GHZ	1313.5970.00
2730	ED CARRIER PLATE RF-JACKS 26GHZ	1313.3619.02
2731	OS INLAYLABEL JACKPANEL R&S FSW B71 26 GHZ	1313.5986.00
2740	FJ FLANGE PANEL 4X BNC-SMA	1313.6618.00
2820	ZE RELAIS UNIT	1313.6976.00
Drawing 160MHz Analysis Bandwidth 1312.1668.01		
None	DETECTOR EXTENSION	1312.8200.02
None	WIDE BAND ADC	1312.9220.02
Drawing 500MHz Analysis Bandwidth 1313.4296.01		
20	DETECTOR EXTENSION	1313.3577.03
30	WIDE BAND ADC	1313.6201.02
40	RF CABLE W221	1313.5934.02
50	COOLING PAD 48X48	1322.9597.00
60	COOLING PAD 30X30	1322.9468.00
70	SECONDARY FAN B500	1322.9474.00
80	INSULATION BUSH POM	1321.6220.00
90	RF CABLE W221	1322.9280.00

5.1.2 Available Power Cables

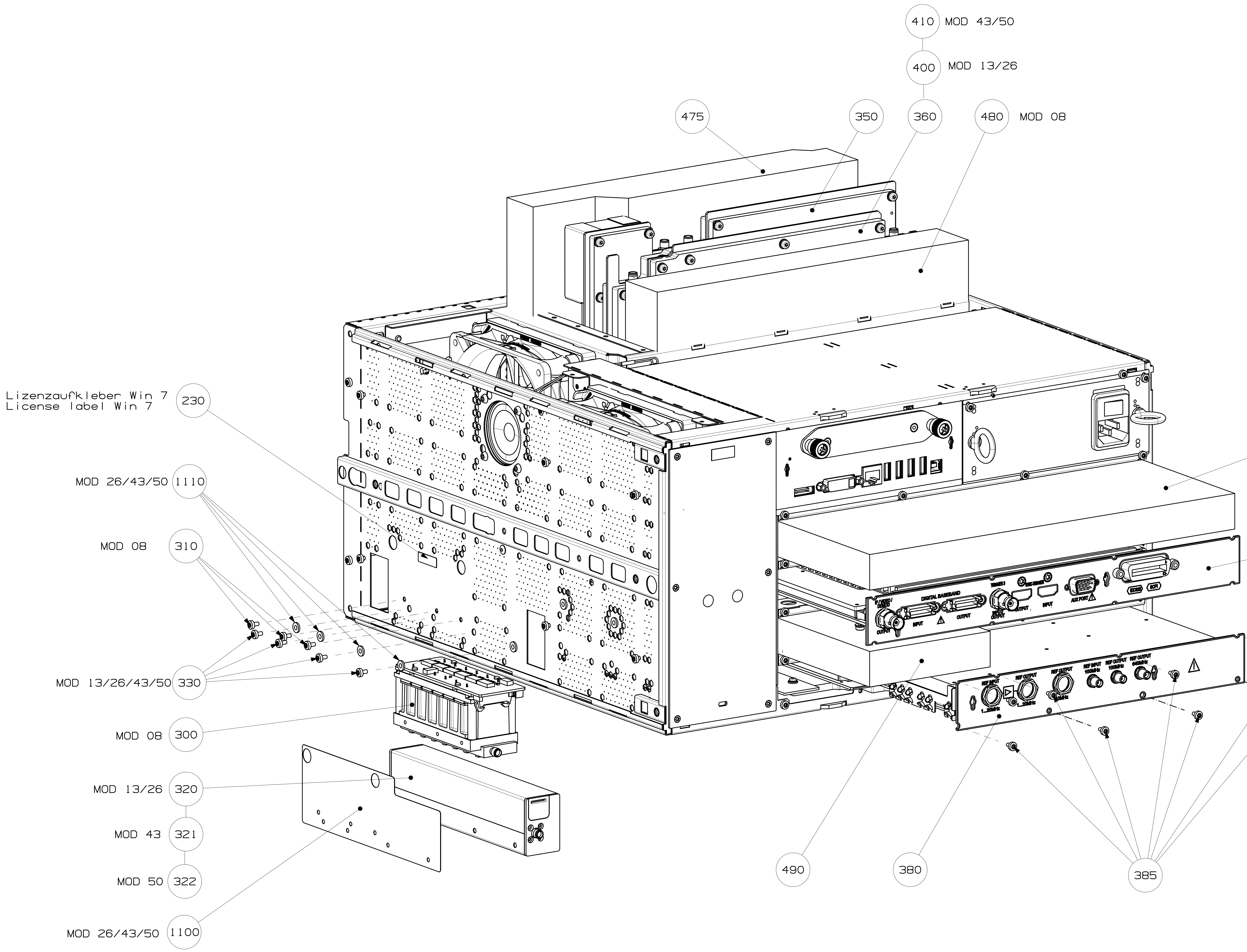
Stock No.	Earthed-contact connector	Preferably used in
DS 0006.7013.00	BS1363: 1967' 10 A, 250 V complying with IEC 83: 1975 standard B2	Great Britain
DS 0006.7020.00	Type 12, 10 A, 250 V complying with SEV-regulation 1011.1059, standard sheet S 24 507	Switzerland

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)

5.1.3 Mechanical Drawings

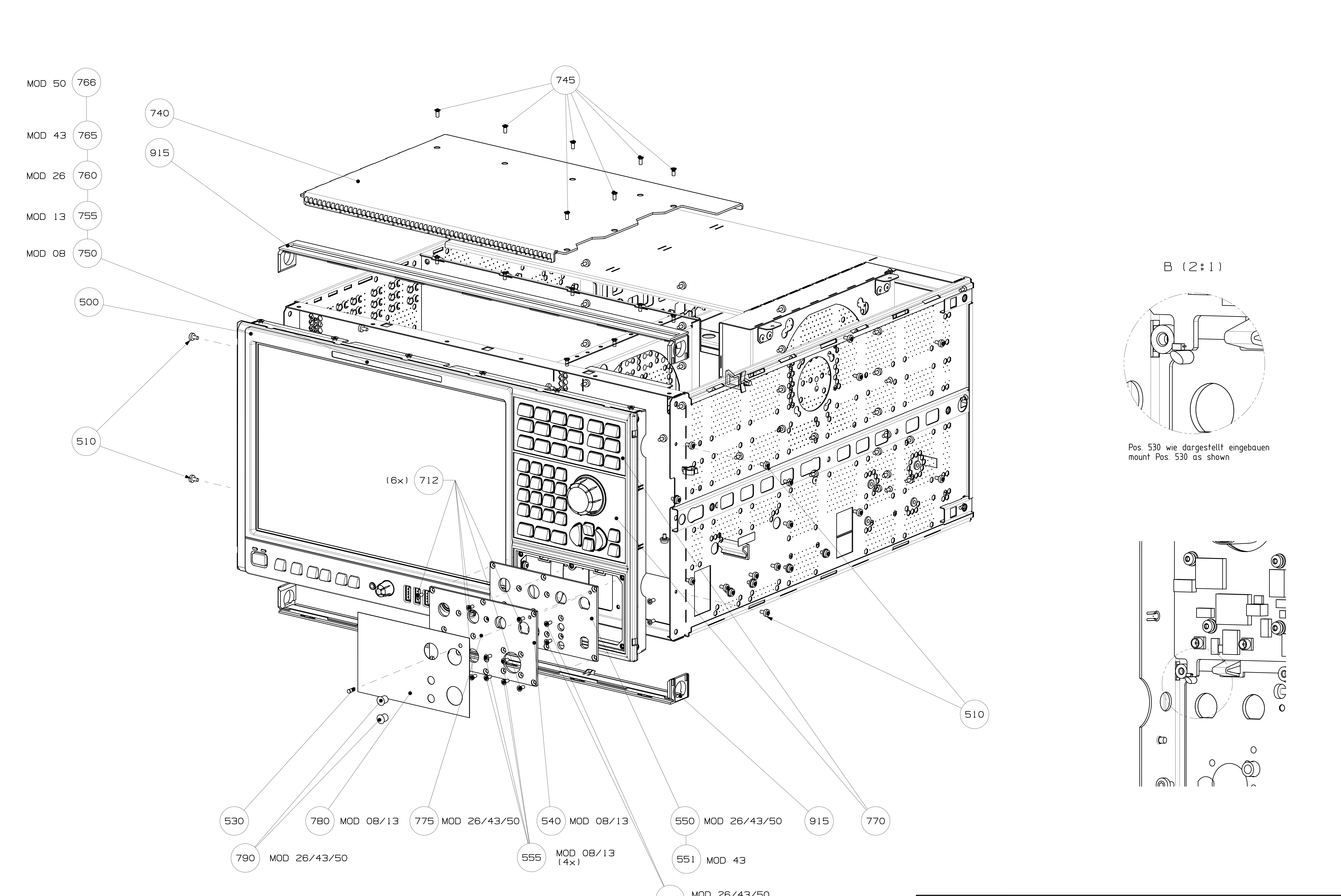
Maßstab / Scale	1:5		
ROHDE&SCHWARZ	FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER	de en	04.00 · 1
FSW	2012-05-08 · 1ESK · AN	1312.8000.01	D

Projektionsmethode
Projection Method



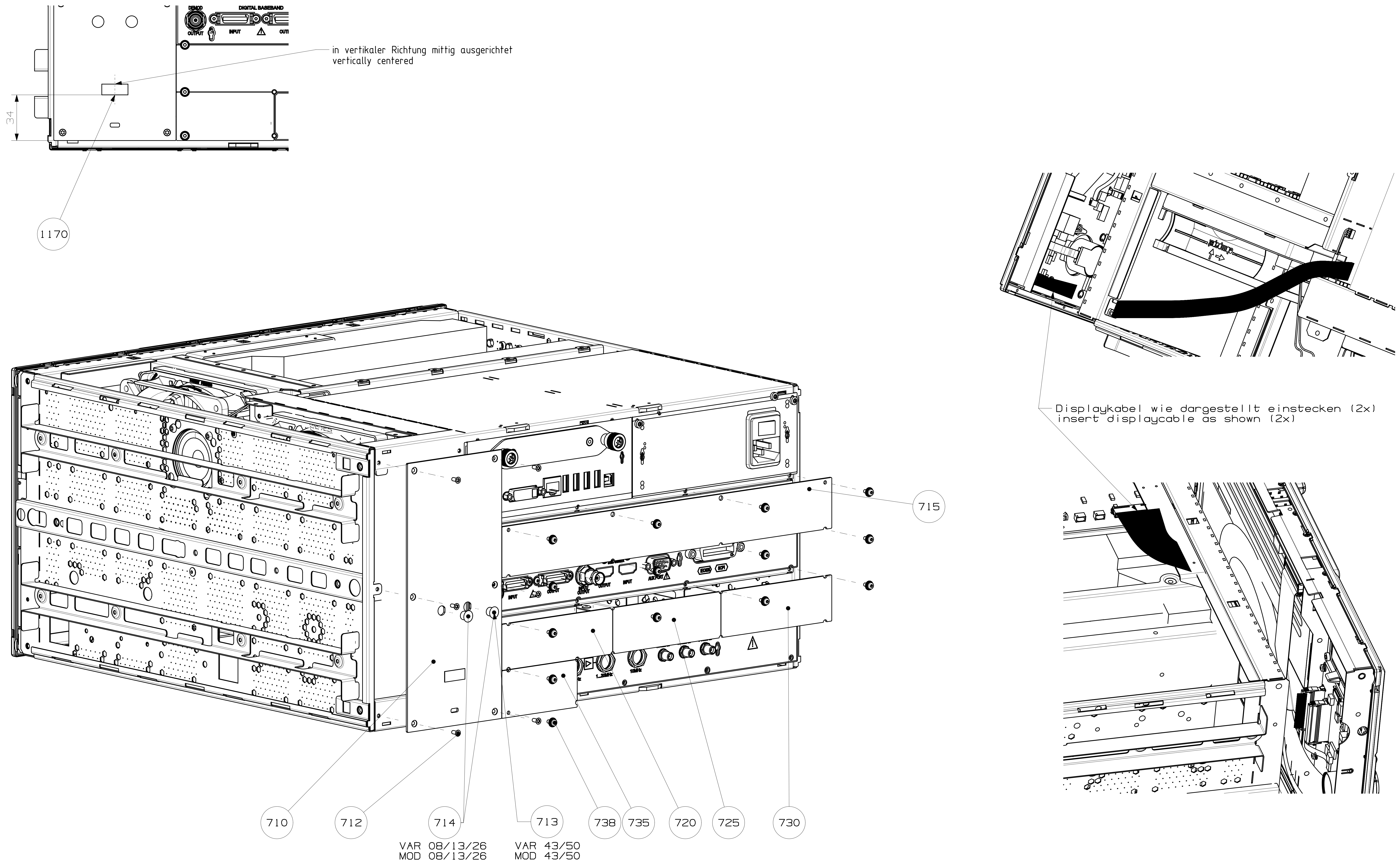
Projektionsmethode
Projection Method

Maßstab / Scale: 1:2	Toleranz / Tol: ISO2768-m	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER	Sprache / Lang: de en	Rev. / Ed.: 04.00
FSW	Datum / Date: 2012-09-20	Abteilung / Dept: 1ESK	Name: AN
	Blatt / Sh: 2	Zeichn.Nr. / Drawing No.: 1312.8000.01	D



Projektions-methode
Projection Method

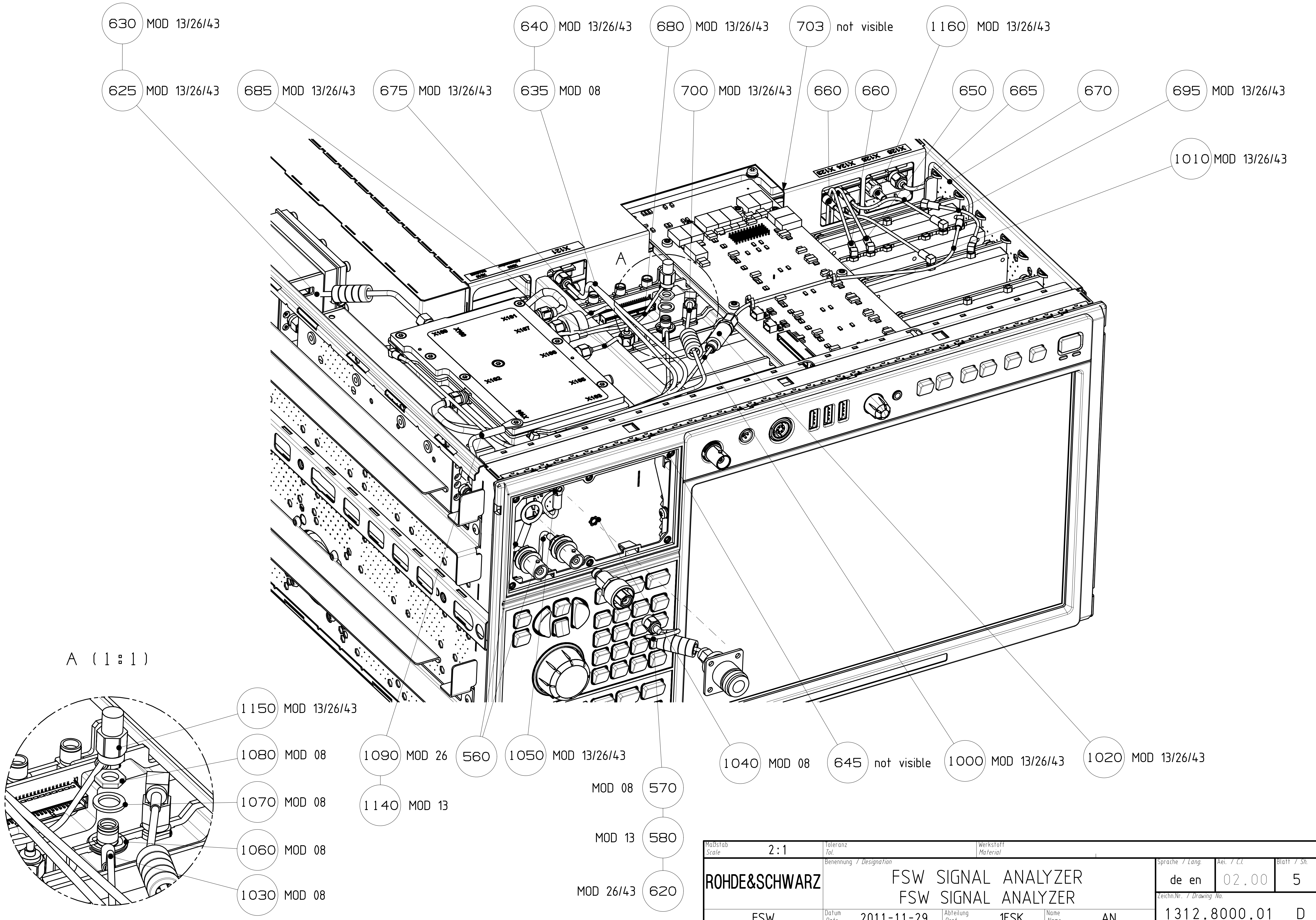
Maßstab / Scale	Toleranz / Tol ISO2768-m	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER		Sprache / Lang. de en	Rev. / E.I. 06.00	Blatt / Sh. 3
FSW	Datum / Date 2013-04-23	Abteilung / Dept. 1ESK	Name AN	Zeichnr. / Drawing No. 1312.8000.01	D



Projektions-methode
Projection Method

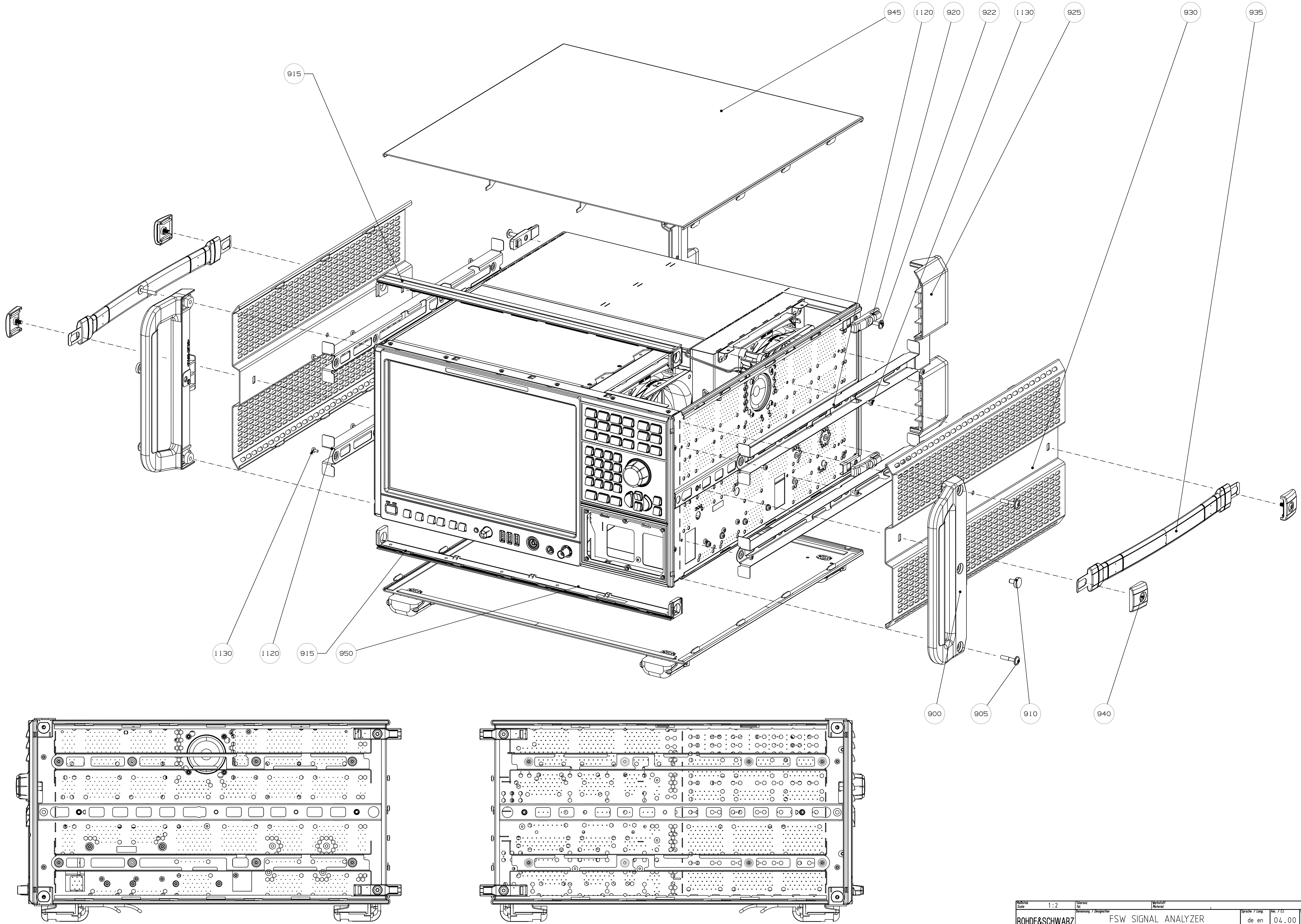
Maßstab / Scale: 1:2	Toleranz / Tol: ISO2768-m	Werkstoff / Material:	
ROHDE&SCHWARZ	Benennung / Designation: FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER	Sprache / Lang: de en	Rev. / C.I.: 04.00 · Blatt / Sh: 4
FSW	Datum / Date: 2011-08-09 · Abteilung / Dept: 1ESK · Name: AN/un	Zeichn.Nr. / Drawing No.: 1312.8000.01	D

NX



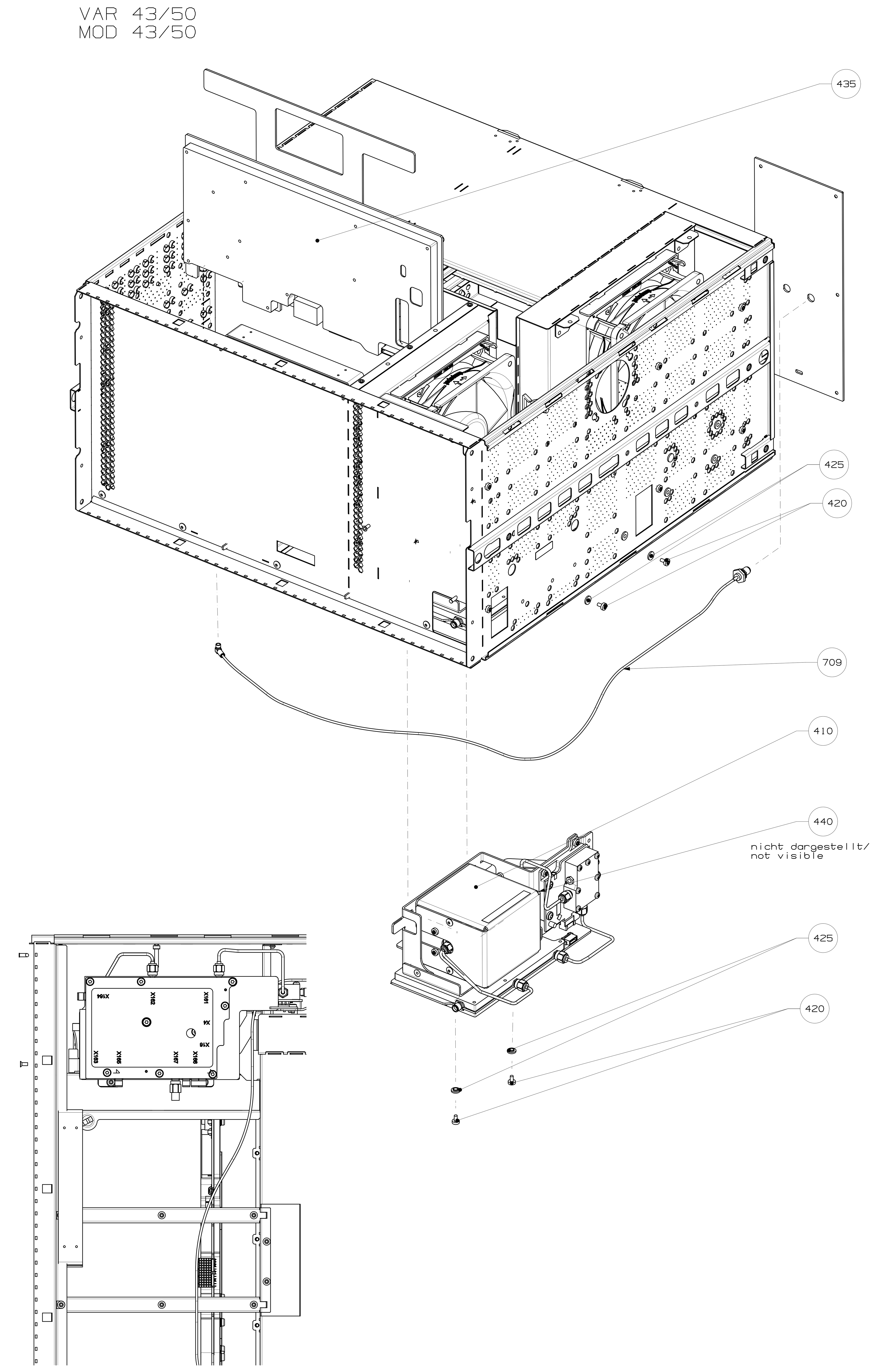
Projektionsmethode
Projection Method

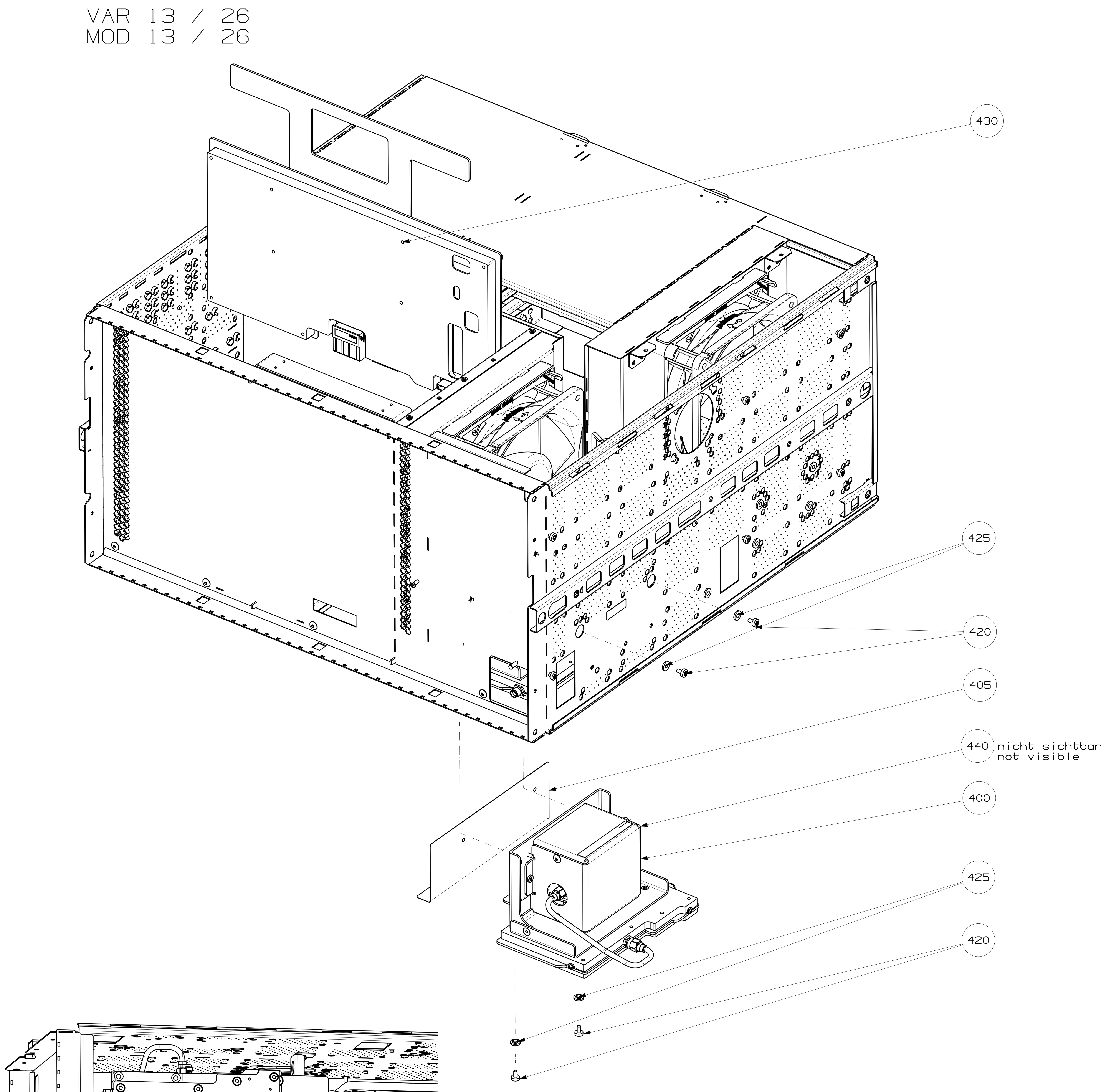
Maßstab / Scale: 2:1	Toleranz / Tol.	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER	Sprache / Lang.: de en	Aei. / C.I.: 02.00
		Blatt / Sh.: 5	Zeichn.Nr. / Drawing No.: 1312.8000.01 D
FSW	Datum / Date: 2011-11-29	Abteilung / Dept.: 1ESK	Name / Name: AN

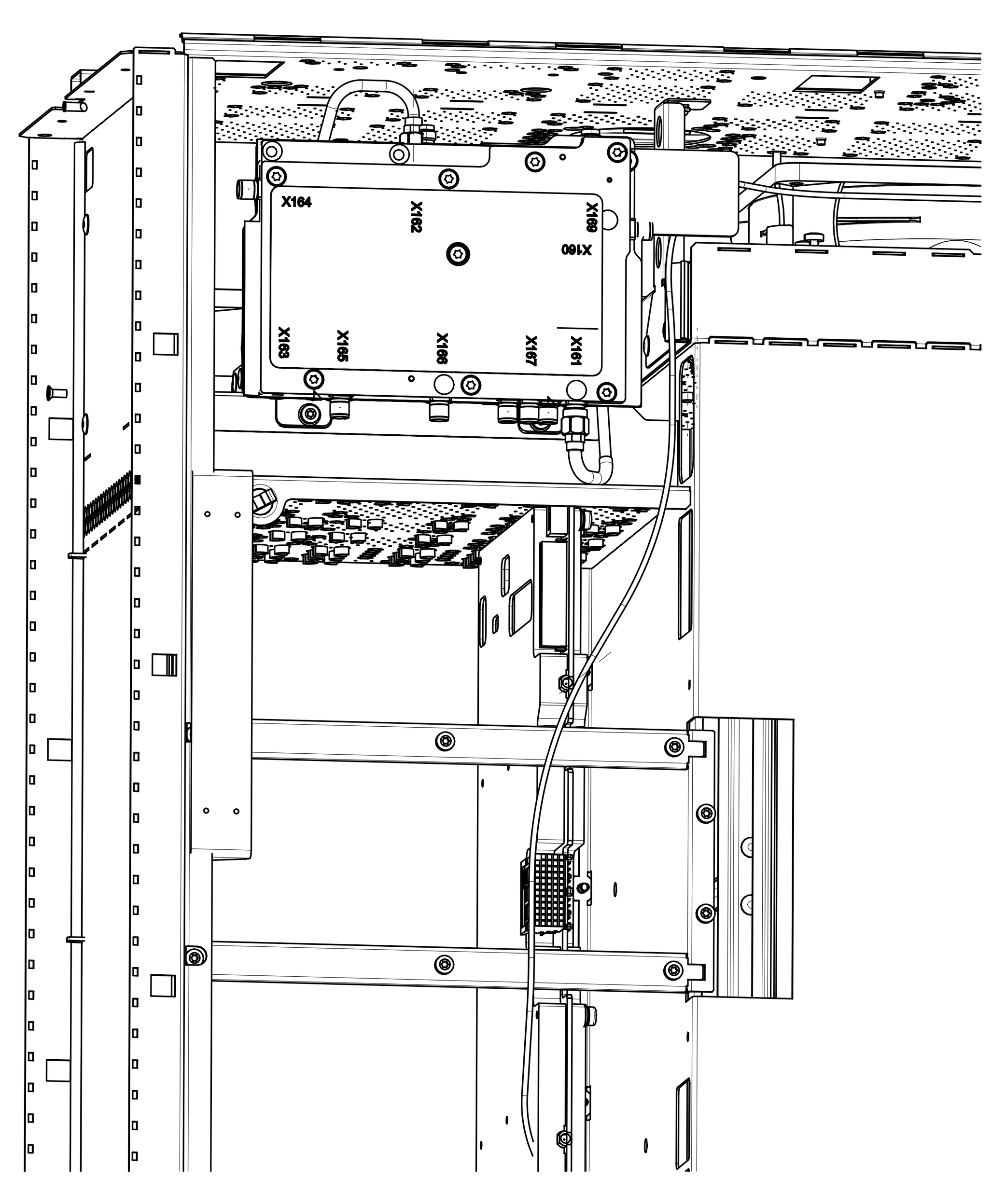


Projektions-methode
Projection Method

Maßstab / Scale	1:2	Toleranz / Tol.		Werkstoff / Material		
ROHDE&SCHWARZ	Benennung / Designation: FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER			Sprache / Lang.: de en	Aei. / C.I.: 04.00	Blatt / Sh.: 6
FSW	Datum / Date: 2013-04-03	Abteilung / Dept.: 1ESK	Name / Name: AN/BU	Zeichn.Nr. / Drawing No.: 1312.8000.01 D		





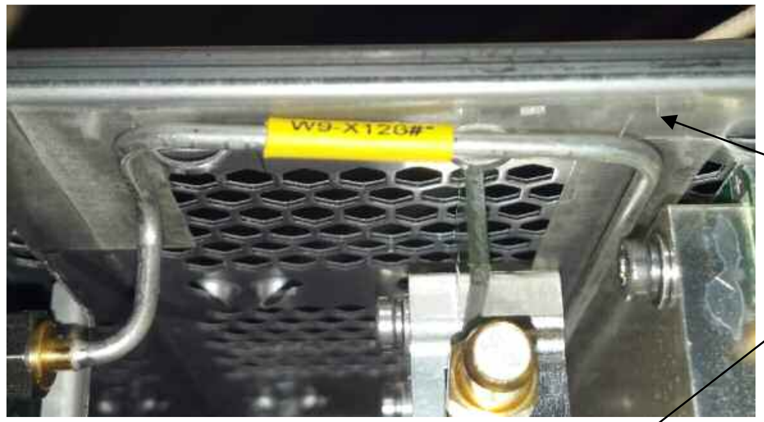


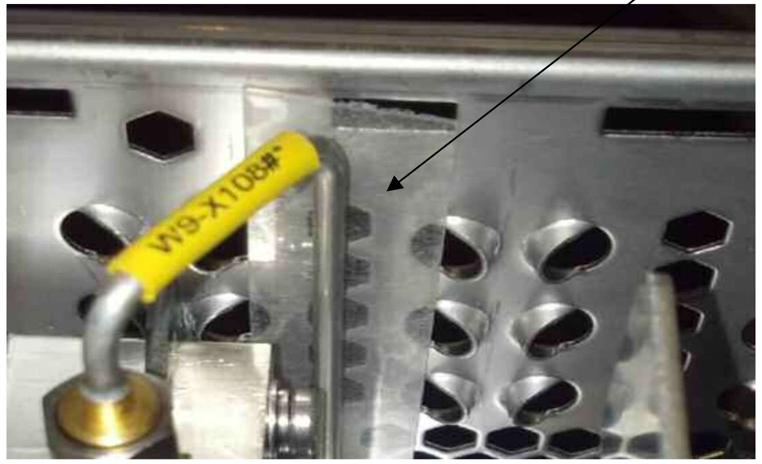
NX

Projektions-methode
Projection Method

Scale 1:2	ISO2768-m		
ROHDE&SCHWARZ	FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER	de en	03.00
FSW	2012-07-30 1ESK AN	1312.8000.01	D

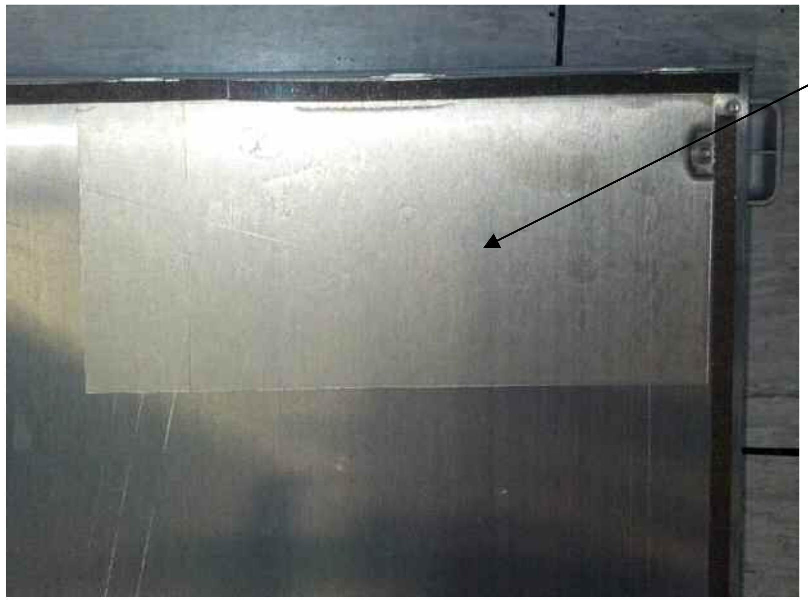
Pos. 192 in Modulschirmfeder PC
eingelegt und beide Enden
mit Silikon abgeklebt/
mounted in shielding gasket PC
and both ends glued with
silikone





Pos. 970 in Schweißrahmen geklebt/
glued in welding frame

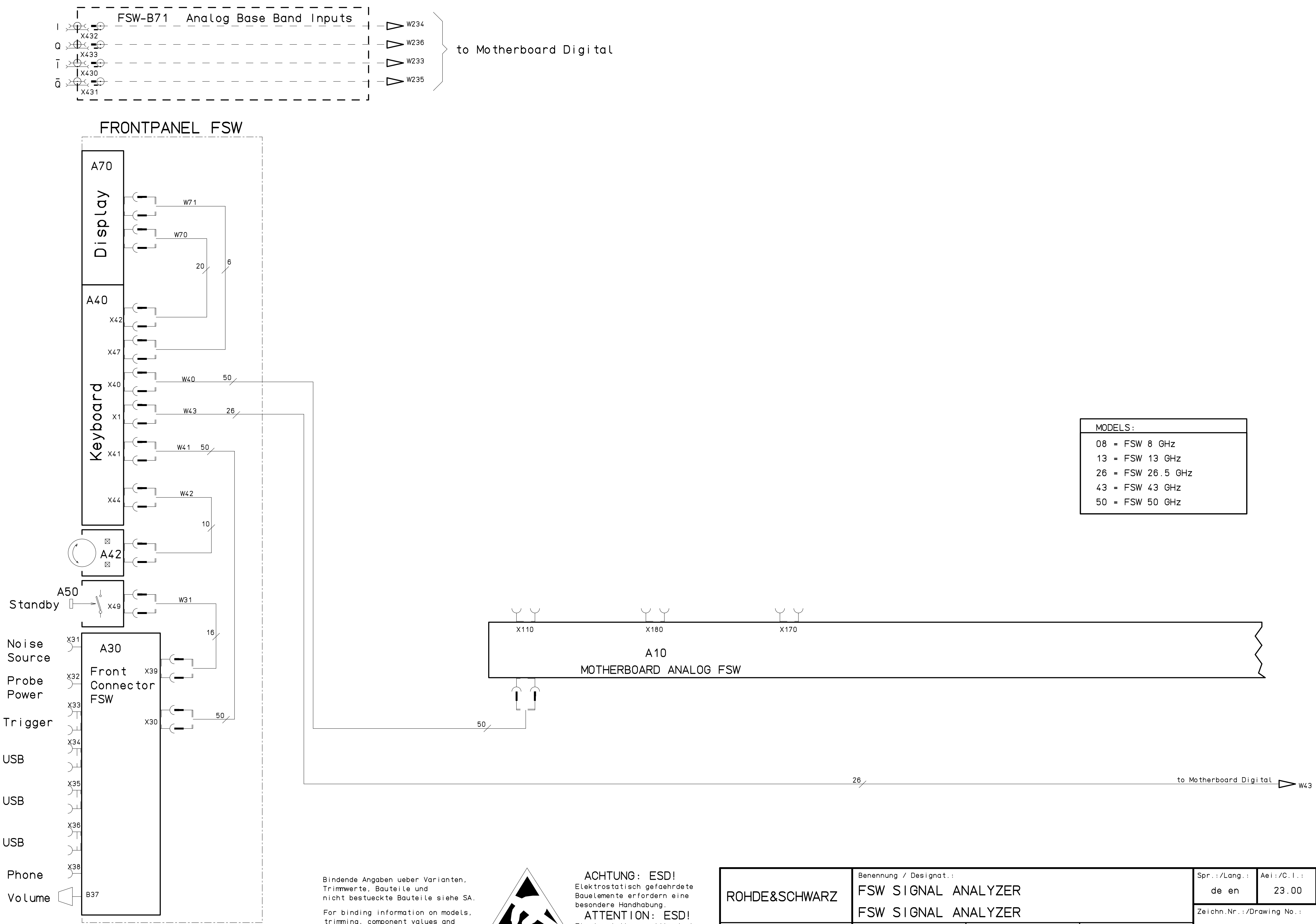
Pos. 194 auf Modulschirmfeder PC
geklebt /
glued on shielding gasket PC



Pos. 960 auf Abdeckung unten geklebt/
glued on cover bottem

nur für VAR43 / only for MOD43

ROHDE&SCHWARZ	Benennung/*Designation* FSW SIGNAL ANALYZER		Sprach./Lang De en	Ä.I. / C.I 01.00	Blatt/Sheet 8
FSW	Datum/*Date* 12.09.12	Abt. / *Dept.* 1ESK	Name / *Name* Wn	Dokument Nr. / Document No. 1312.8000.01	



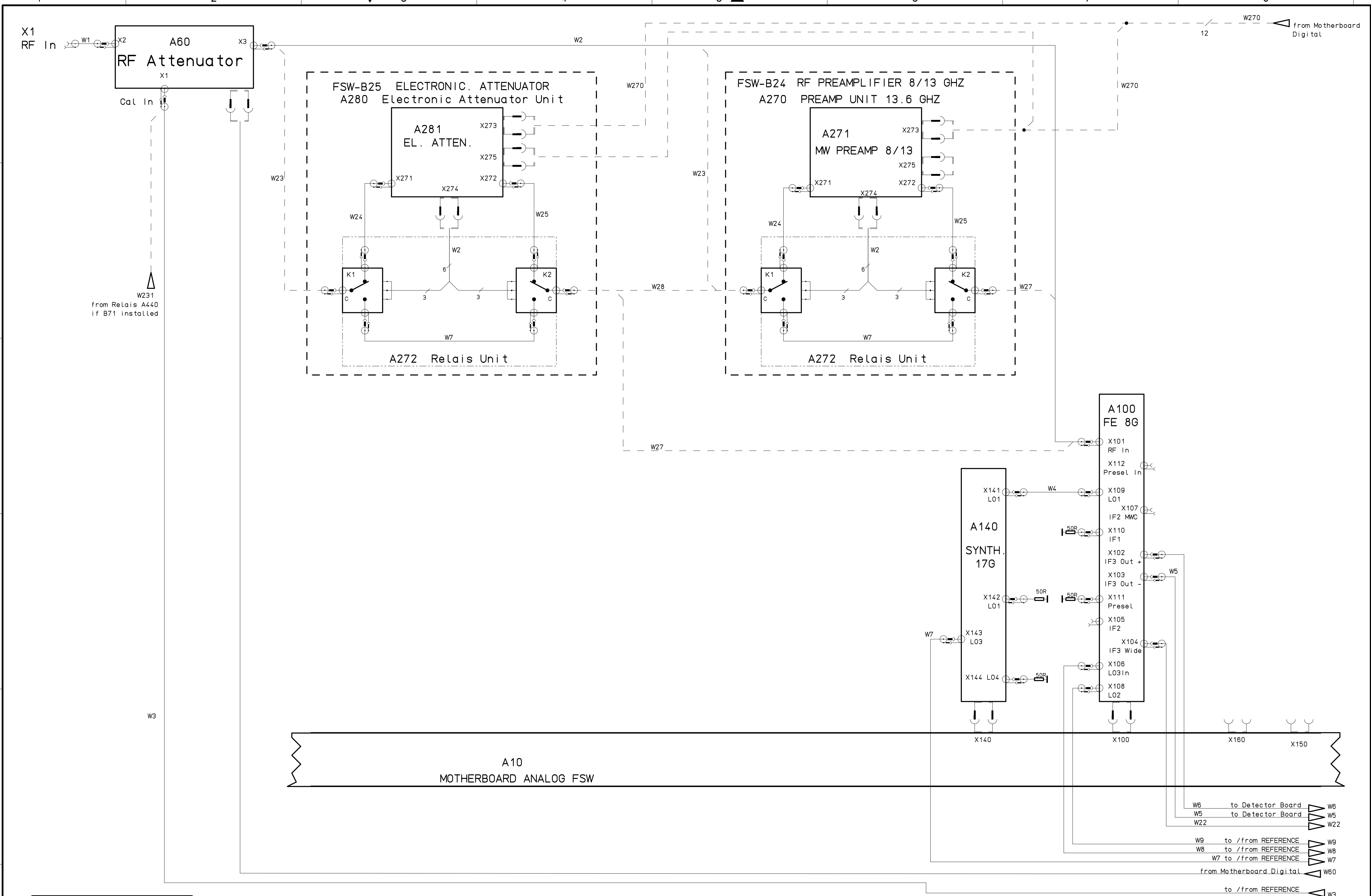
Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

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.: 23.00	Blatt:/Sh.: 1 +
FSW	Datum:/Date: 2013-04-22	Abteilung:/Dept.: 1ESK	Name:/Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S		



MODELS:
08 = FSW 8 GHz

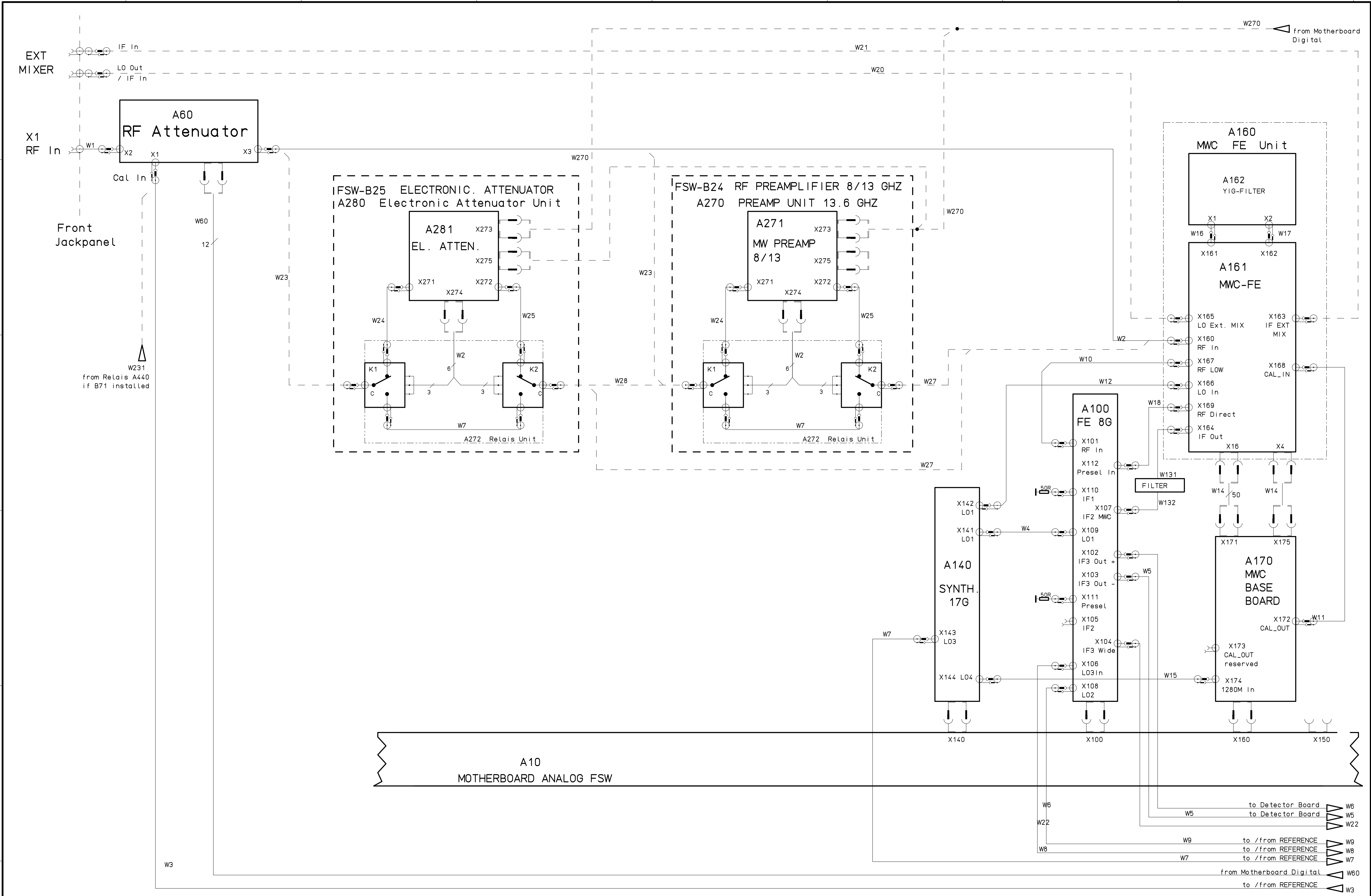
Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

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.: FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER	Spr.:/Lang.: de en	Aei:/C.I.: 23.00	Blatt:/Sh.: 2 +
FSW	Datum:/Date: 2013-04-22 · Abteilung:/Dept.: 1ESK · Name:/Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S		



MODELS:

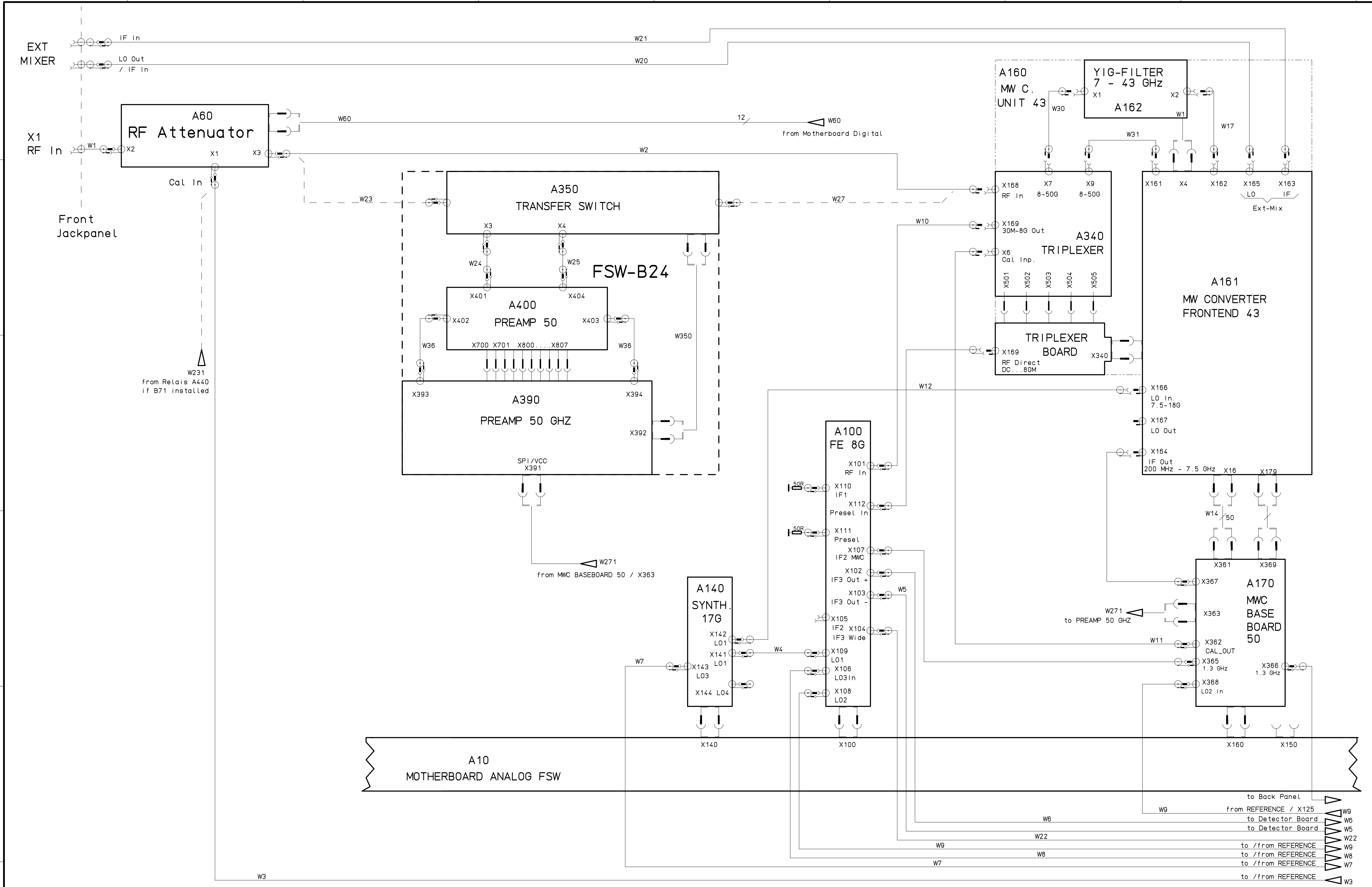
13 = FSW 13 GHz
26 = FSW 26.5 GHz

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	Benennung / Designat.: FSW SIGNAL ANALYZER / FSW SIGNAL ANALYZER	Spr.:/Lang.: de en	Aei:/C.I.: 23.00	Blatt:/Sh.: 3 +
FSW	Datum: / Date: 2013-04-22 · Abteilung: / Dept.: 1ESK · Name: / Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S		



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.

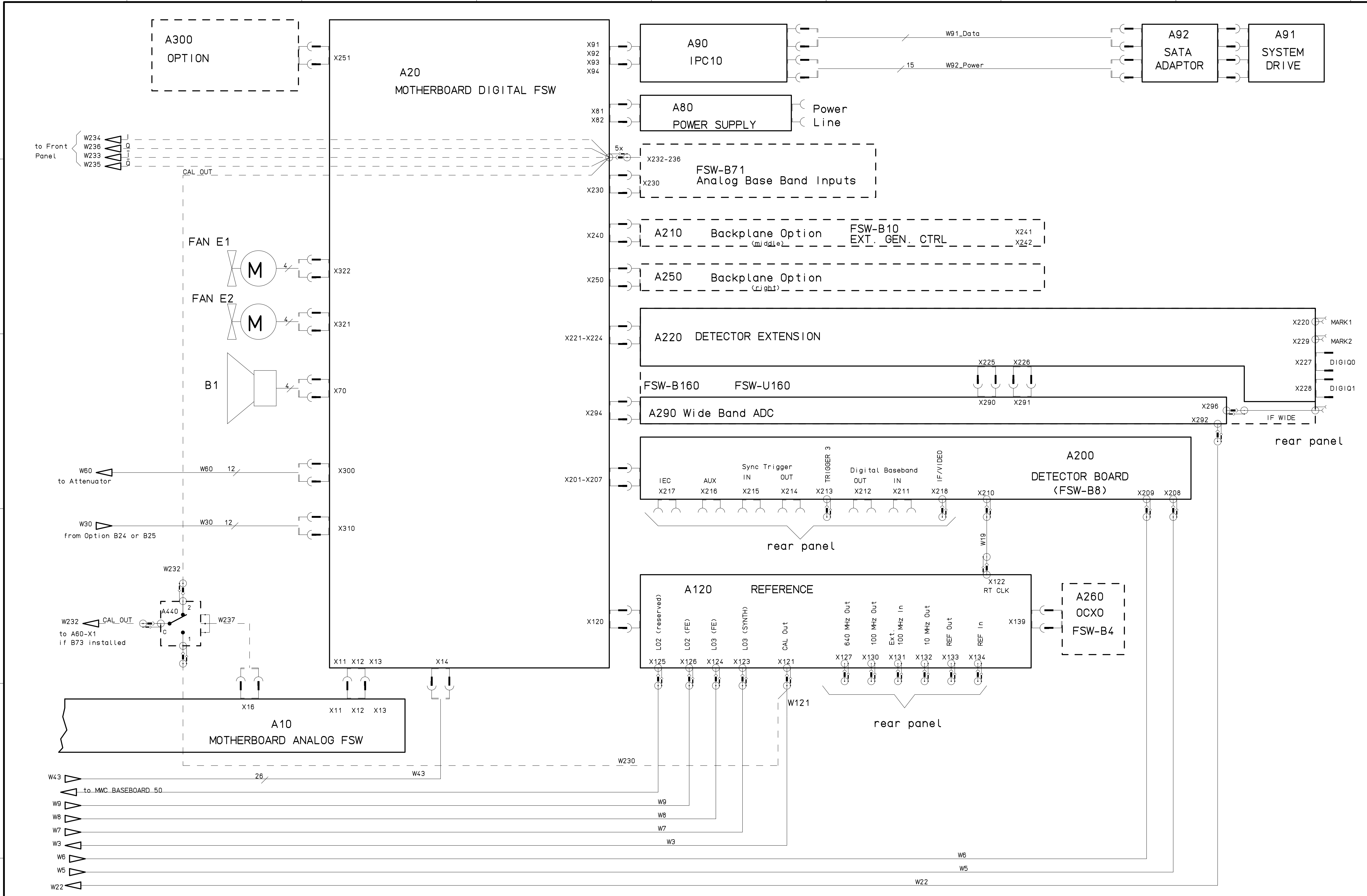
ROHDE&SCHWARZ	Benennung / Designat.: FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER	Spr.:/Lang.: de en	Aei:/C.I.: 23.00	Blatt:/Sh.: 4 +
FSW	Datum:/Date: 2013-04-22 · Abteilung:/Dept.: 1ESK · Name:/Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S		

This Sheet is intentionally left blank

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.: 23.00	Blatt:/Sh.: 5 +
FSW	Datum:/Date: 2013-04-22	Abteilung:/Dept.: 1ESK	Name:/Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S		



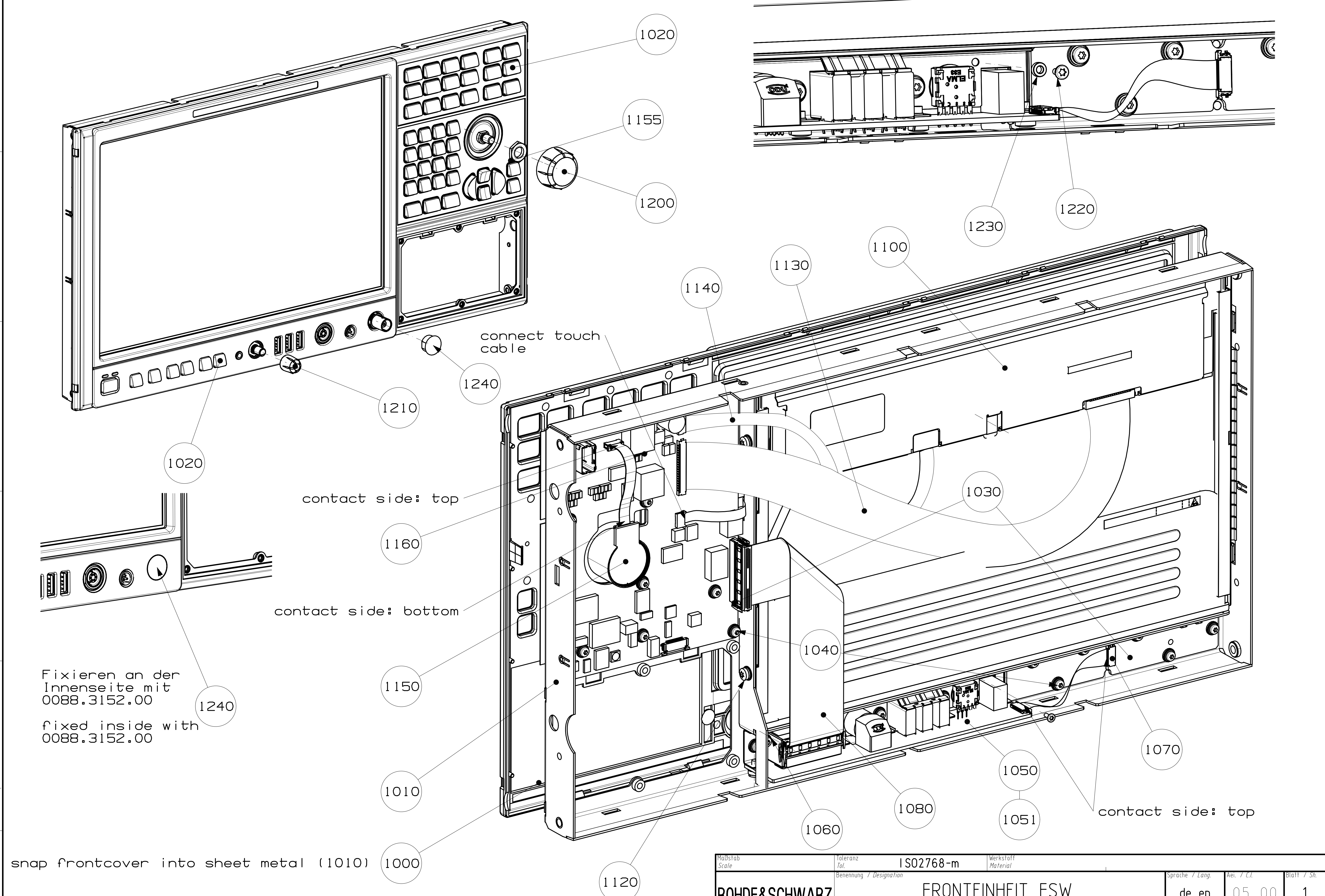
Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

For binding information on models, trimming, component values and not fitted components see SA.

ACHTUNG: ESD!
Elektrostatisch gefaehrdete Bauelemente erfordern eine besondere Handhabung.

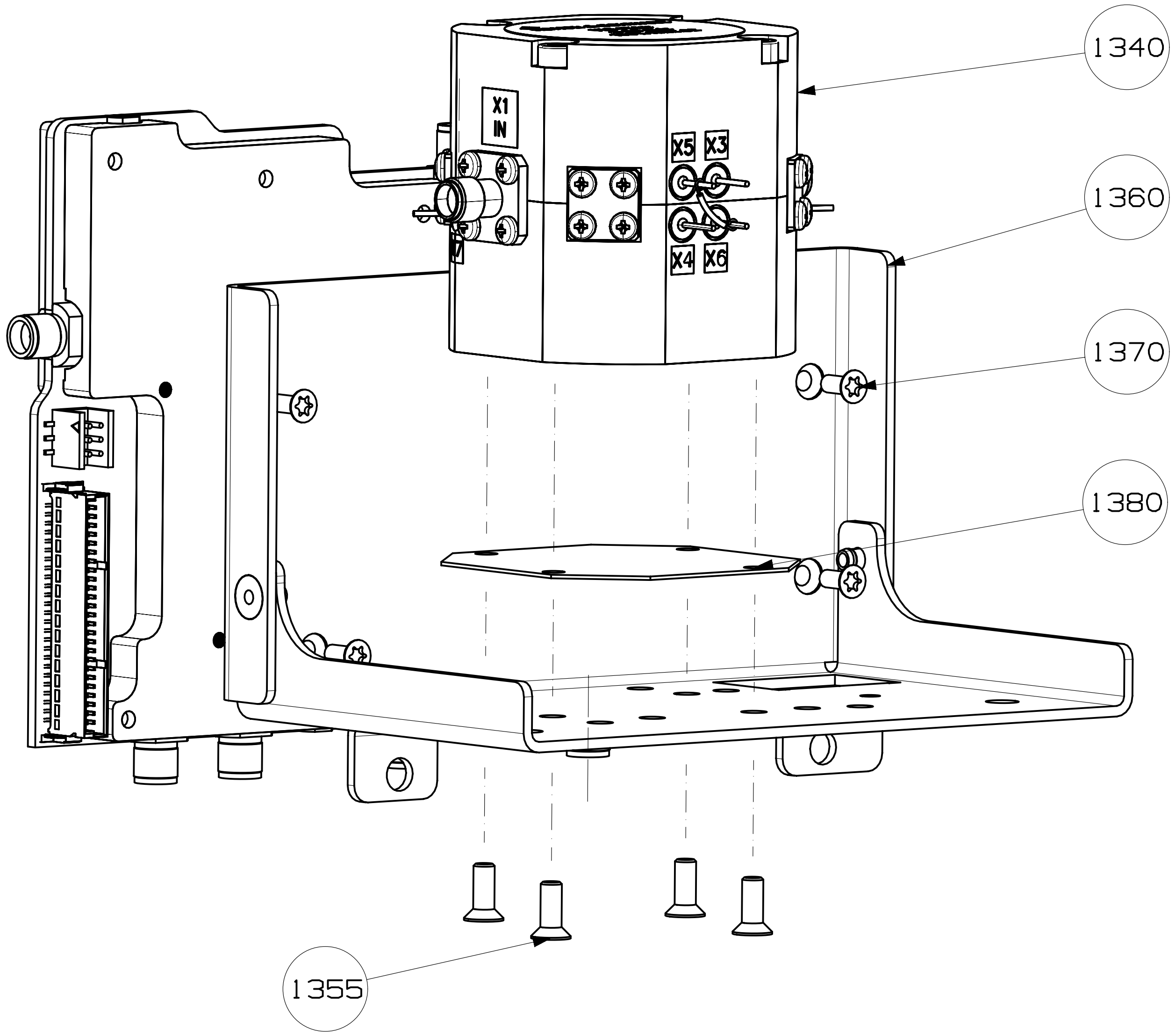
ATTENTION: ESD!
Electrostatic sensitiv devices require a special handling.

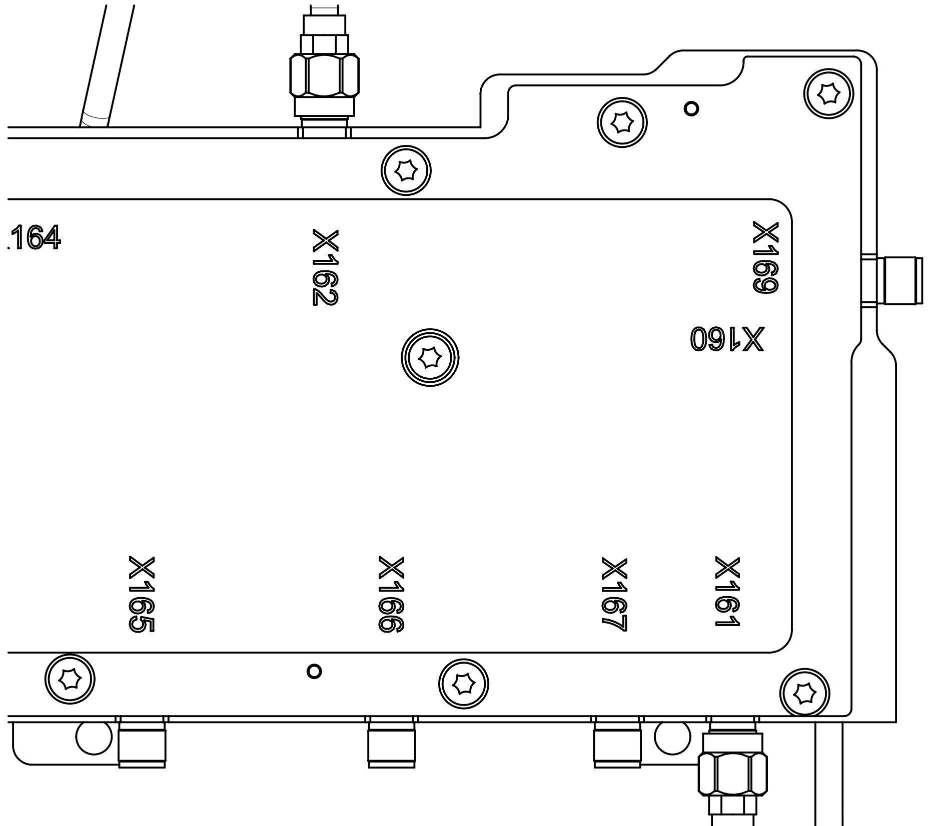
ROHDE&SCHWARZ	Benennung / Designat.: FSW SIGNAL ANALYZER / FSW SIGNAL ANALYZER	Spr.:/Lang.: de en	Aei:/C.I.: 23.00	Blatt:/Sh.: 6 -
FSW	Datum: Date: 2013-04-22 · Abteilung: Dept.: 1ESK · Name: Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S		

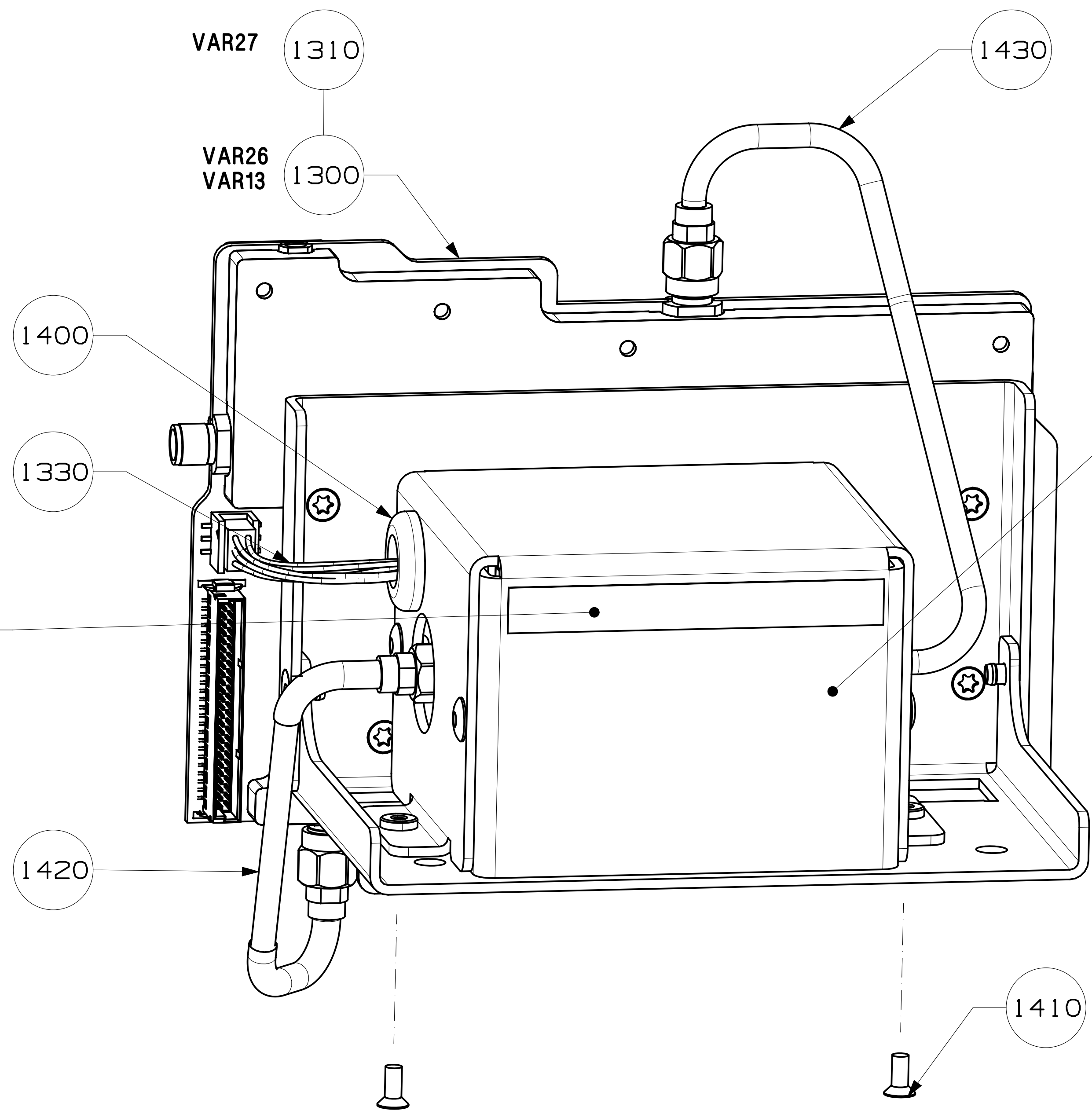


Projektionsmethode / Projection Method

Maßstab / Scale	Toleranz / Tol. ISO2768-m	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: FRONTEINHEIT FSW FRONTPANEL FSW	Sprache / Lang. de en	Aei. / C.I. 05.00 — Blatt / Sh. 1
FSW	Datum / Date 2012-06-28 — Abteilung / Dept. 1ESK — Name / Name AN	Zeichn.Nr. / Drawing No. 1312.8023.01	D







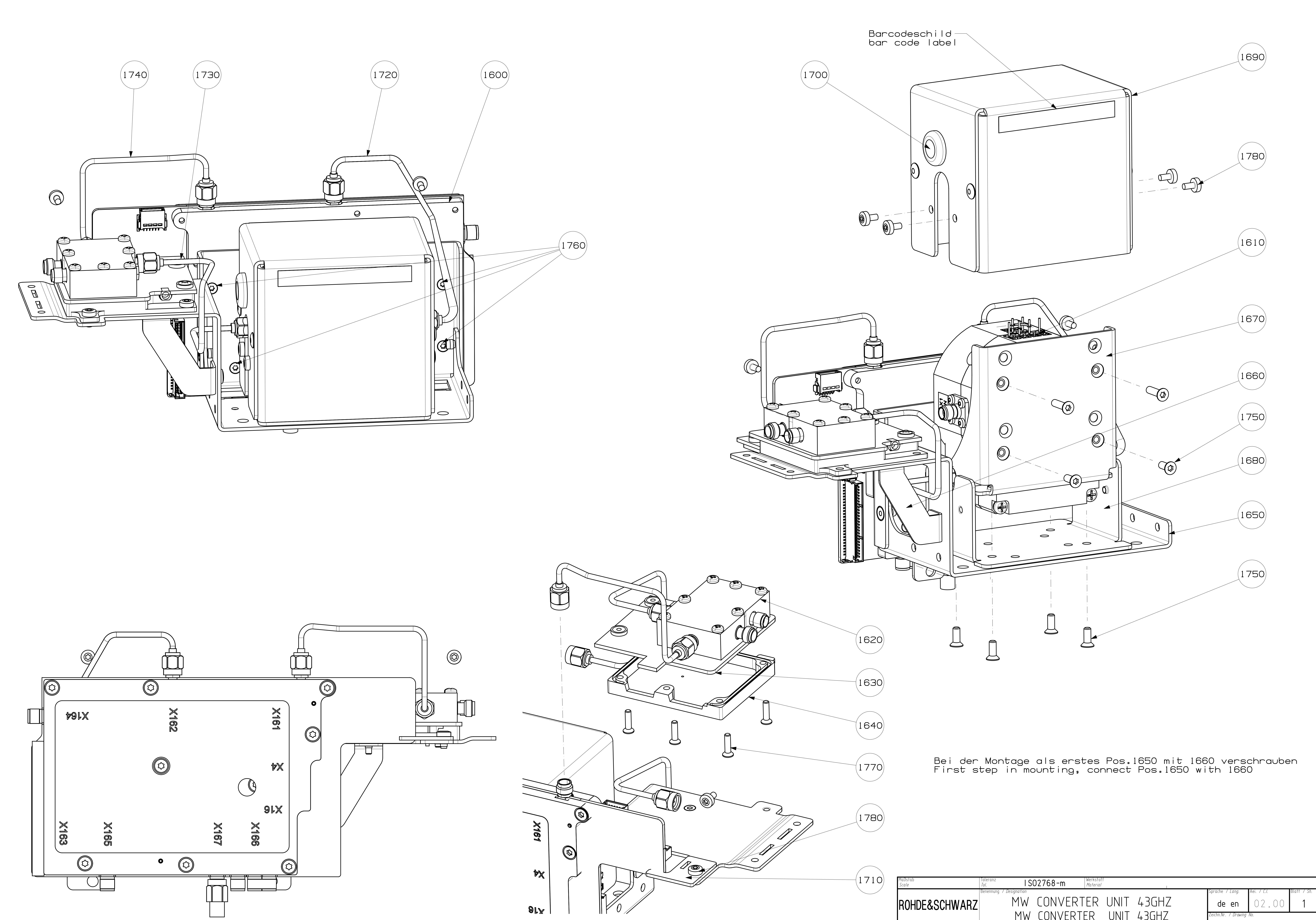
NX

Projektions-methode

Projection Method

MOD26 = 26.5 GHz
MOD27 = 26.5 GHZ + EXT. MIXER

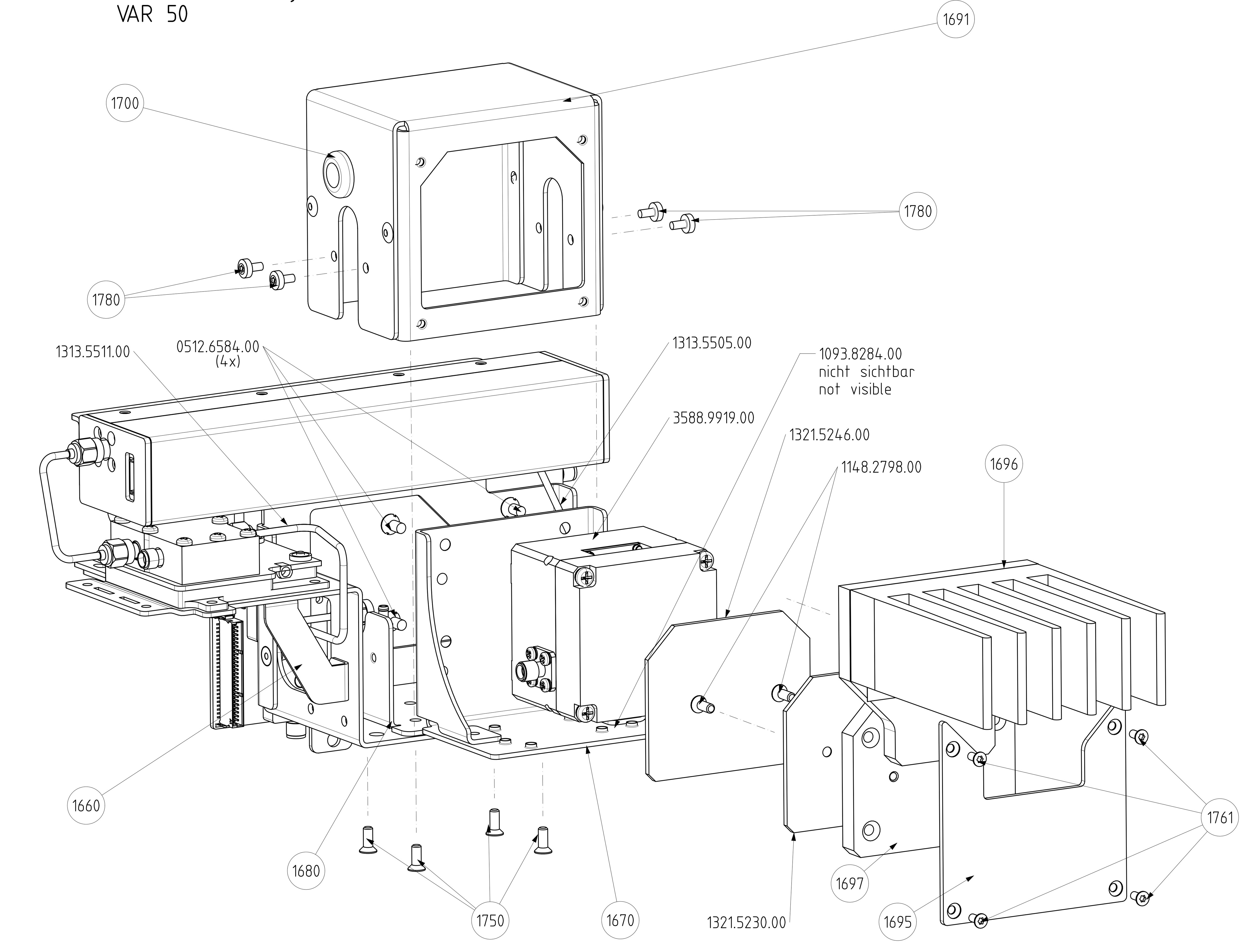
Maßstab / Scale: 1:1	Toleranz / Tol.	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: MW CONVERTER FRONTEND UNIT MW CONVERTER FRONTEND UNIT	Sprache / Lang.: de en	Äei. / C.I.: 05.00 · Blatt / Sh.: 1
SIRIUS	Datum / Date: 2012-03-01 · Abteilung / Dept.: 1ESK · Name / Name: AN/un	Zeichn.Nr. / Drawing No.: 1312.8298.01	D



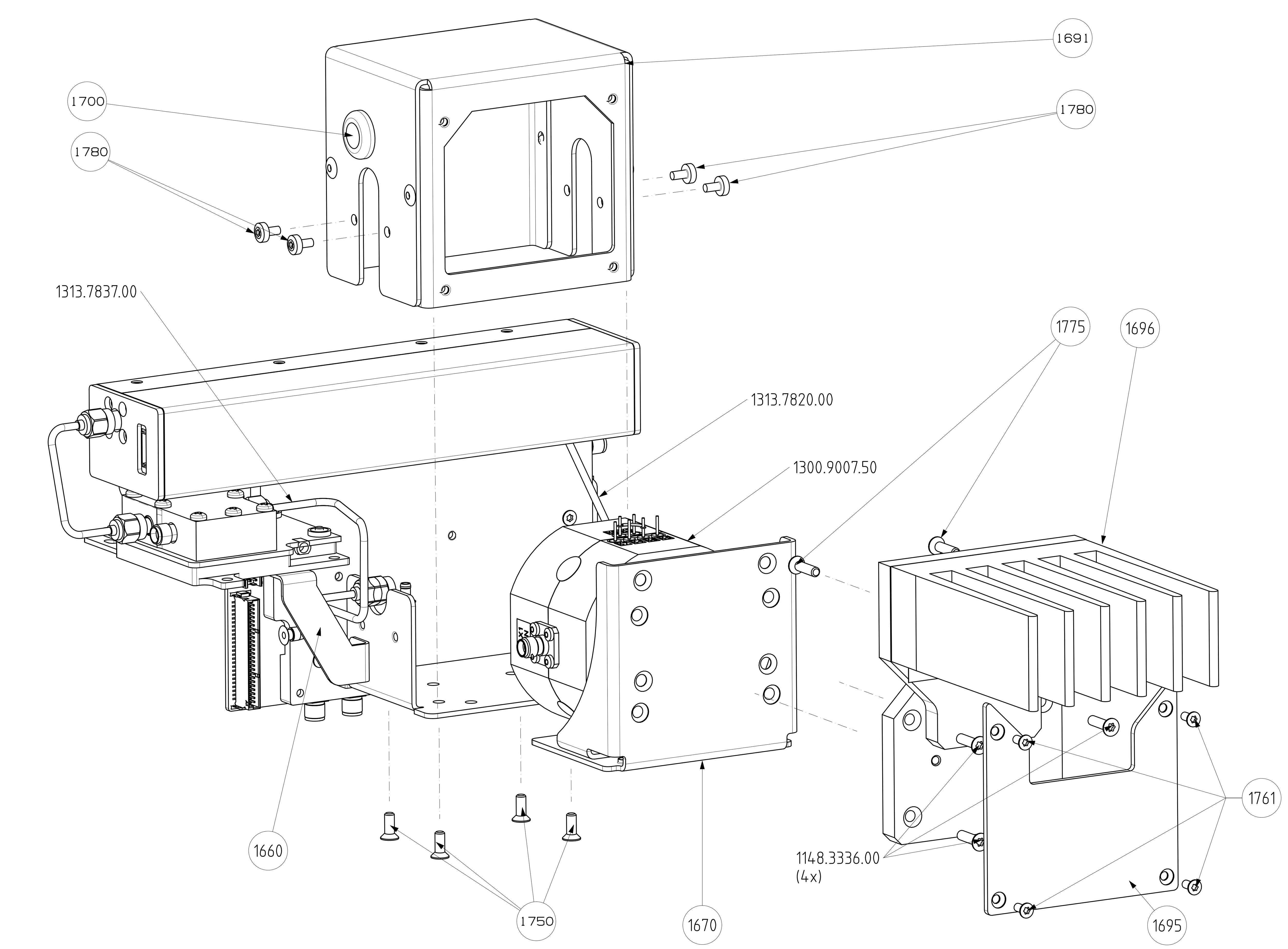
Projektions-methode
Projection Method

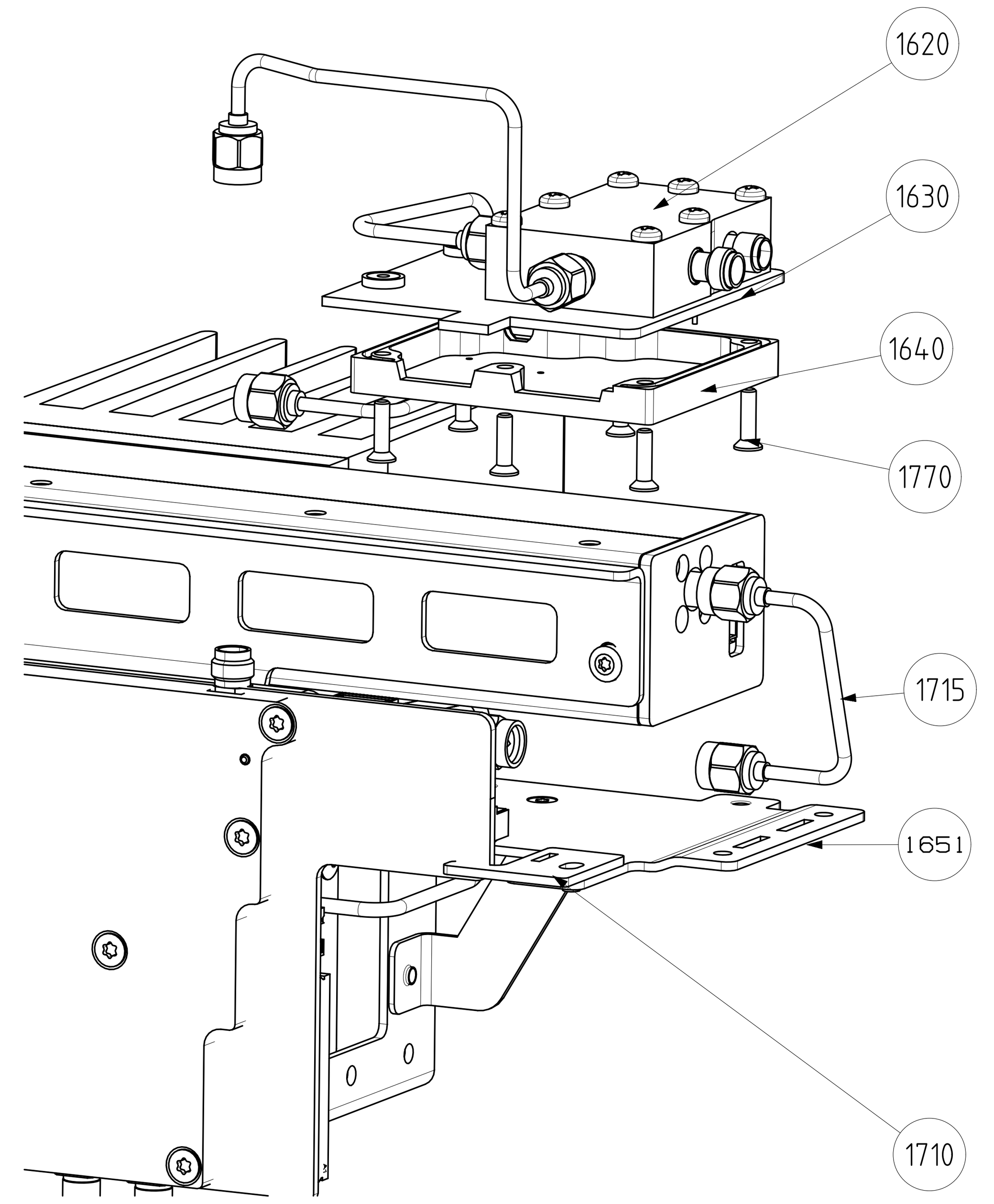
Maßstab / Scale	Toleranz / Tol: ISO2768-m	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: MW CONVERTER UNIT 43GHZ MW CONVERTER UNIT 43GHZ	Sprache / Lang: de en	Aen. / CI: 02.00 · Blatt / Sh: 1
SIRIUS	Datum / Date: 2012-12-12 · Abteilung / Dept: 1ESK · Name: AN	Zeichn.Nr. / Drawing No.: 1312.8323.01	D

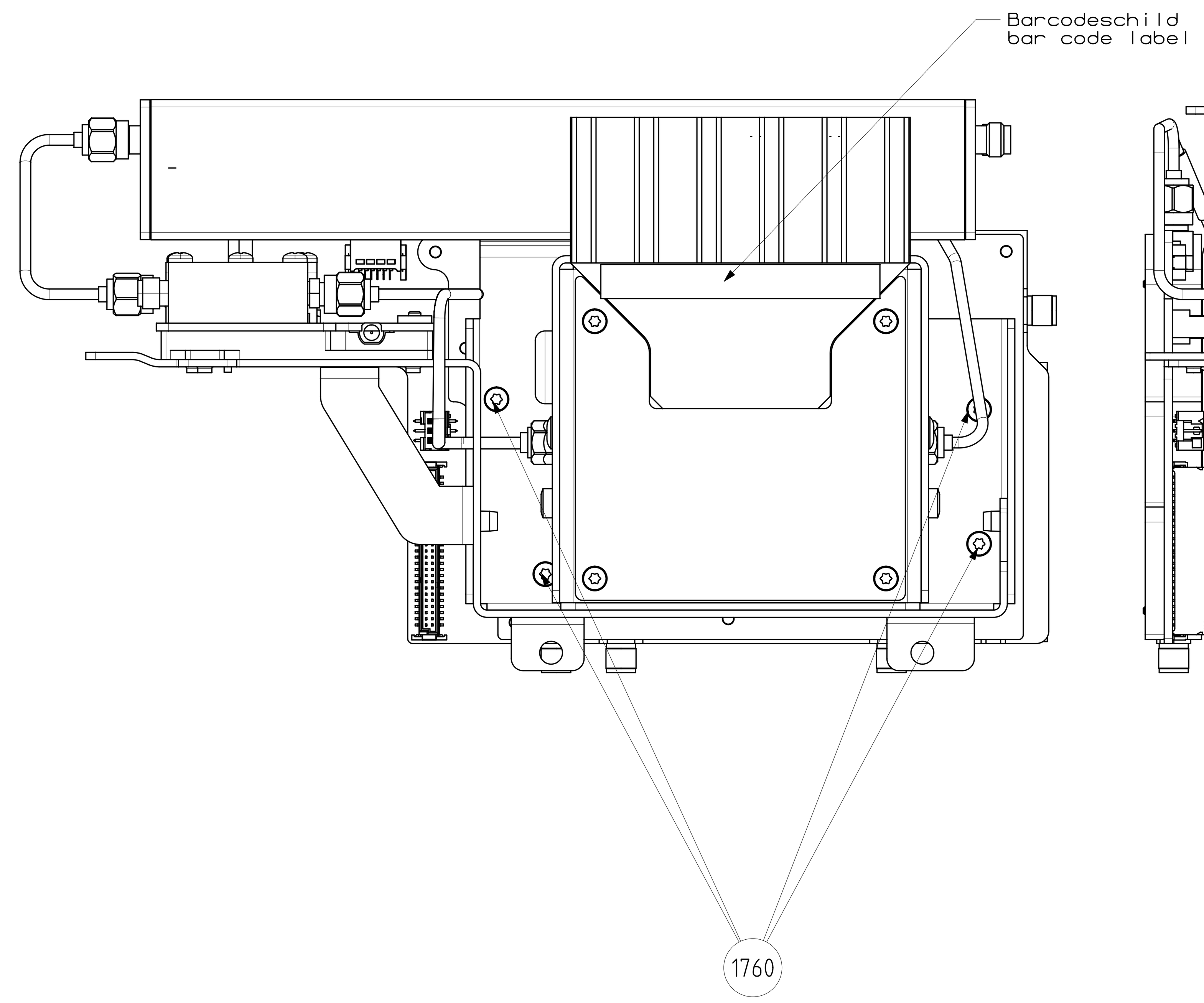
Pos. 1611 YIG Filter Teledyne
VAR 50

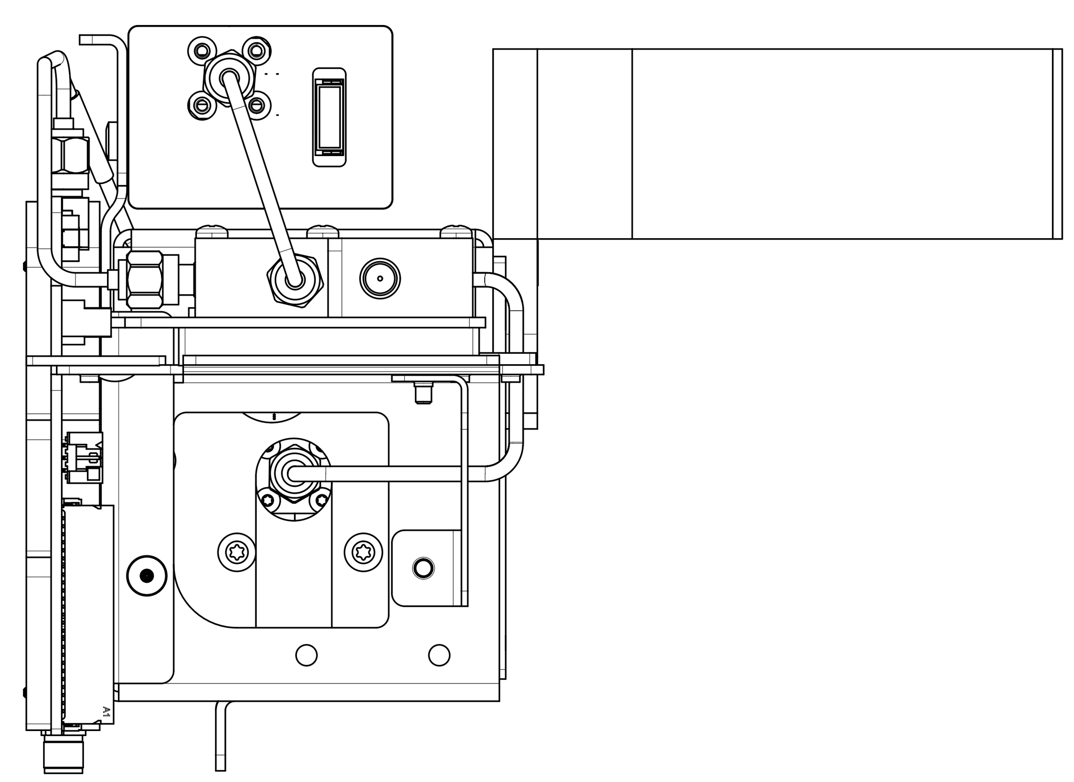


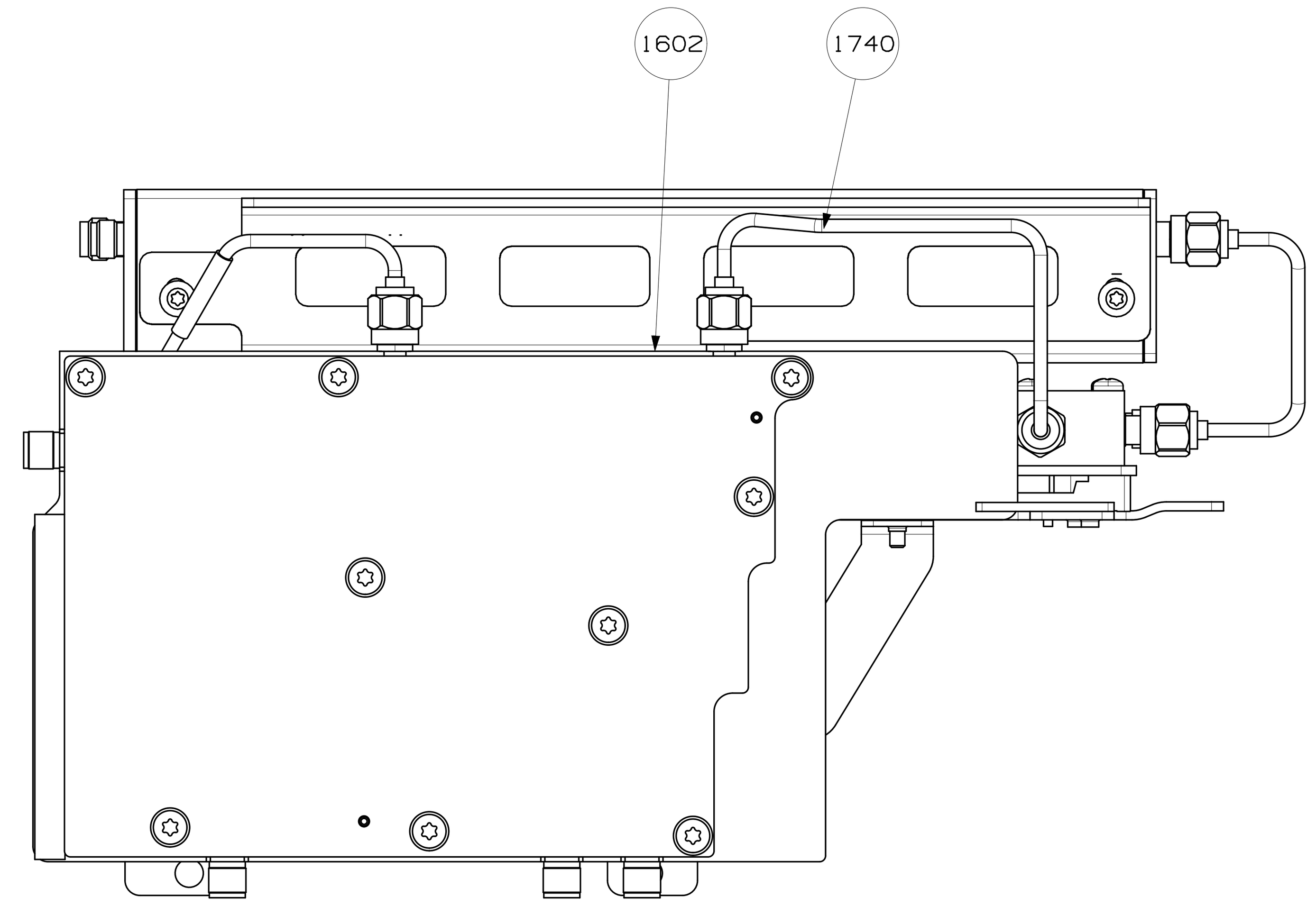
Pos. 1612 YIG Filter R&S
VAR 50









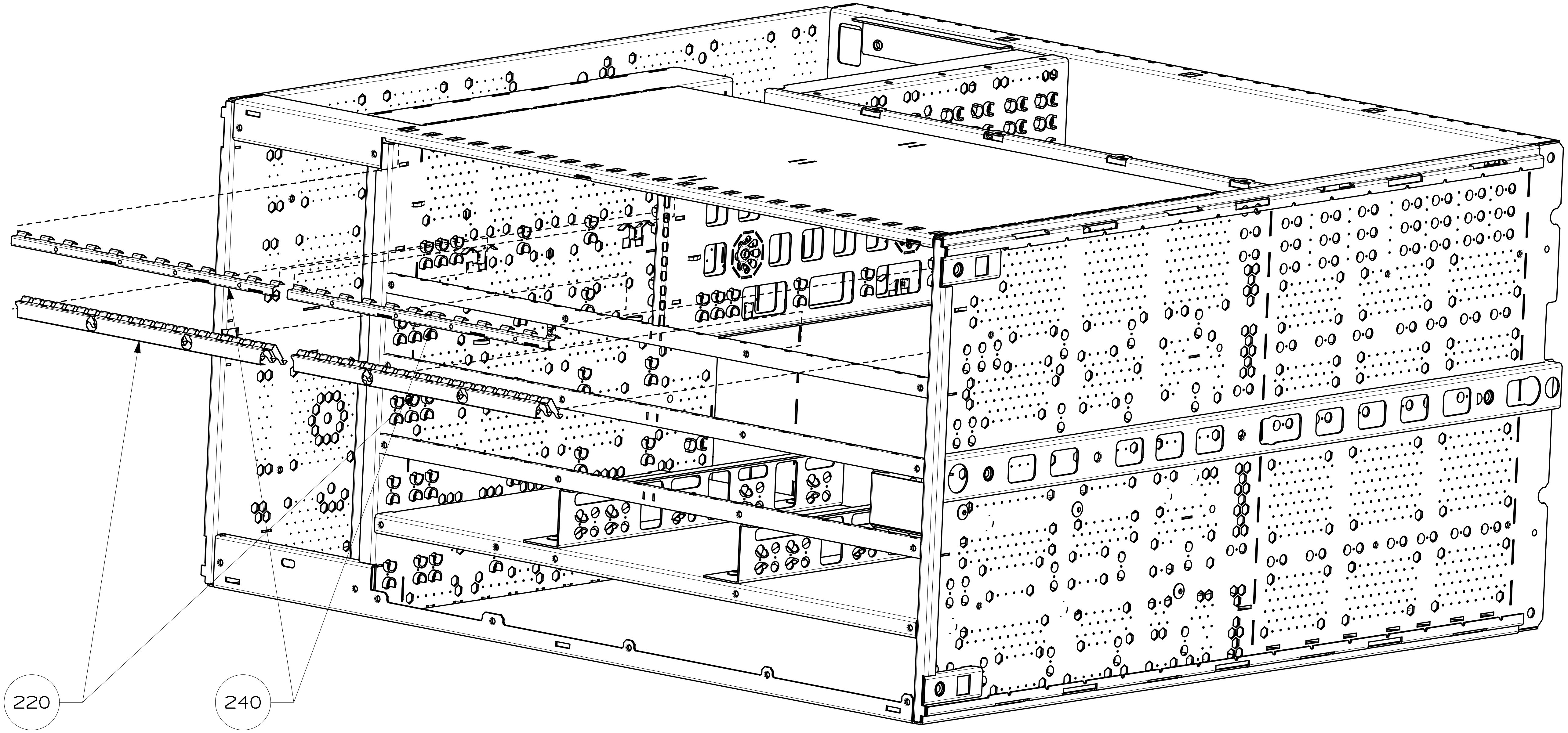


Bei der Montage als erstes Pos.1650 mit 1660 verschrauben
First step in mounting, connect Pos.1650 with 1660

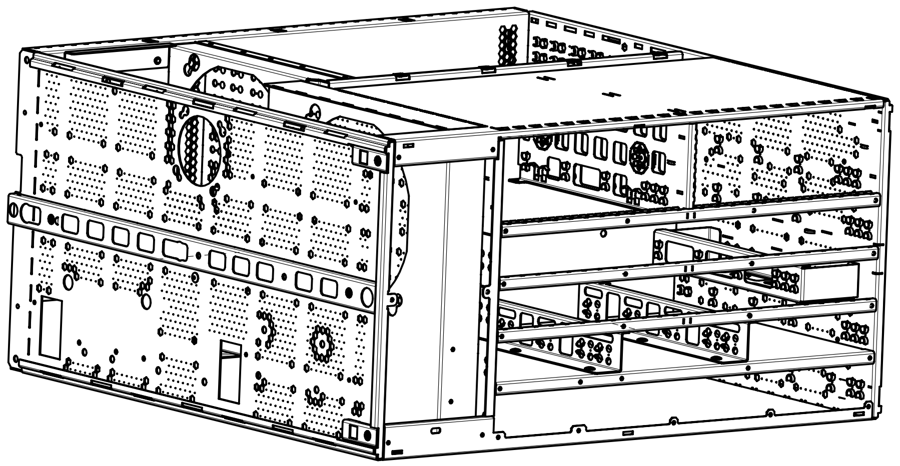
Projektionsmethode
Projection Method

ROHDE&SCHWARZ	1S02768-m	
	MW CONVERTER UNIT 43GHZ	de en / 02.00 / 2
	MW CONVERTER UNIT 43GHZ	1312.8323.01 D
SIRIUS	2013-01-28 / 1ESK / AN/Hx	

A1



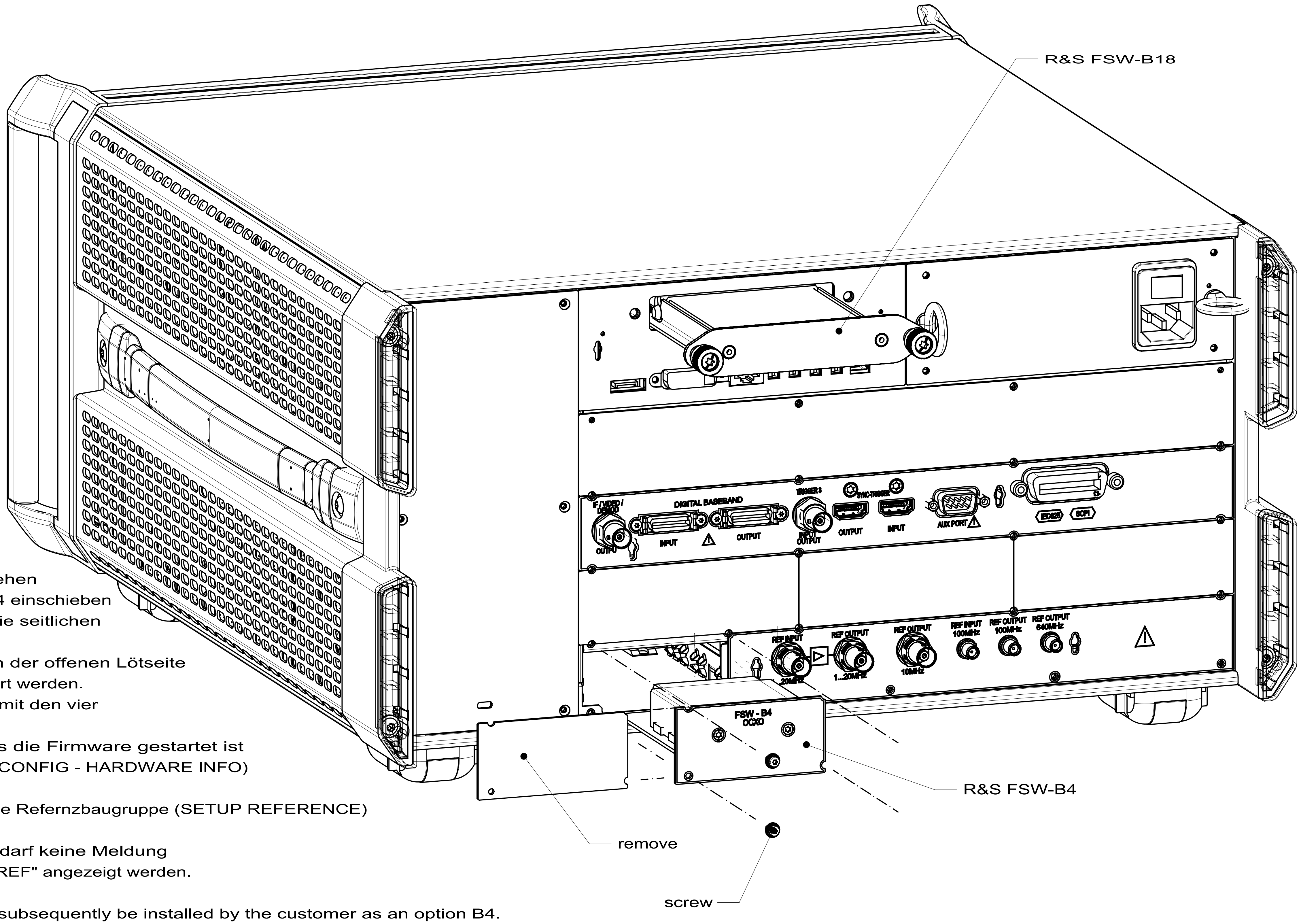
M1:5



Projektionsmethode
Projection Method

Maßstab / Scale	1:2	Toleranz / Tol.	ISO2768-m	Werkstoff / Material			
ROHDE&SCHWARZ		Benennung / Designation	SCHWEISSRAHMEN WELDING-FRAME	Sprache / Lang. de en	Aei. / C.I. 04.00	Blatt / Sh. 4	
SIRIUS		Datum / Date 2012-08-27	Abteilung / Dept. 1ESK	Name / Name AN	Zeichn.Nr. / Drawing No. 1313.4021.00	D	

NX



Die OCXO-Baugruppe 1313.0703.02
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 abgeschert 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 Refernzbaugruppe (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 1313.0703.02 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

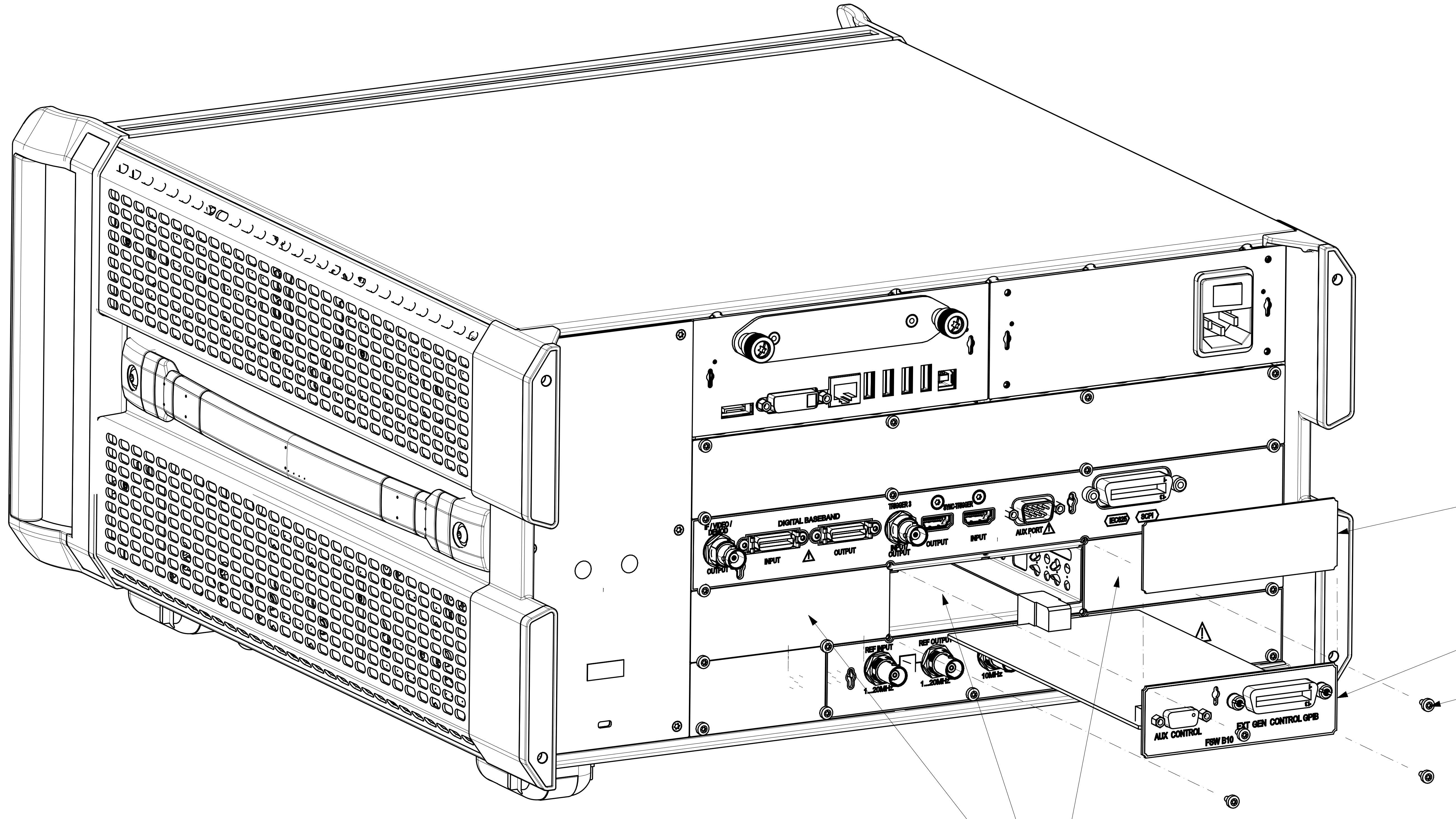
Otherwise there is a risk that assembly components are sheared off from the open solder side of the option.

- 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.

Projektions-
methode
Projection Method

Maßstab / *Scale* –	Toleranz / *Tol.*	Werkstoff / *Material*		
ROHDE&SCHWARZ	Benennung / *Designation* EINBAUANWEISUNG FSW OPTIONEN ASSEMBLY INSTRUCTION FSW OPTIONS	Sprache / *Lang.* de en	Aei. / *C.I.* 01.00	Blatt / *Sh.* 1
	Datum / *Date* 2011-06-10	Abteilung / *Dept.* 1ESK	Name / *Name* RN	Zeichn.Nr. / *Drawing No.* 1313.2758.00 D



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.

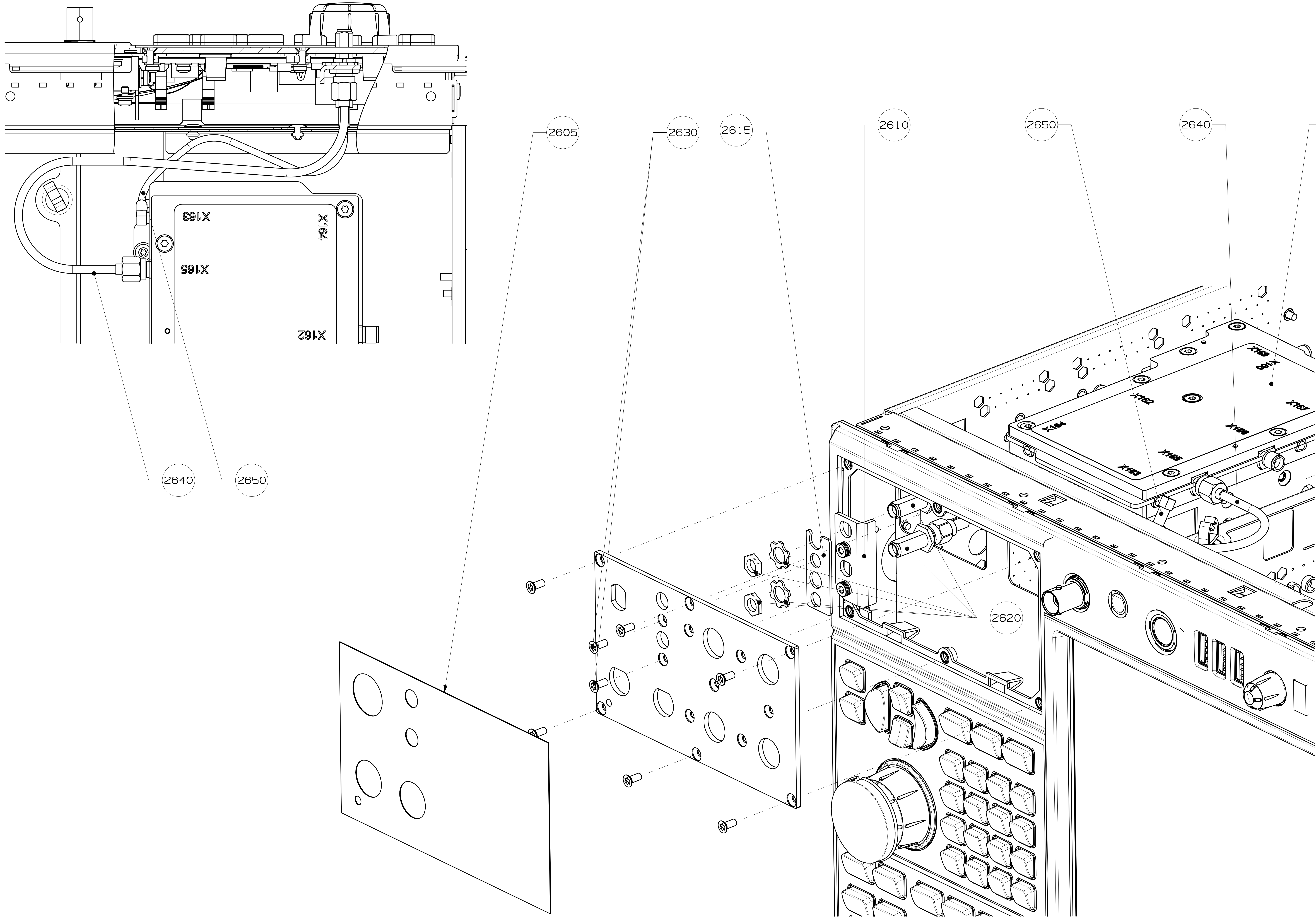
Überprüfung
- Drücken Sie die folgenden Tasten:

SETUP:System Config: Versions+Options
- Prüfen ob die Optionsliste den Eintrag "B10 Ext. GEN.Control" enthält.

Keine weiteren Funktionstest erforderlich!

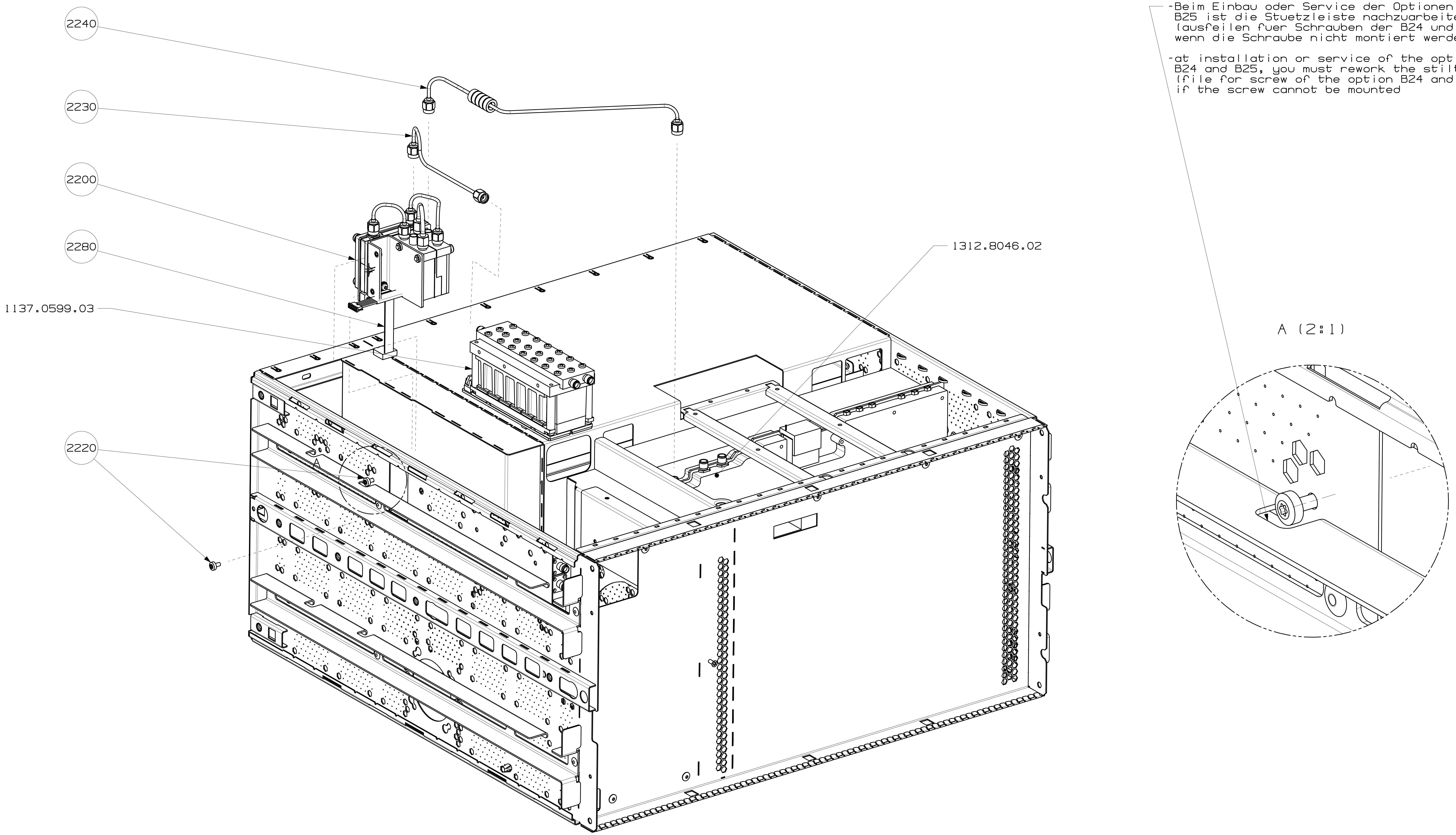
Projektions-methode
Projection Method

Maßstab / Scale: 1:2	Toleranz / Tol.	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW - B10 ASSEMBLY INSTRUCTION FSW - B10	Sprache / Lang.: de en	Rev. / CI: 02.00
		Blatt / Sh.: 1	Zeichn.Nr. / Drawing No.: 1313.7489.00 D
FSW-B10	Datum / Date: 2013-02-05	Abteilung / Dept.: 1ESK	Name: AN



Projektions-methode
Projection Method

Maßstab / Scale: 1:1	Toleranz / Tol: ISO2768-m	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B21 ASSEMBLY INSTRUCTION FSW-B21	Sprache / Lang: de en	Rev. / C.I.: 02.00	Blatt / Sh: 1
FSW	Datum / Date: 2013-03-04	Abteilung / Dept: 1ESK	Name: AN	Zeichn.Nr. / Drawing No.: 1313.1116.00 D



-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

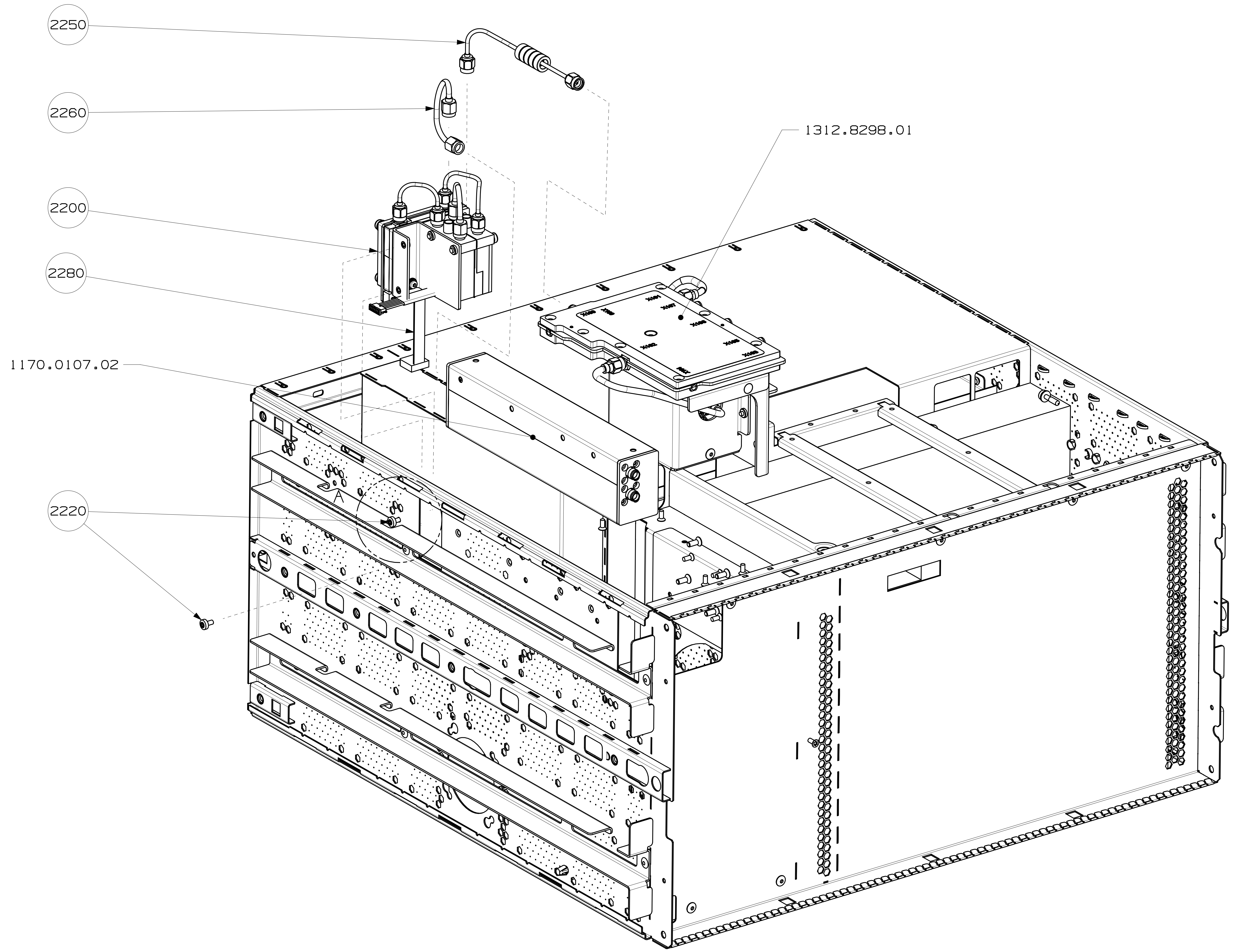
VAR13 = 8GHz
MOD13 = 8GHz

Maßstab / Scale: 1:2	Toleranz / Tol	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24	Sprache / Lang: de en	Äe. / C.I.: 03.00	Blatt / Sh: 1	
FSW	Datum / Date: 2011-09-28	Abteilung / Dept: 1ESK	Name: AN/PA	Zeichn.Nr. / Drawing No.: 1313.0855.00	D

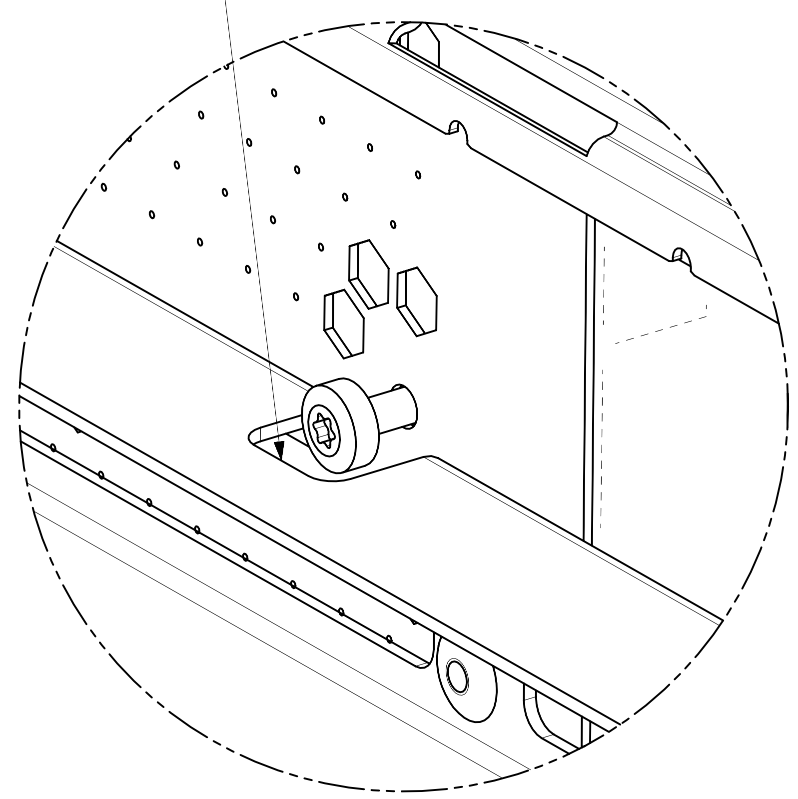
Projektions-methode
Projection Method

-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)



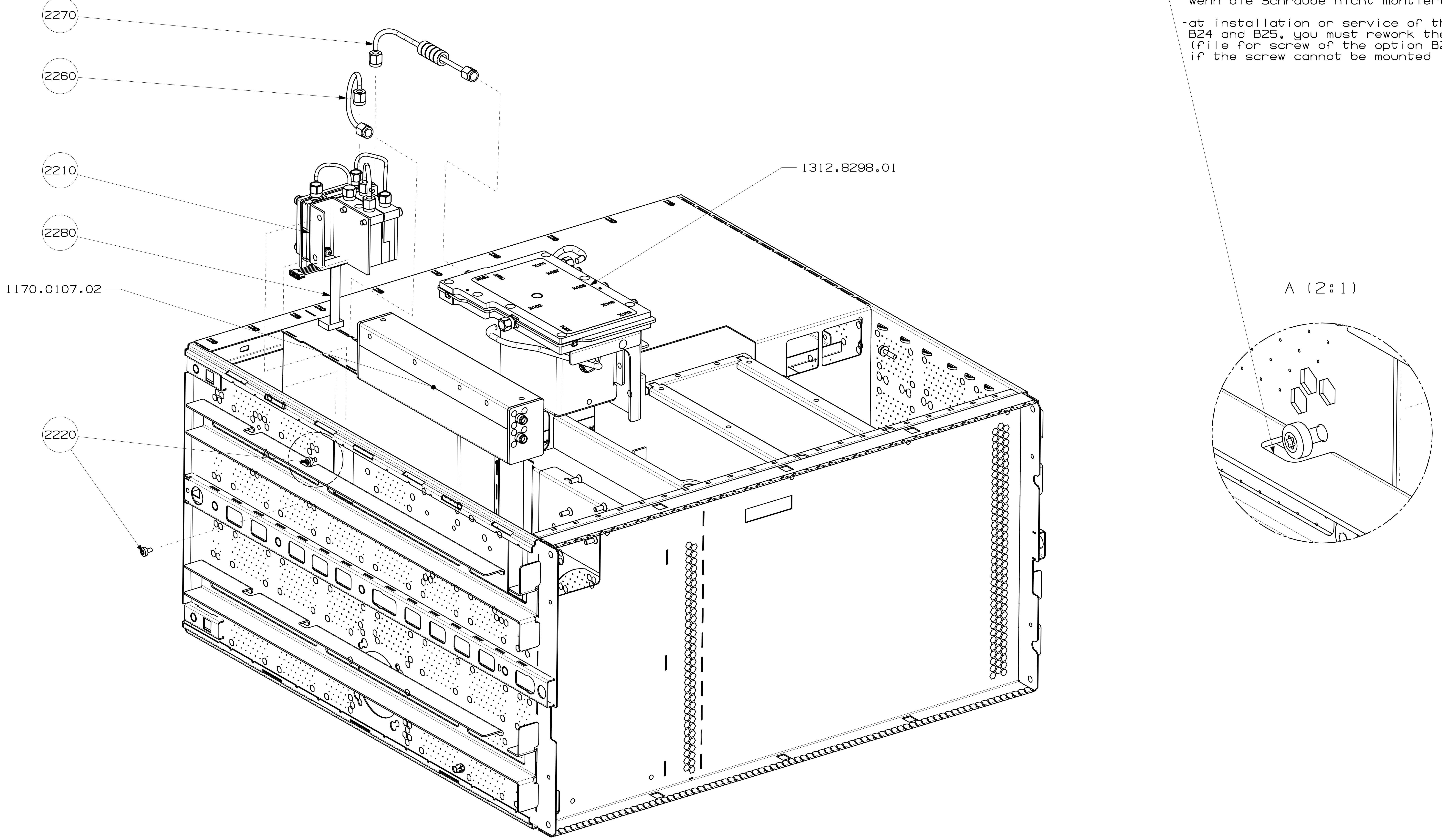
VAR13 = 13.6GHZ
MOD13 = 13.6GHz

Maßstab / Scale 1:2	Toleranz / Tol	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24	Sprache / Lang: de en	Änd. / CI: 02.00 · Blatt / Sh: 2
FSW	Datum / Date: 2011-09-28 · Abteilung / Dept: 1ESK · Name / Name: AN/PA	Zeichn.Nr. / Drawing No.: 1313.0855.00	D

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



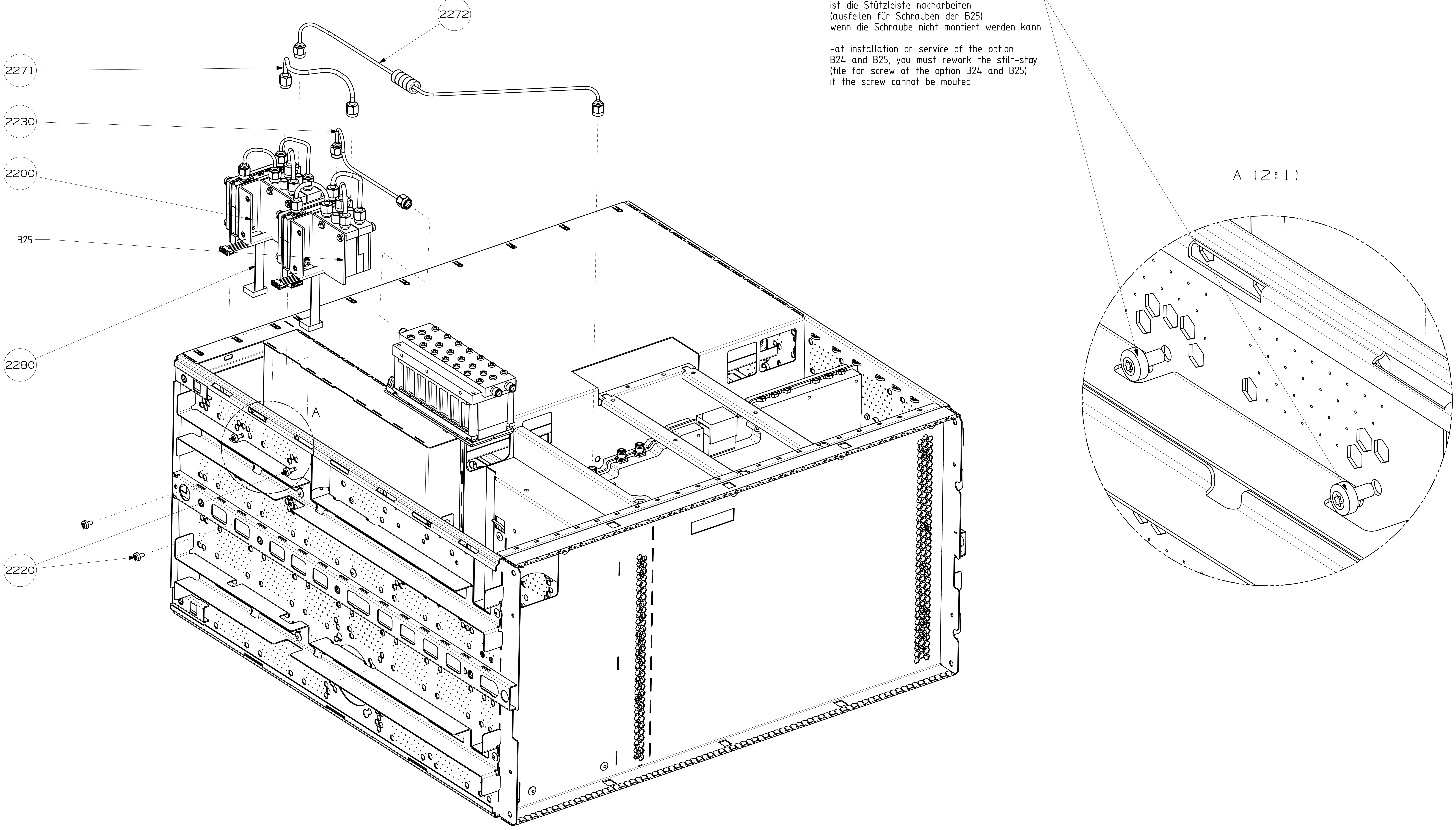
VAR26 = 26,5GHz
MOD26 = 26,5GHz

Maßstab / Scale: 1:2	Toleranz / Tol		Werkstoff / Material		
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24			Sprache / Lang: de en	Änd. / CI: 02.00	Blatt / Sh: 3
FSW	Datum / Date: 2011-09-28	Abteilung / Dept: 1ESK	Name: AN/PA	Zeichn.Nr. / Drawing No.: 1313.0855.00	D

Projektions-methode
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

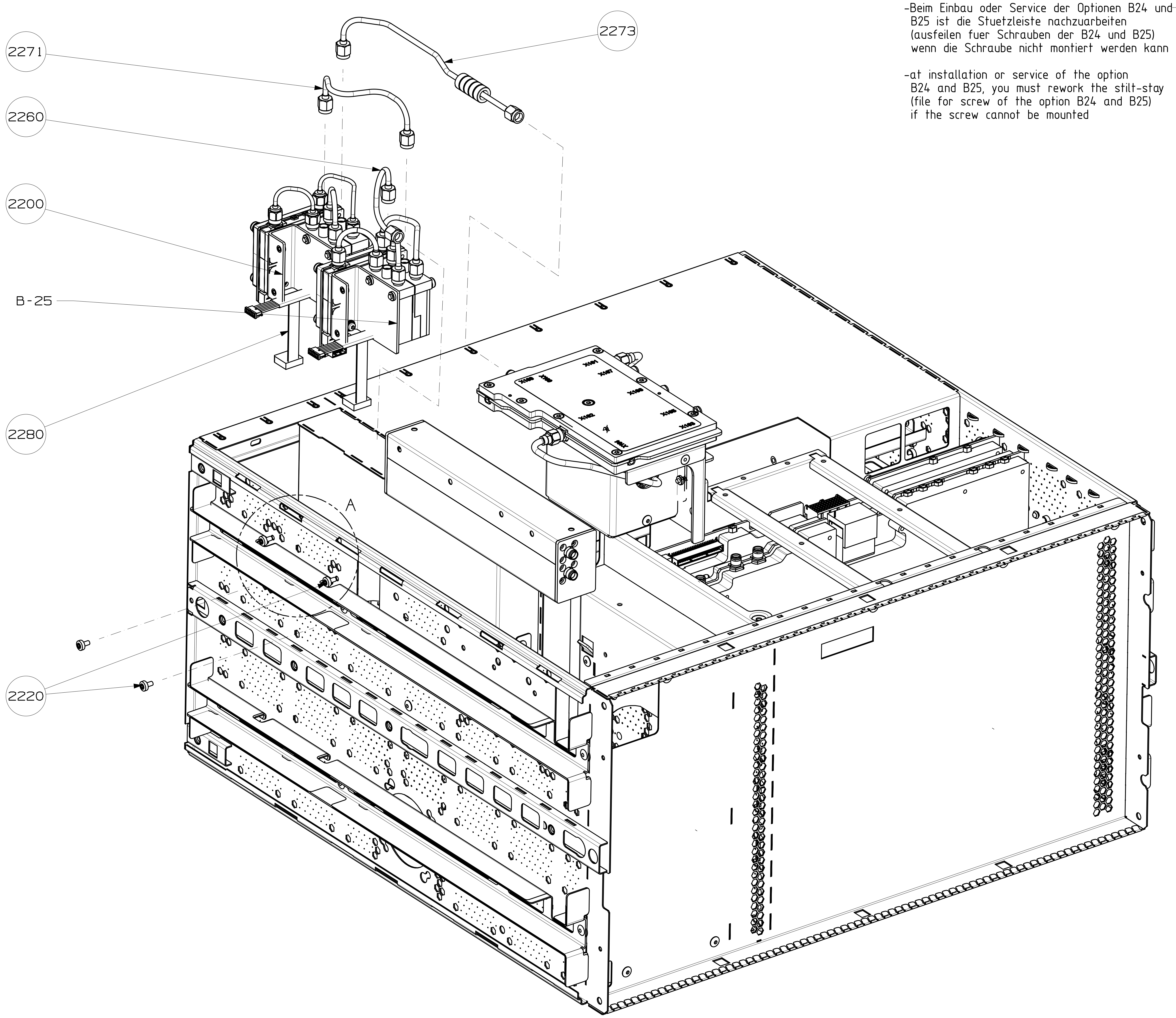


B25 with B24

VAR13 = 8GHz
MOD13 = 8GHz

Projektions-methode
Projection Method

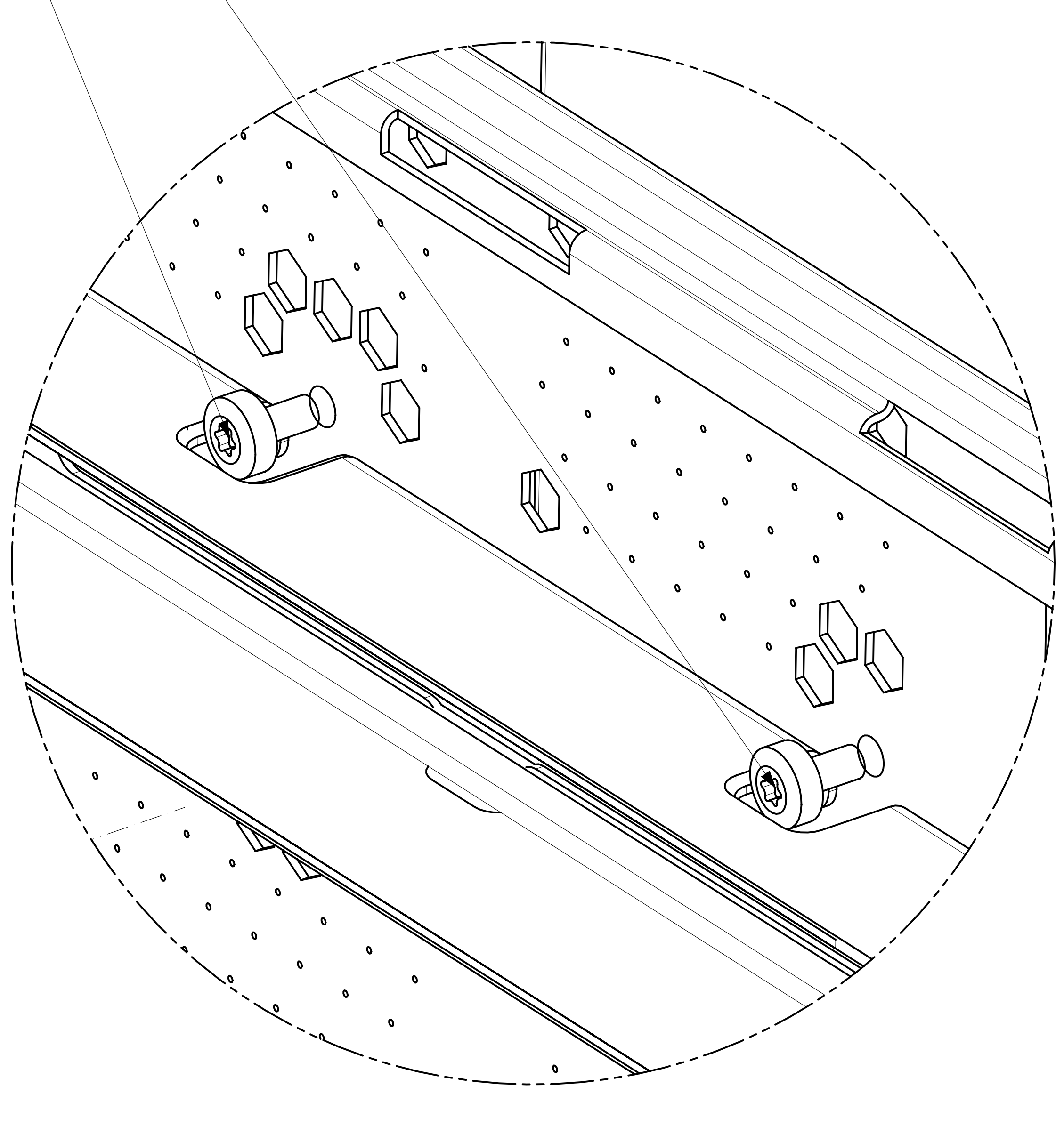
Maßstab / Scale: 1:2	Toleranz / Tol		Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24			Sprache / Lang: de en	Än. / C.I.: 01.00	Blatt / Sh: 4
FSW	Datum / Date: 2012-01-20	Abteilung / Dept: 1ESK	Name: AN	Zeichn.Nr. / Drawing No.: 1313.0855.00		D



-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

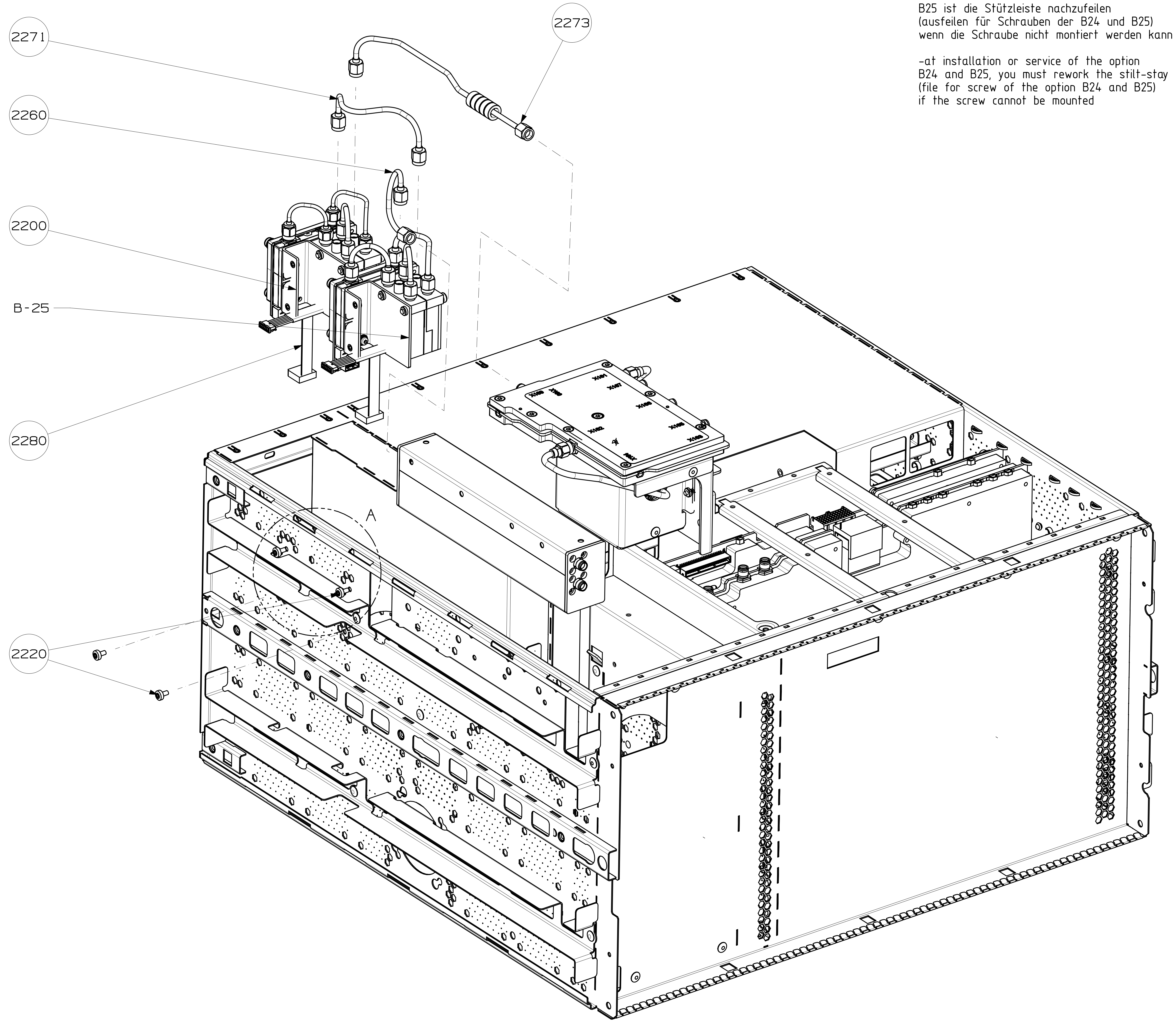
VAR13 = 13GHz
MOD13 = 13GHz

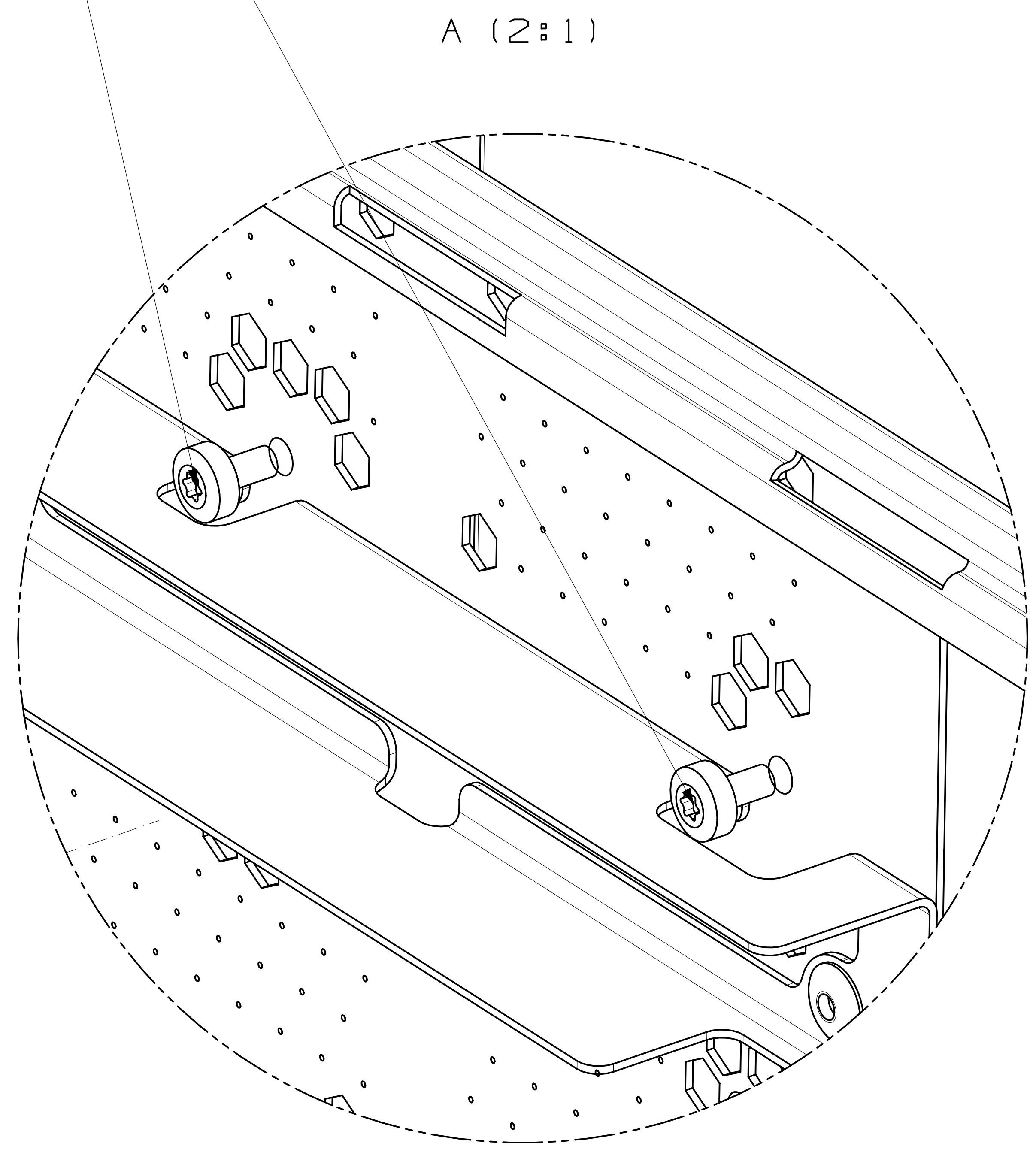
Maßstab / Scale: 1:2	Toleranz / Tol.	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24	Sprache / Lang.: de en	Rev. / I.S.: 01.00
		Blatt / Sh.: 5	Zeichn.Nr. / Drawing No.: 1313.0855.00 D
FSW	Datum / Date: 2012-01-20	Abteilung / Dept.: 1ESK	Name / Name: AN

Projektions-methode
Projection Method

- Beim Einbau oder Service der Potionen 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



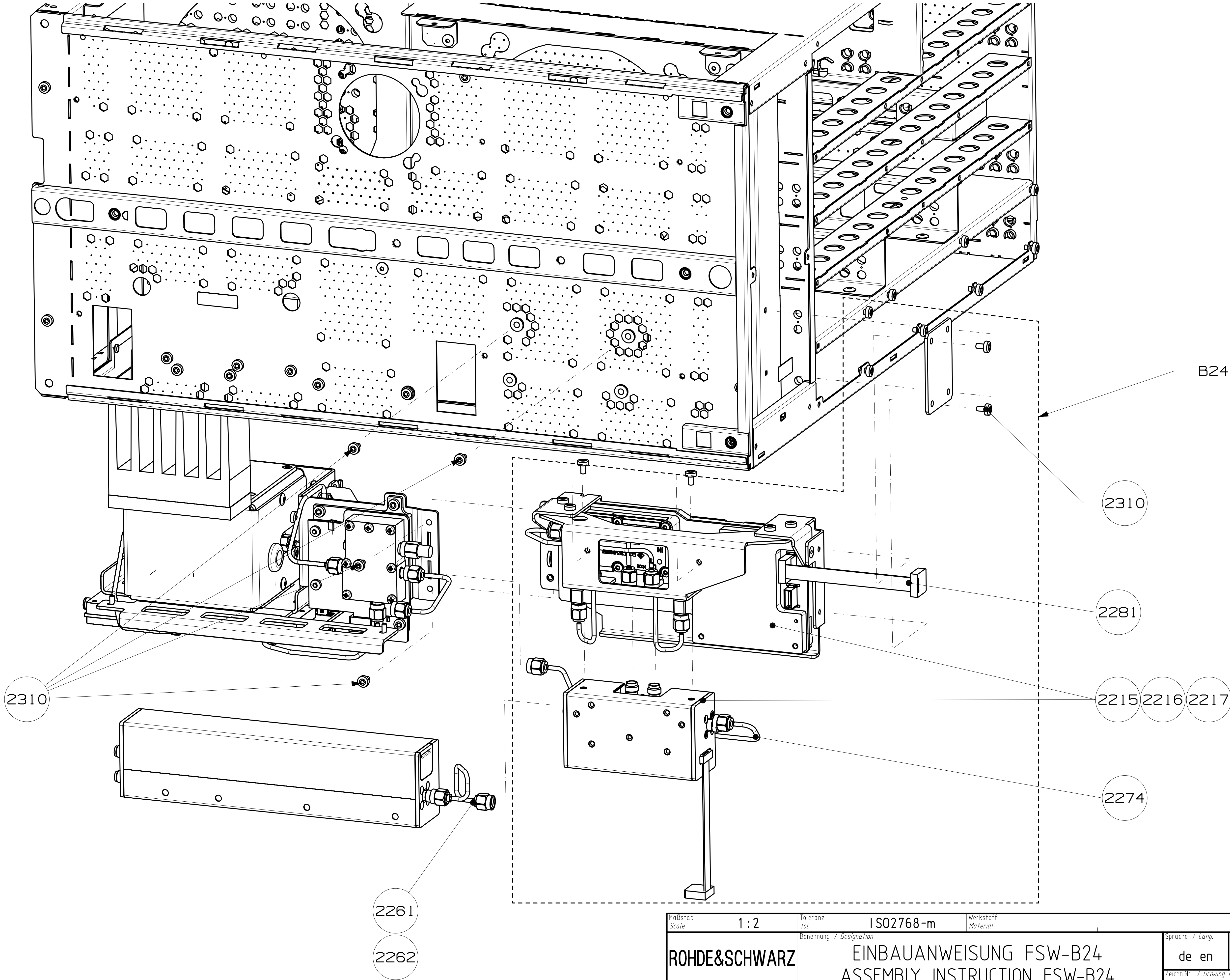


B25 mit B24

VAR26 = 26GHz
MOD26 = 26GHz

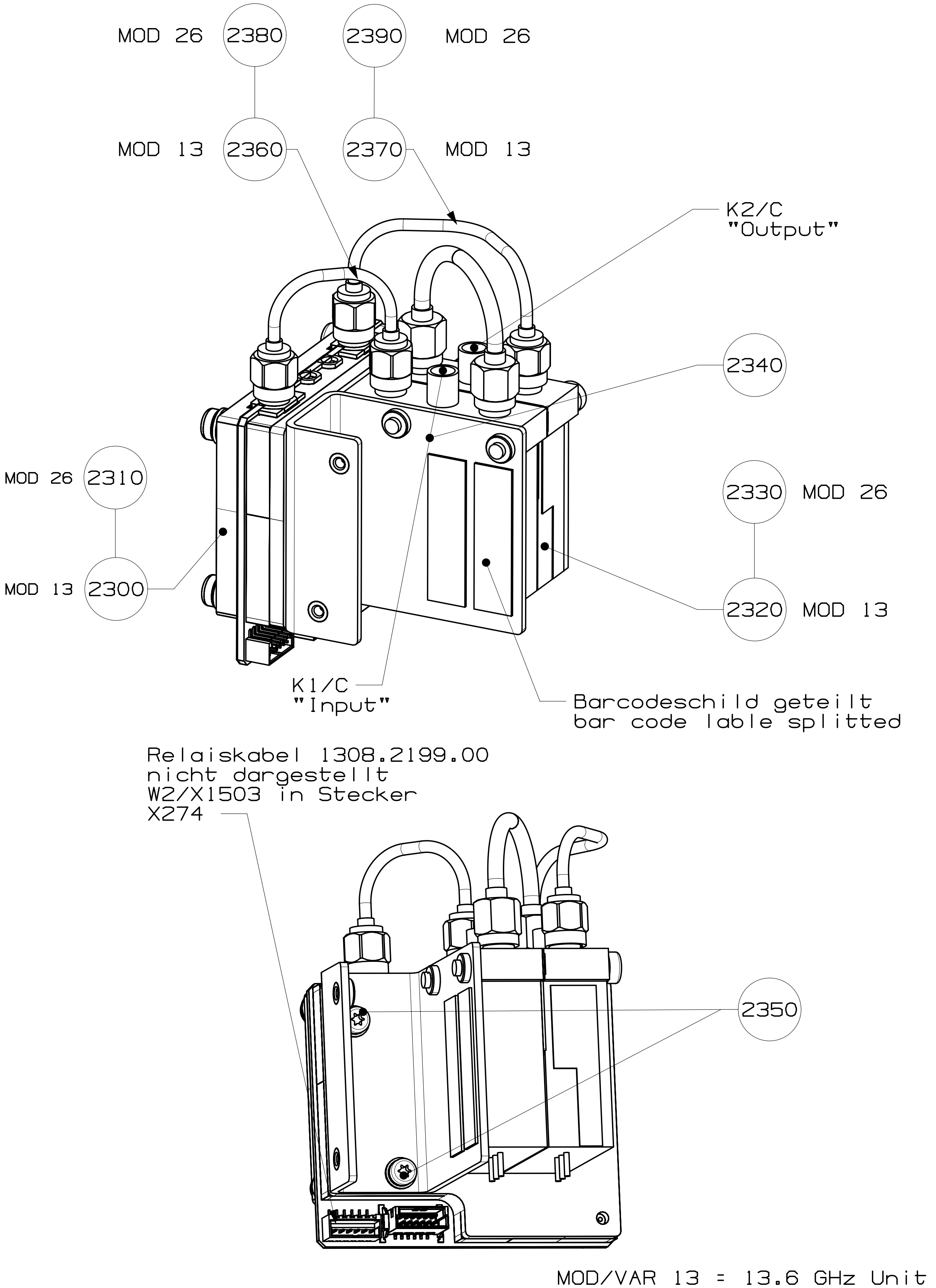
Maßstab / Scale: 1:2	Toleranz / Tol	Werkstoff / Material		
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24	Sprache / Lang: de en	Änd. / C.I.: 01.00	Blatt / Sh: 6
FSW	Datum / Date: 2012-01-20	Abteilung / Dept: 1ESK	Name: AN	Zeichnr. / Drawing No.: 1313.0855.00 D

Projektionsmethode
Projection Method



Projektions-methode
Projection Method

Maßstab / Scale: 1:2	Toleranz / Tol.: ISO2768-m	Werkstoff / Material				
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24			Sprache / Lang.: de en	Aei. / C.I.: 03.00	Blatt / Sh.: 1
FSW	Datum / Date: 2013-03-11	Abteilung / Dept.: 1ESK	Name / Name: AN/BU	Zeichn.Nr. / Drawing No.: 1313.5792.00 D		



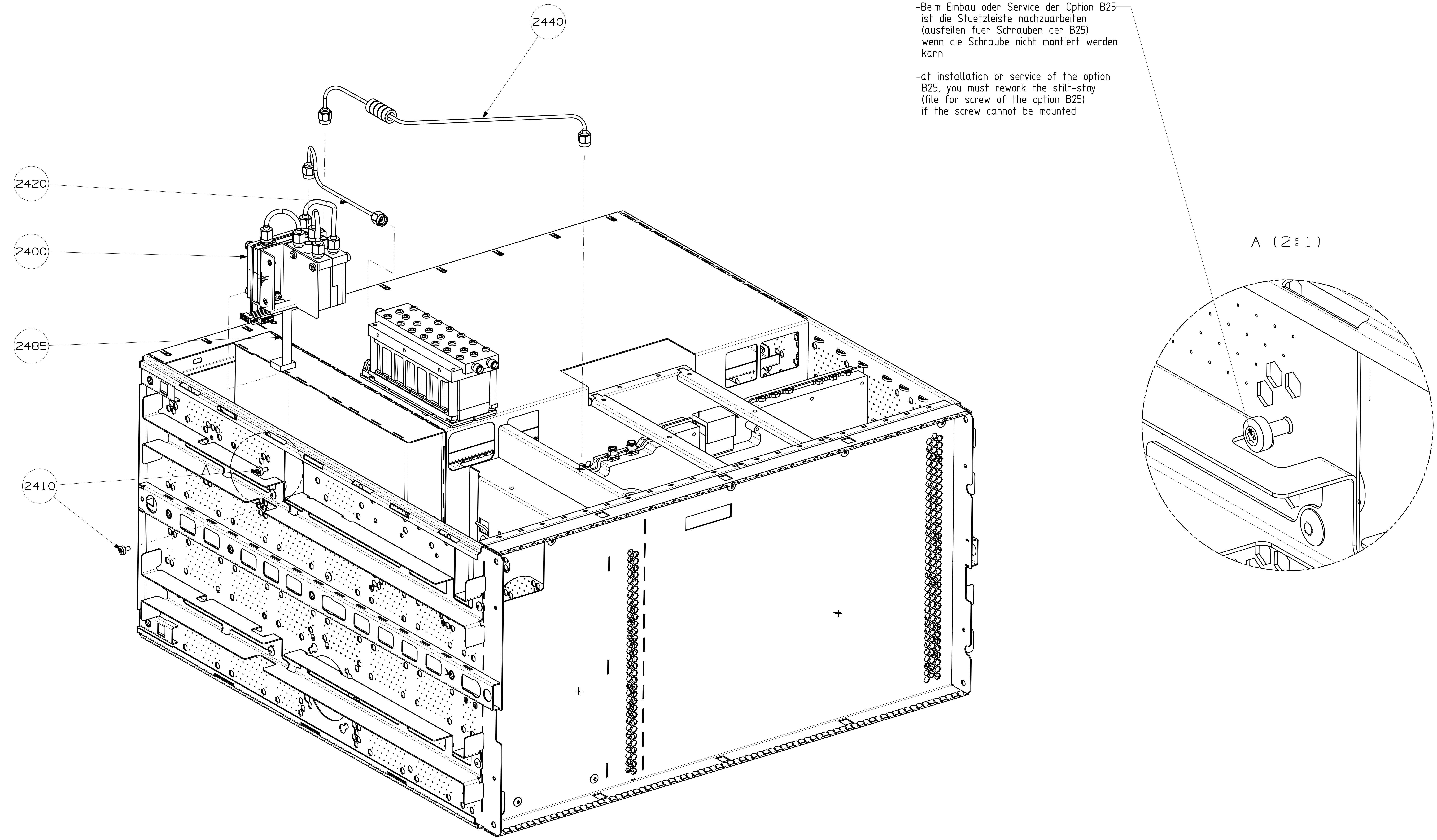
MOD/VAR 13 = 13.6 GHz Unit
MOD/VAR 26 = 26.5 GHz Unit

Maßstab / Scale: 1:1	Toleranz / Tol.	Werkstoff / Material				
ROHDE&SCHWARZ	Benennung / Designation: VORVERSTAERKER EINHEIT PREAMP UNIT			Sprache / Lang.: de en	Aei. / C.I.: 04.00	Blatt / Sh.: 1
FSW	Datum / Date: 2012-03-01	Abteilung / Dept.: 1ESK	Name / Name: AM/un	Zeichn.Nr. / Drawing No.: 1313.0903.01		D

NX

Projektions-methode

Projection Method



-Beim Einbau oder Service der Option B25 ist die Stuetzleiste nachzuarbeiten (ausfeilen fuer Schrauben der B25) wenn die Schraube nicht montiert werden kann

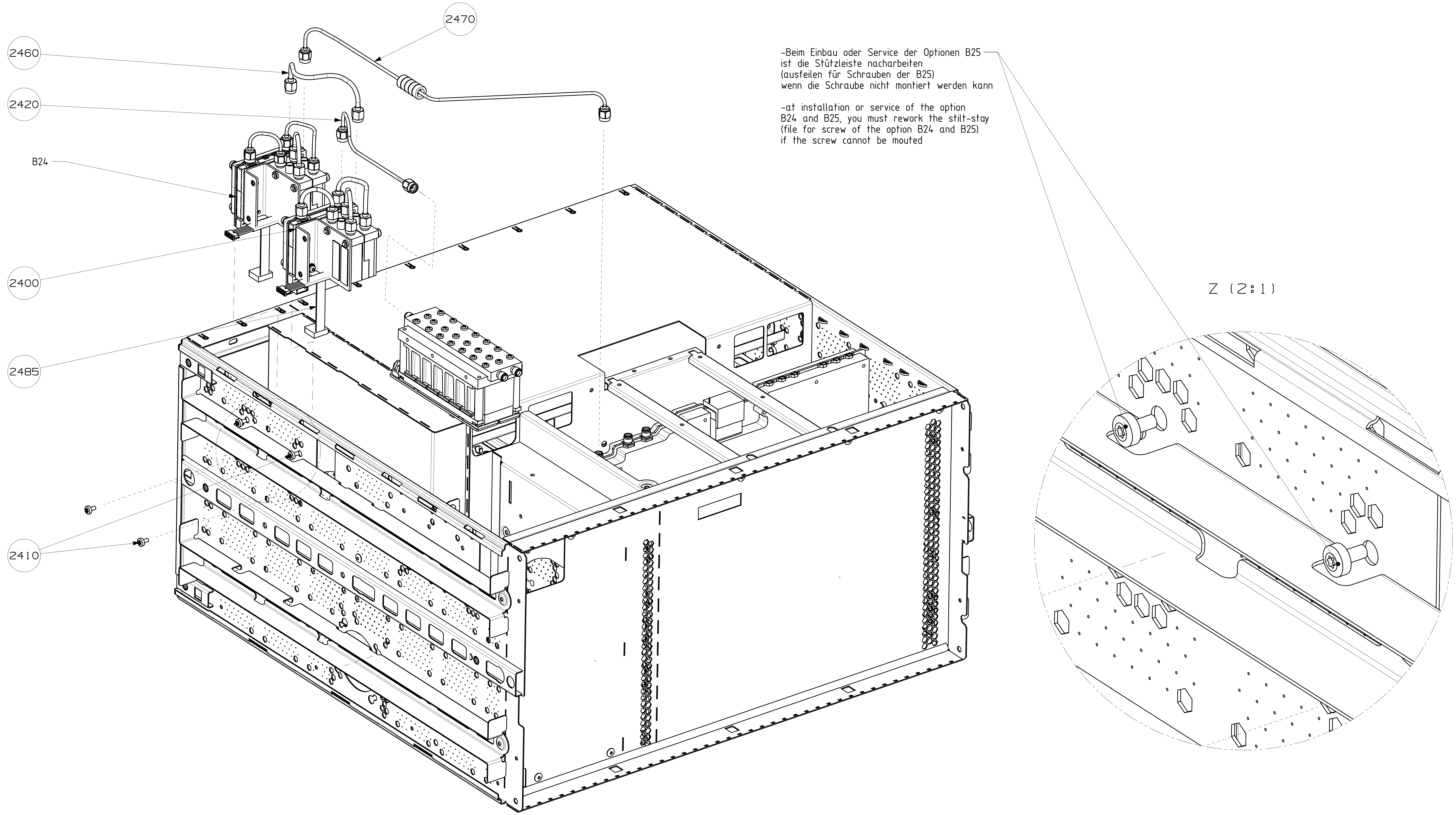
-at installation or service of the option B25, you must rework the stilt-stay (file for screw of the option B25) if the screw cannot be mounted

B25

VAR02=8GHz
MOD02=8GHz

Projektions-methode
Projection Method

Maßstab / Scale: 1:2	Toleranz / Tol	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B25 ASSEMBLY INSTRUCTION FSW-B25	Sprache / Lang: de en	Änd. / C.I.: 03.00
FSW	Datum / Date: 2012-01-18; Abteilung / Dept: 1ESK; Name: AN	Zeichn.Nr. / Drawing No.: 1313.3783.00 D	Blatt / Sh: 1



-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

VAR02 = 8GHz
MOD02 = 8GHz

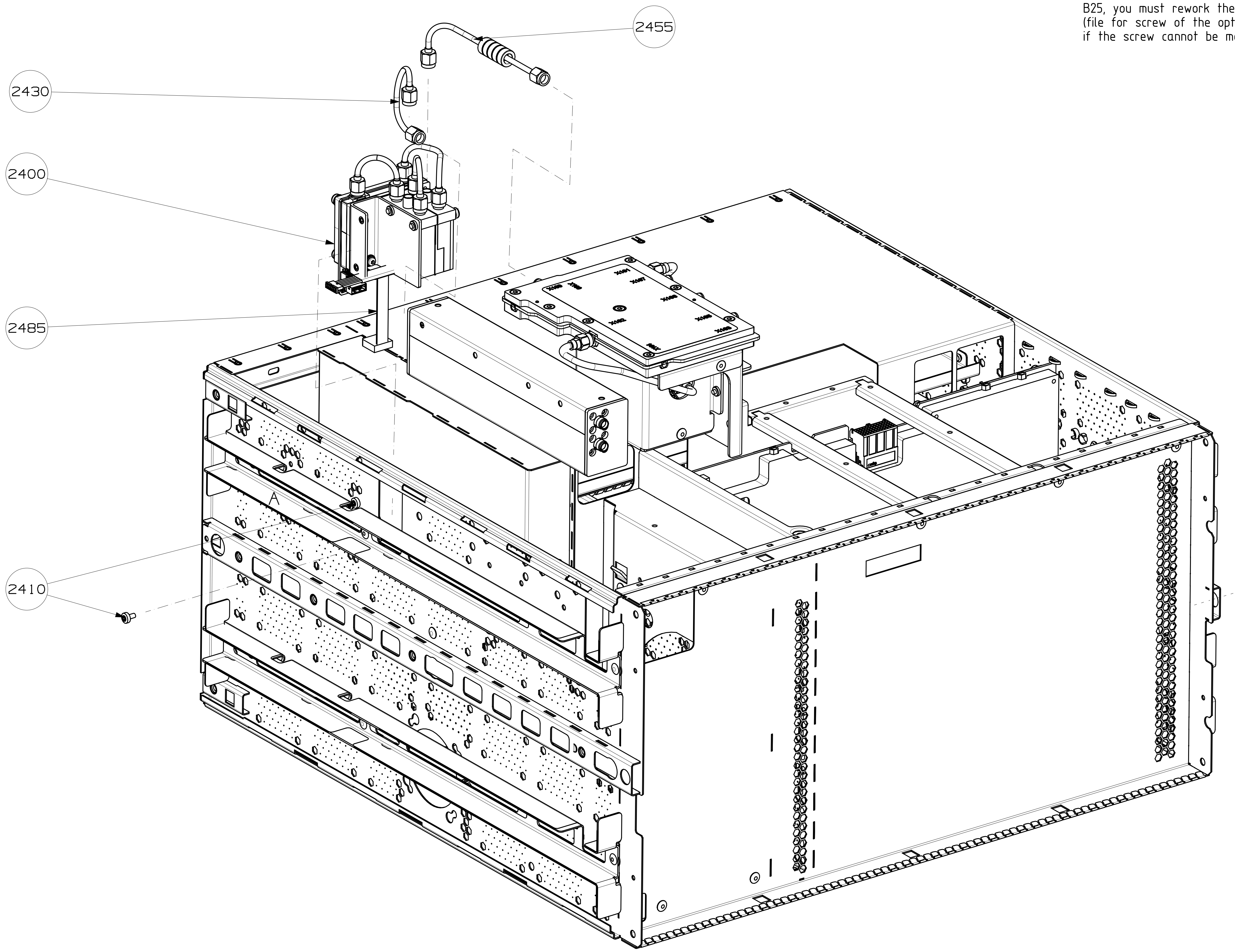
Projektions-methode
Projection Method

Maßstab / Scale	Toleranz / Tol	Werkstoff / Material		
1:2				
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B25 / ASSEMBLY INSTRUCTION FSW-B25	Sprache / Lang: de en	Änd. / Ch: 04.00	Blatt / Sh: 2
FSW	Datum / Date: 2012-01-19	Abteilung / Dept: 1ESK	Name: AN	Zeichn.Nr. / Drawing No.: 1313.3783.00 D

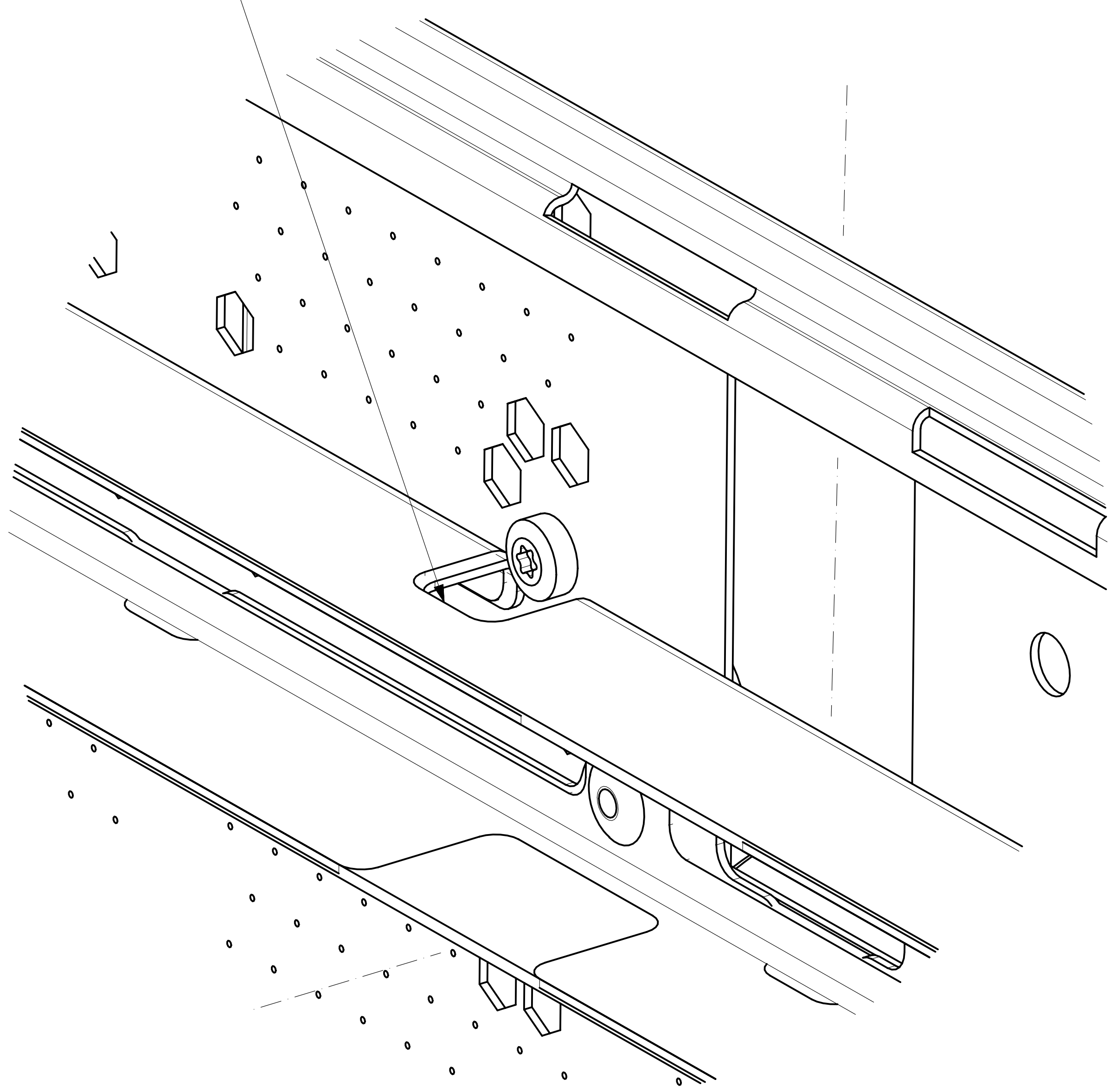
-Beim Einbau oder Service der Optionen B25
ist die Stuetzleiste nachzuarbeiten
(ausfeilen fuer Schrauben der B25)
wenn die Schraube nicht montiert werden kann

-at installation or service of the option
B25, you must rework the stilt-stay
(file for screw of the option B25)
if the screw cannot be mounted

NX



A (2:1)



VAR02 = 13GHZ
MOD02 = 13GHz

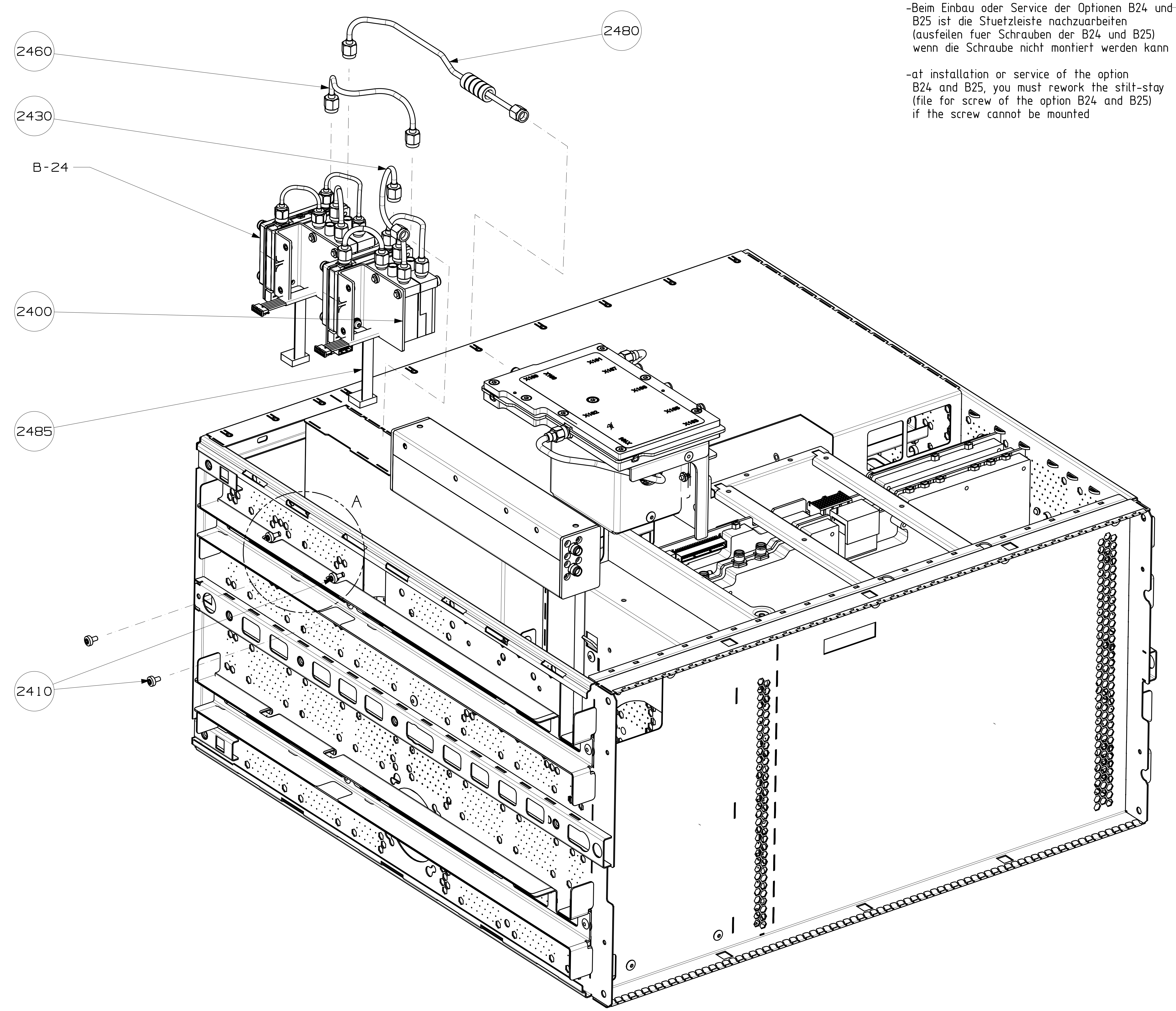
Projektionsmethode
Projection Method

Maßstab / Scale 1:2	Toleranz / Tol	Werkstoff / Material		
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B25 ASSEMBLY INSTRUCTION FSW-B25	Sprache / Lang. de en	Aen. / CI. 03.00	Blatt / Sh. 3
FSW	Datum / Date 2012-01-18 · Abteilung / Dept. 1ESK · Name / Name AN	Zeichn.Nr. / Drawing No. 1313.3783.00		D

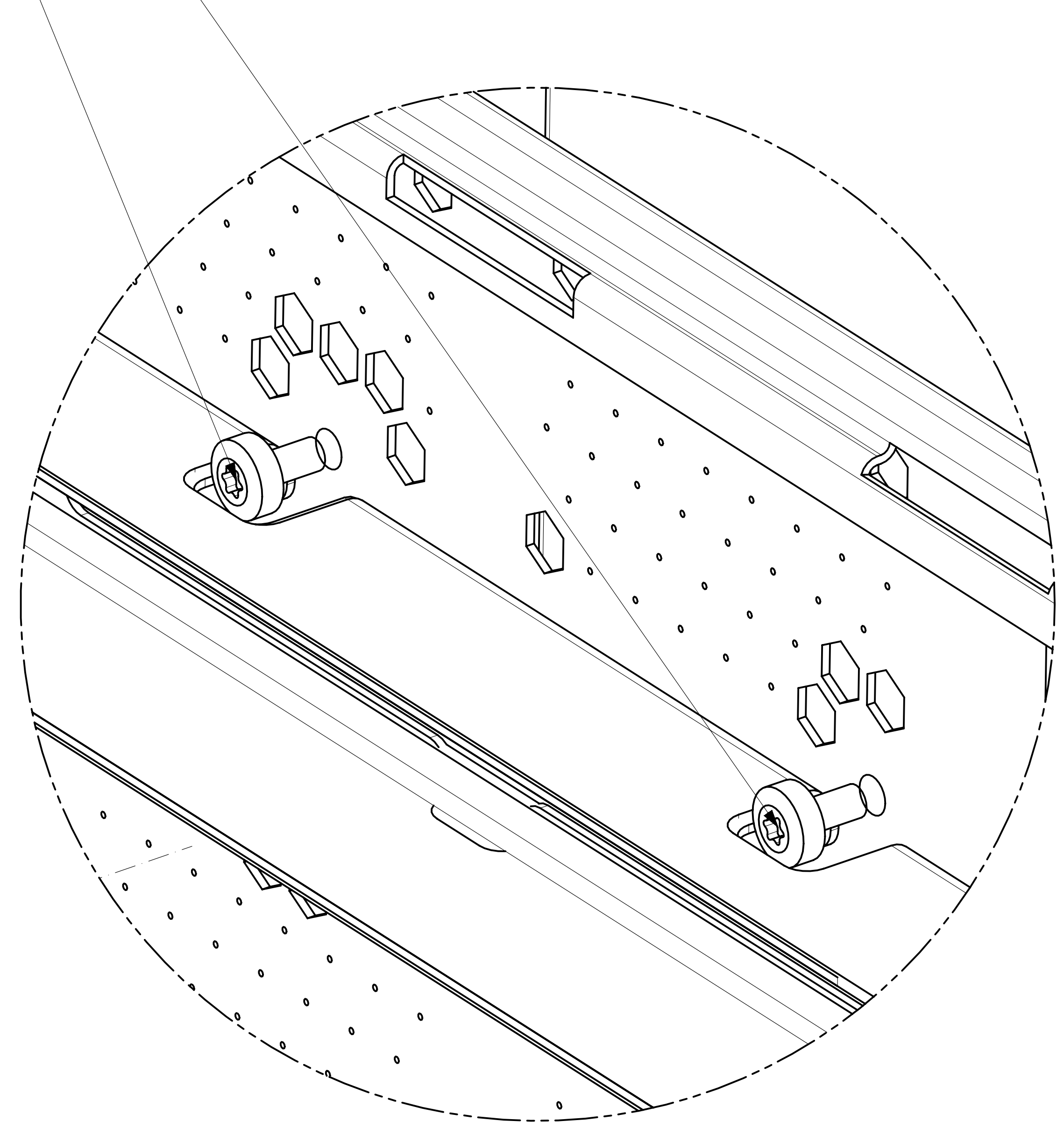
-Beim Einbau oder Service der Optionen B24 und B25 ist die Stuetzleiste nachzuarbeiten (ausfeilen fuer Schrauben der B24 und B25) wenn die Schraube nicht montiert werden kann

-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

NX



A (2:1)



B25 mit B24

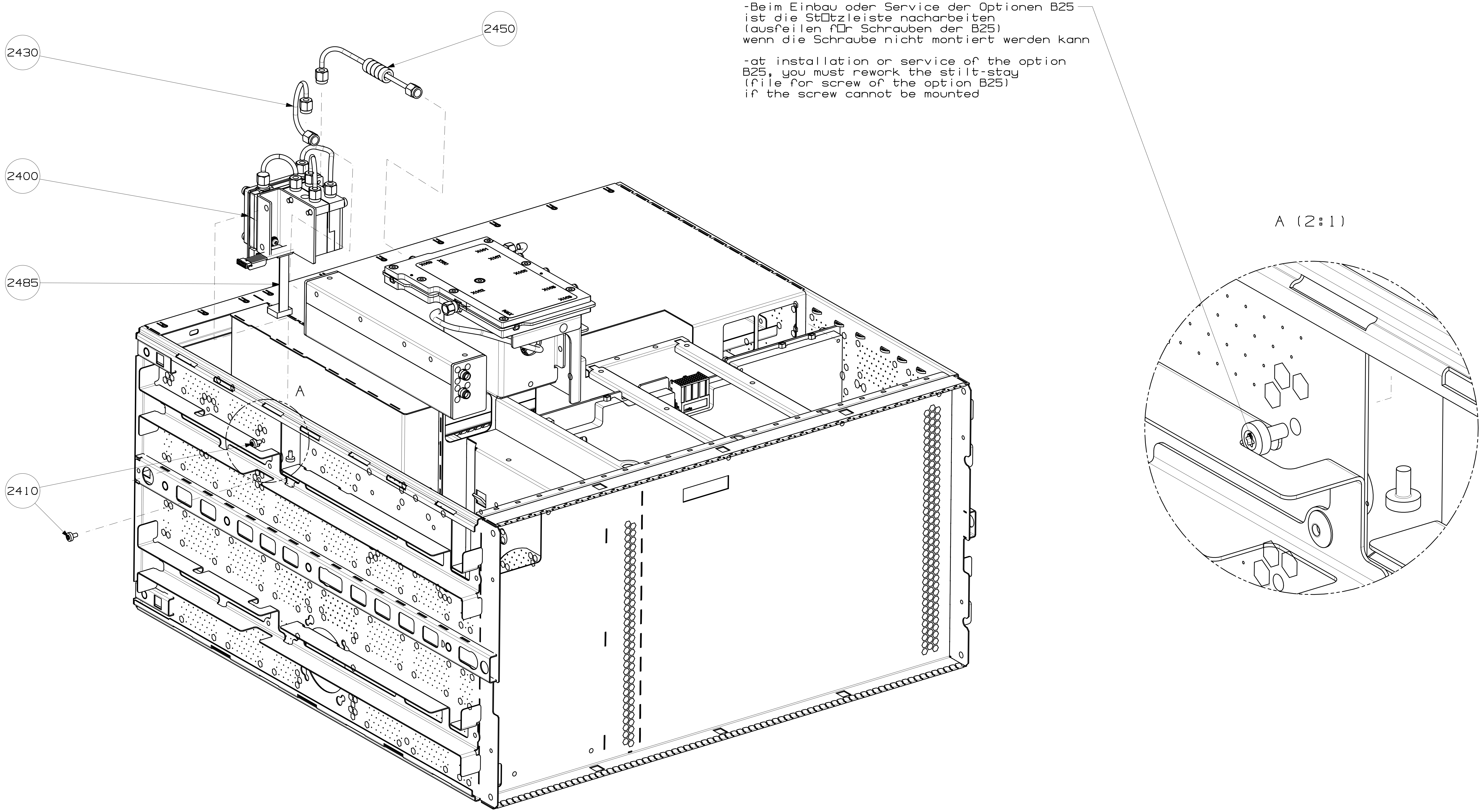
VAR02 = 13GHz
MOD02 = 13GHz

Maßstab / Scale	1:2	Toleranz / Tol.		Werkstoff / Material			
ROHDE&SCHWARZ		Benennung / Designation: EINBAUANWEISUNG FSW-B25 ASSEMBLY INSTRUCTION FSW-B25			Sprache / Lang.: de en	Äv. / C.I.: 03.00	Blatt / Sh.: 4
					Zeichnr. / Drawing No.: 1313.3783.00		D
FSW		Datum / Date: 2012-01-19	Abteilung / Dept.: 1ESK	Name / Name: AN			

Projektions-methode
Projection Method

-Beim Einbau oder Service der Optionen B25
ist die St□tzleiste nacharbeiten
(ausfeilen f□r Schrauben der B25)
wenn die Schraube nicht montiert werden kann

-at installation or service of the option
B25, you must rework the stilt-stay
(file for screw of the option B25)
if the screw cannot be mounted



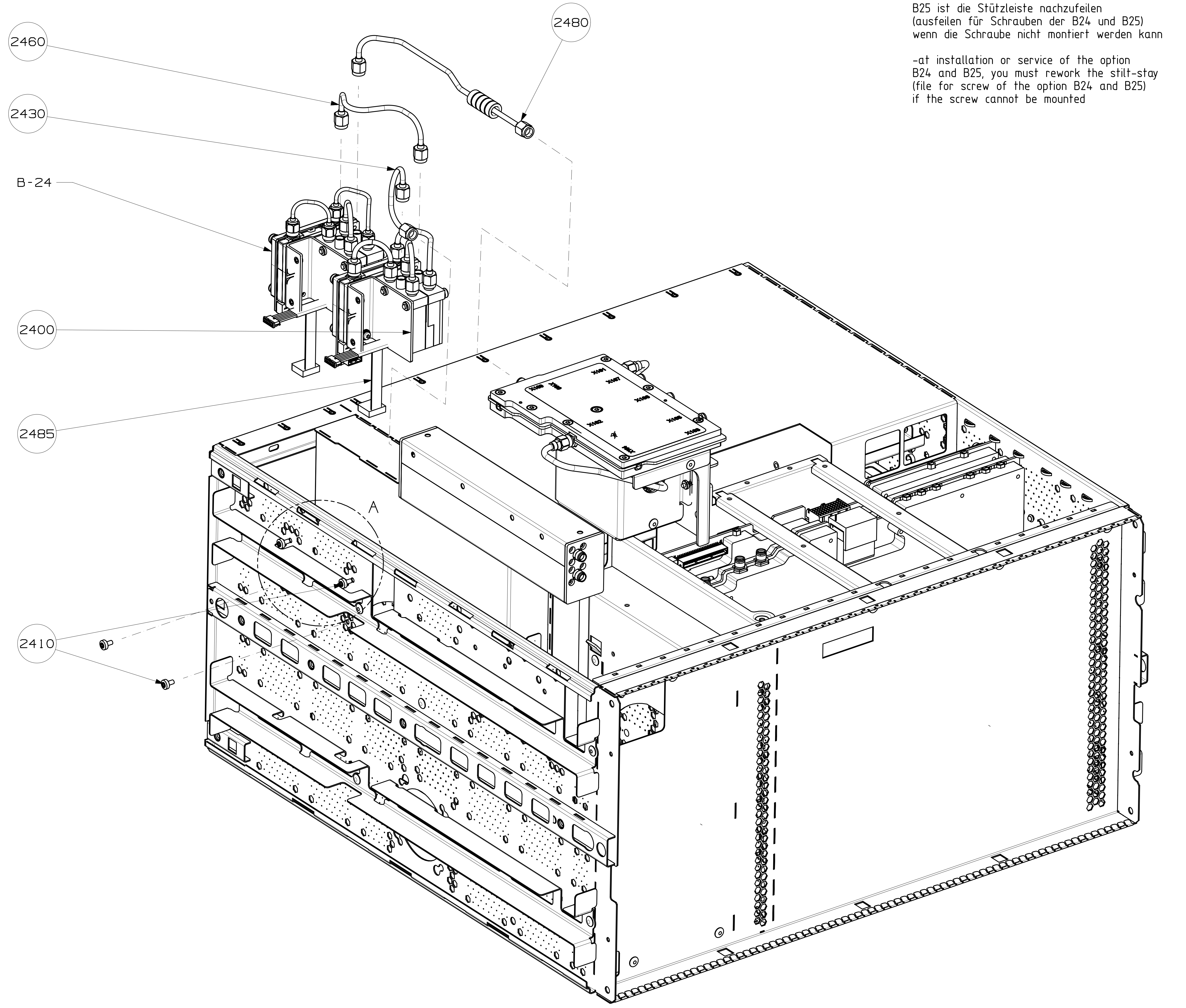
VAR02 = 26GHz
MOD02 = 26GHz

Maßstab / Scale 1:2	Toleranz / Tol.	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B25 ASSEMBLY INSTRUCTION FSW-B25		Sprache / Lang. de en	Änd. / C.I. 03.00	Blatt / Sh. 5
FSW	Datum / Date 2012-01-18	Abteilung / Dept. 1ESK	Name / Name AN	Zeichn.Nr. / Drawing No. 1313.3783.00	D

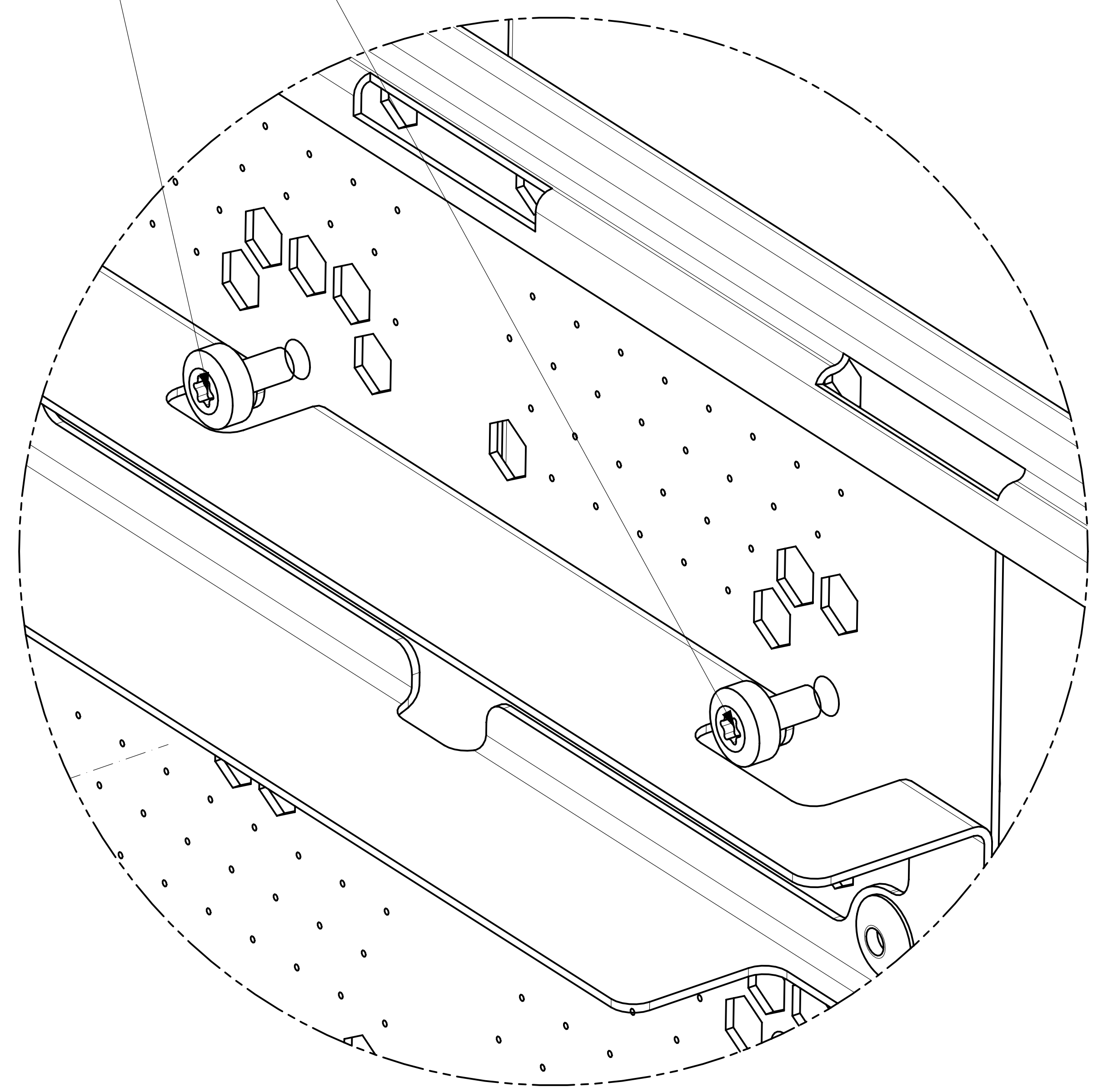
Projektions-methode
Projection Method

- Beim Einbau oder Service der Potionen 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



A (2:1)



B25 mit B24

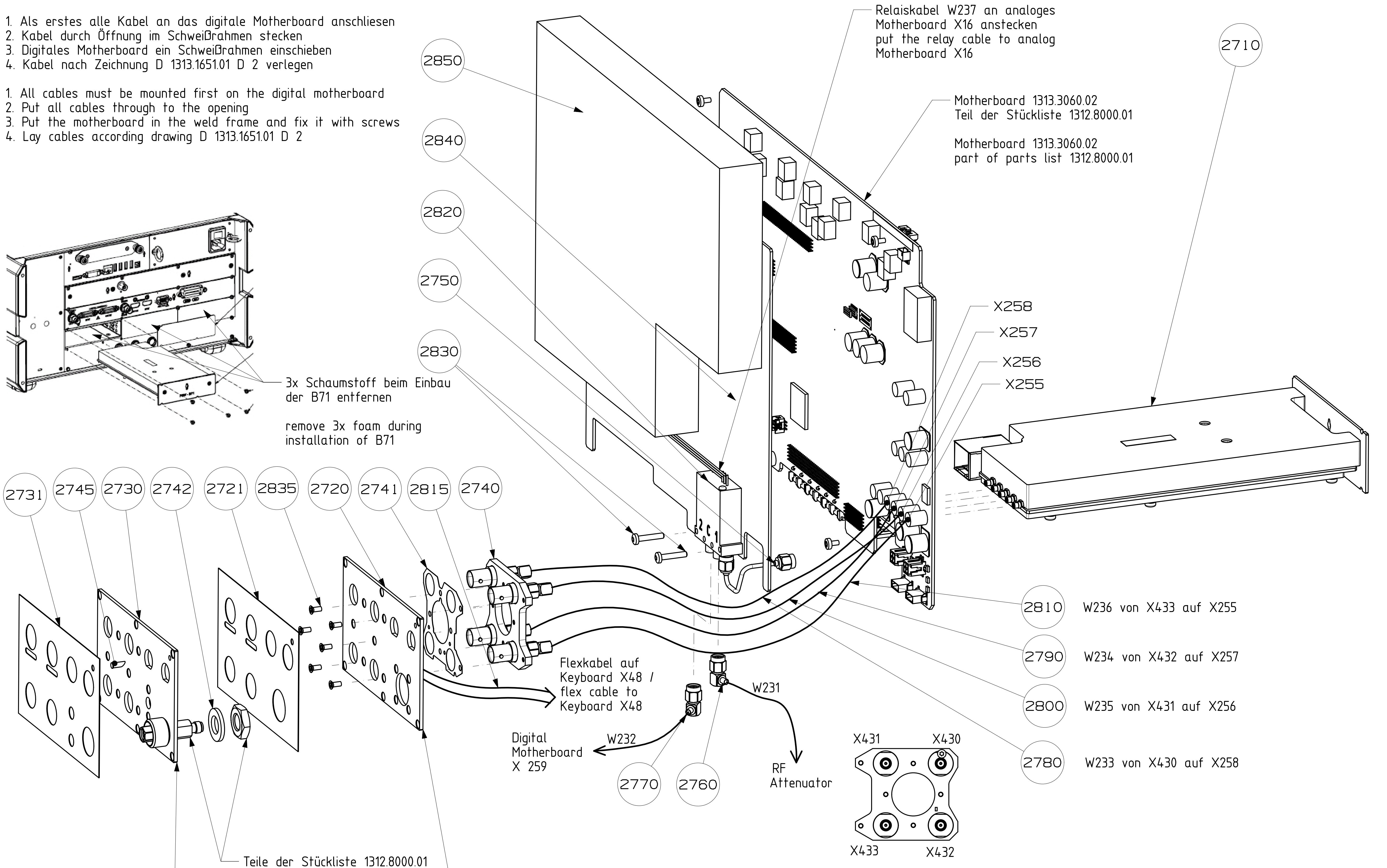
VAR02 = 26GHz
MOD02 = 26GHz

Maßstab / Scale: 1:2	Toleranz / Tol		Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B25 ASSEMBLY INSTRUCTION FSW-B25			Sprache / Lang: de en	Änd. / C.I.: 03.00	Blatt / Sh: 6
FSW	Datum / Date: 2012-01-20	Abteilung / Dept: 1ESK	Name / Name: AN	Zeichn.Nr. / Drawing No.: 1313.3783.00		D

Projektionsmethode
Projection Method

1. Als erstes alle Kabel an das digitale Motherboard anschliesen
2. Kabel durch Öffnung im Schweißrahmen stecken
3. Digitales Motherboard ein Schweißrahmen einschieben
4. Kabel nach Zeichnung D 1313.1651.01 D 2 verlegen

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 1313.1651.01 D 2



NX

Projektions-methode / Projection Method

Maßstab / Scale: 1:2	Toleranz / Tol.: ISO2768-m	Werkstoff / Material:	
ROHDE&SCHWARZ	Benennung / Designation: FSW-B71 ANALOG BASE BAND INPUTS FSW-B71 ANALOG BASE BAND INPUTS	Sprache / Lang.: de en	Aei. / C.I.: 03.00 — Blatt / Sh.: 1
FSW-B71	Datum / Date: 2013-01-10 — Abteilung / Dept.: 1ESK — Name: AN	Zeichn.Nr. / Drawing No.: 1313.1651.01 D	

A3

Installation

- Gerät ausschalten und Netzstecker ziehen.
- Zum Einbau der Option B71 muss das digitale Motherboard ausgebaut werden.
- Digitales Motherboard 1312.8152.02 durch 1313.2070.01 TAZ ≥ 01.05 austauschen.
- Auf den digitalen Motherboard 1313.2070. TAZ ≤ 01.04 sind Modifikationen vorzunehmen.
  - R365 und R366 entfernen (siehe Bestückungszeichnung)
  - R399,R400,R401,R402 durch 0R ersetzen (0R=0041.0192.00) (siehe Bestückungszeichnung)

- Kabel nach D 1313.1651.01 D 1 montieren.
- Digitales Motherboard wieder einbauen
- Rückwandblech lösen und die Option B71 einschieben.
- Beim Einschieben darauf achten, dass die seitlichen Führungen getroffen werden.
- Nach dem Einschieben die Baugruppe mit den 5 Rückwandschrauben festschrauben.
- Option B71 nach D 1313.6082.00 D 2 einbauen.

Firmware
- Option FSW-B71 erfordert die Firmware version 1.61 oder höher.

License Key (nur erforderlich für FSW-B71E)
- 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 ob die Optionsliste den Eintrag "Analog Baseband Input B71" enthält.
  und bei Option FSW-B71E zusätzlich "Analog Baseband 80MHz B71E" enthält

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

Kalibrierung
- laut Performance Test

Keine weiteren Funktionstest erforderlich!

Installation

- switch off the instrument and disconnected the power plug
- the digital Motherboard must be demount to install the Option B71
- Digital motherboard 1312.8152.02 replace to 1313.2070.02 TAZ ≥ 01.05
- on the digital motherboard 1313.2070.02 TAZ ≤ 01.04 are making modifications
  - R365 and R366 remove (see layout drawing)
  - R399,R400,R401,R402 replace to 0R (0R=0041.0192.00) (layout drawing)

- cable mounting to D 1313.1651.01 D 1
- put the digital motherboard into die device
- unscrew the rear panel and insert the option B71
- when pushing in make sure that the slides are met
- after inserting, fix the module with the 5 rear screws
- Option B71 mounting to D 1313.6082.00 D 2

Firmware
- Option FSW-B71 requires Firmware version 1.61 or higher.

License Key (only for FSW-B71E)
- 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:

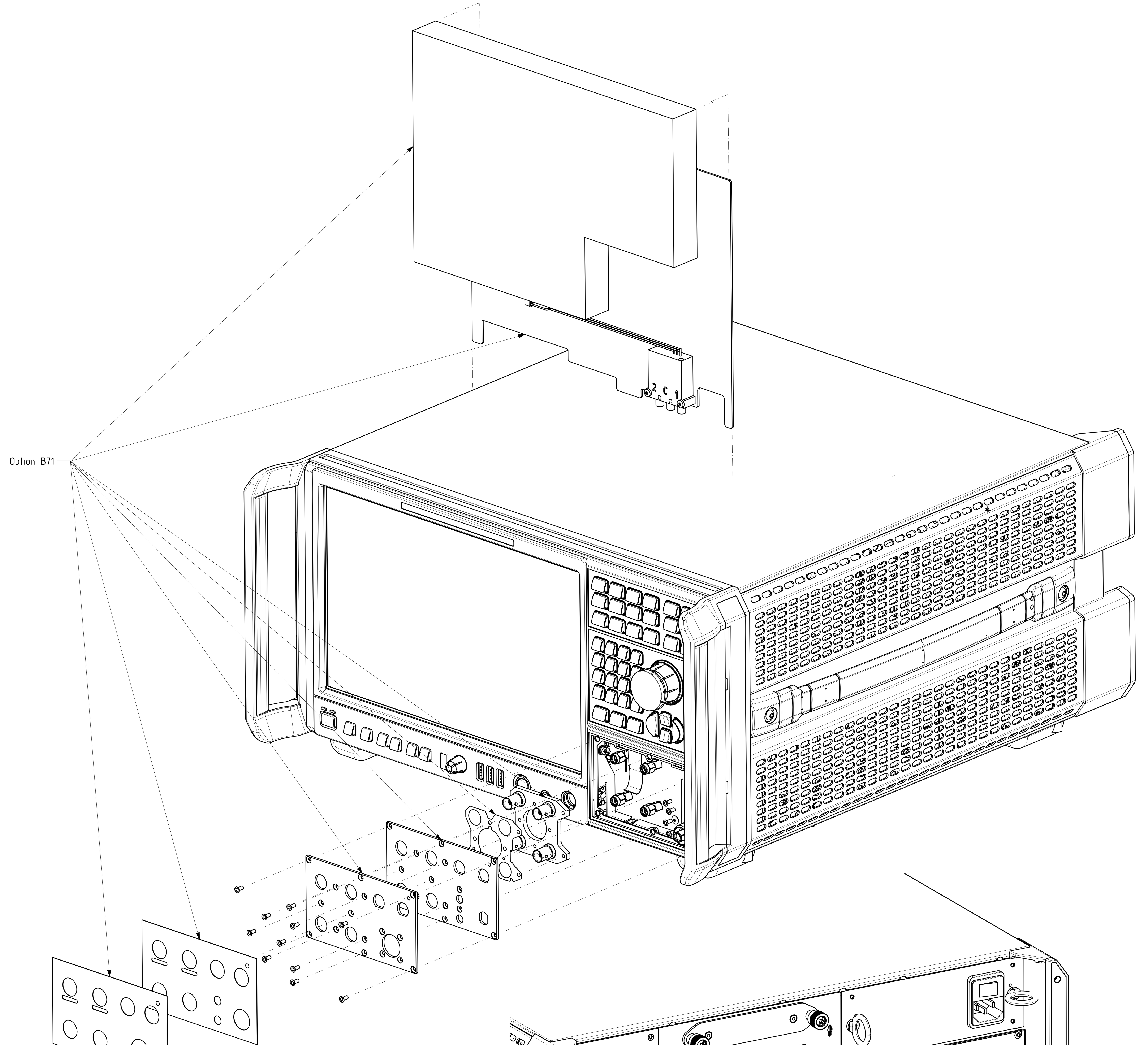
SETUP:System Config: Versions+Options
- check the option list for "Analog Baseband Input B71"
  and additionally for Option FSW-B71E "Analog Baseband 80GHz"

Selftest
- run selftest
- press: SETUP: Service+Support: Selftest: Start selftest
- wait until selftest has finished
- check for Selftest state = PASSED (in the text box)

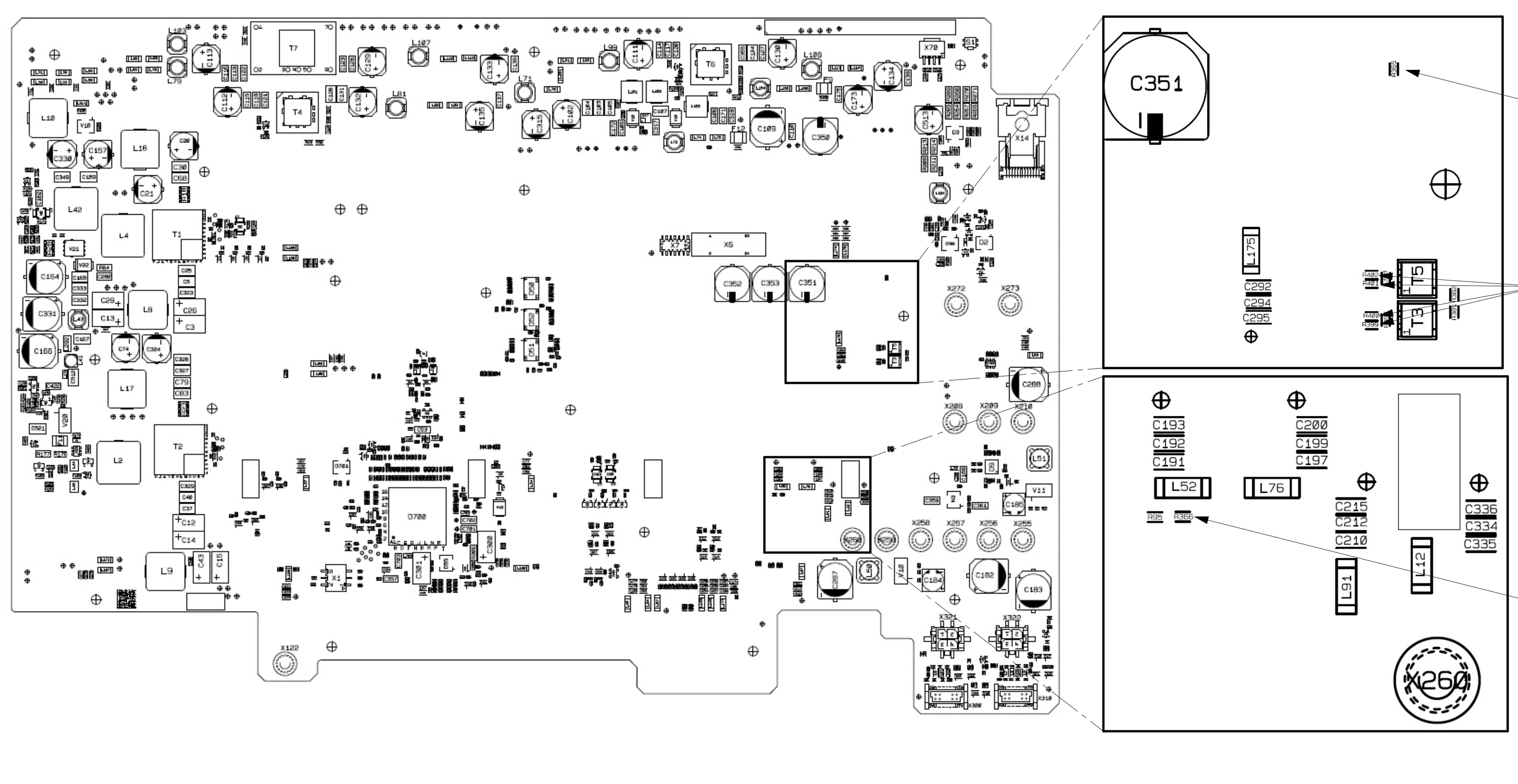
Alignment
- run selfalignment, mandatory !
- press: SETUP: Alignment: Start self alignment
- wait until self alignment has finished
- check for Alignment state = PASSED (in the text box)

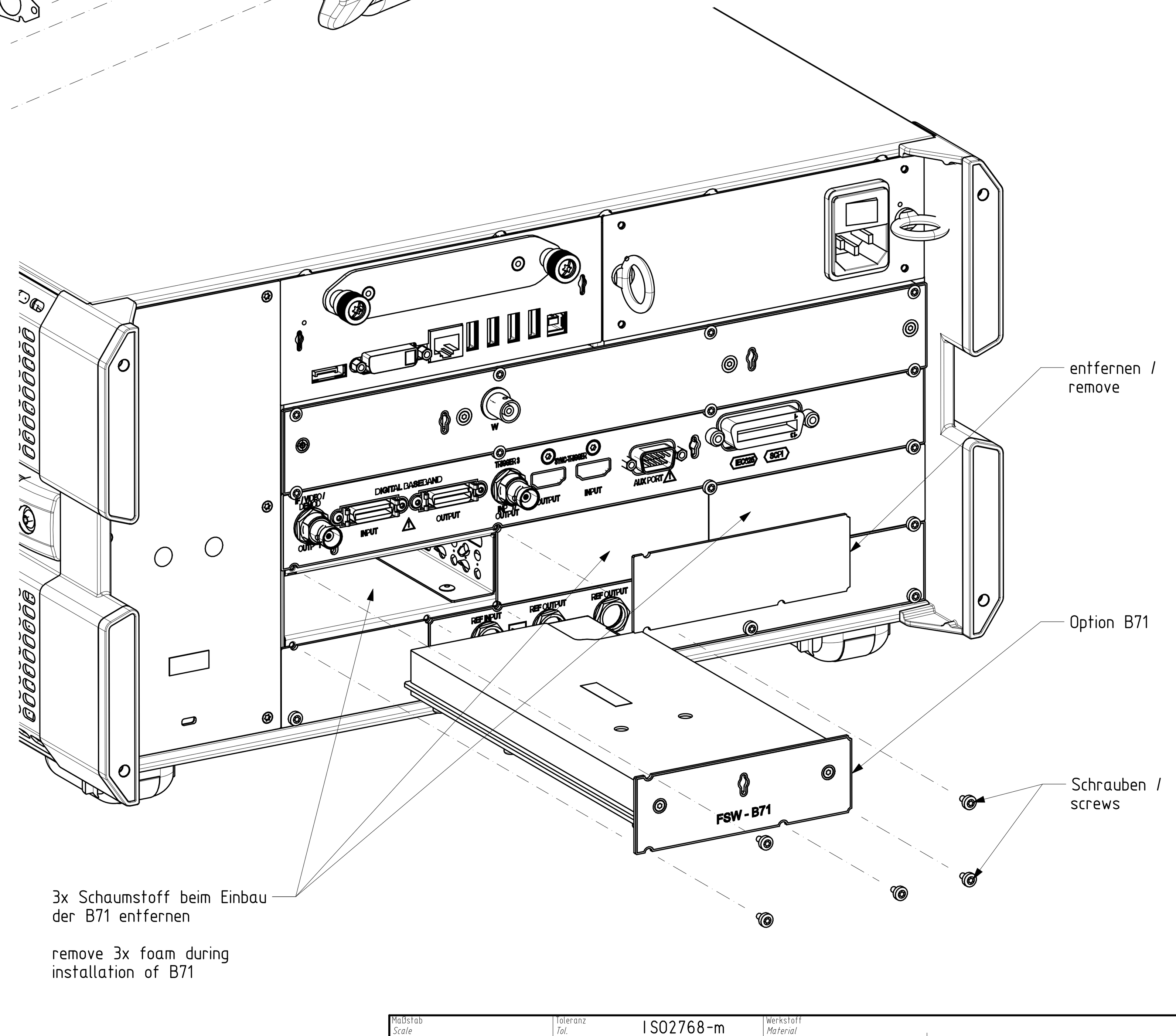
Calibration
- according to performance test

No more functional tests necessary !



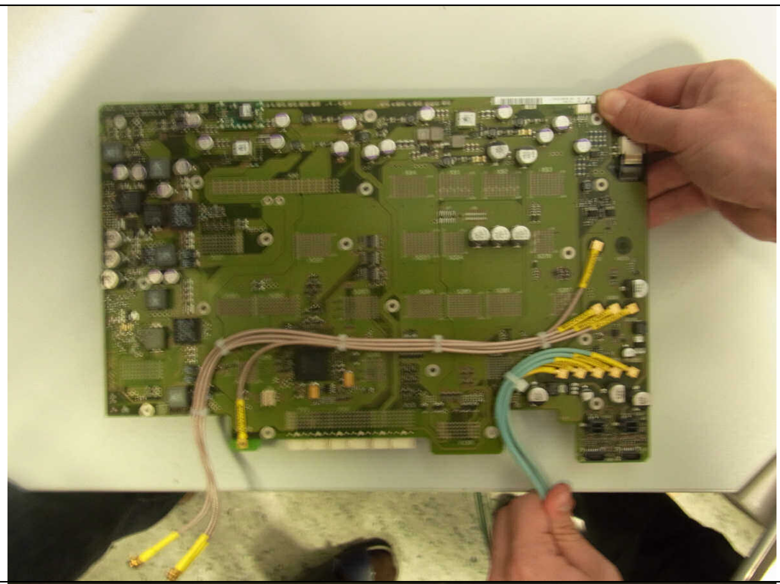
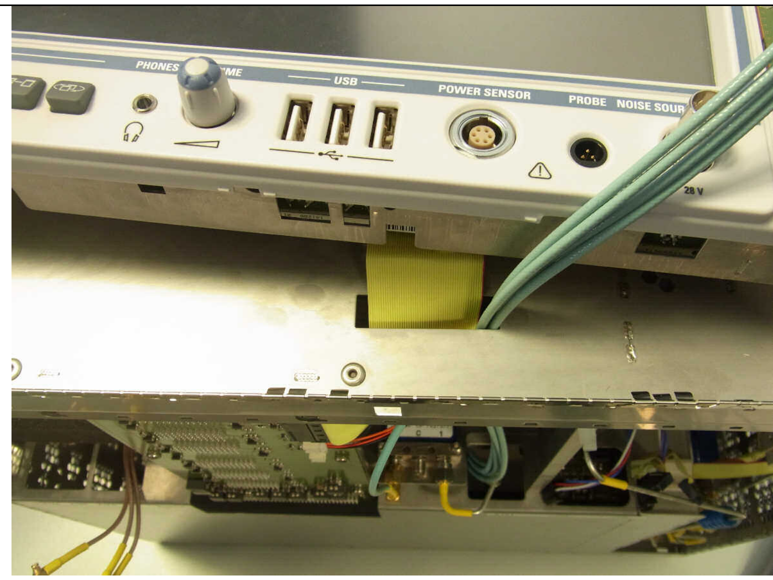
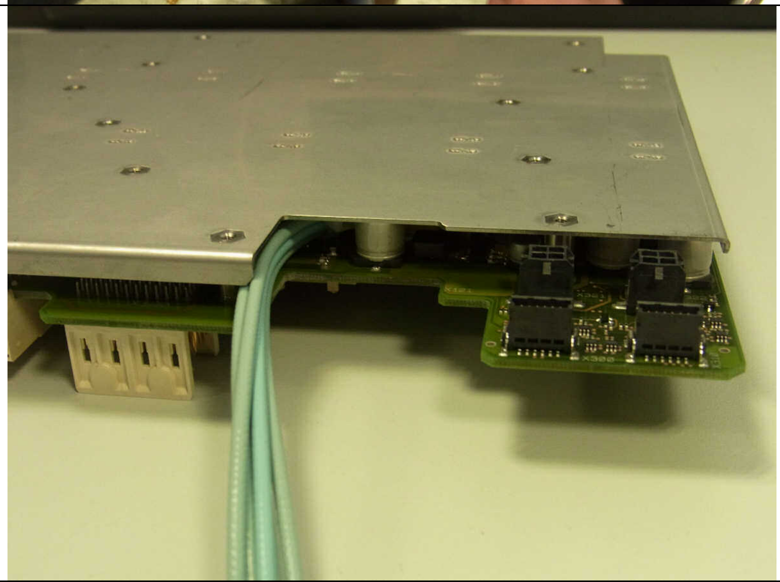
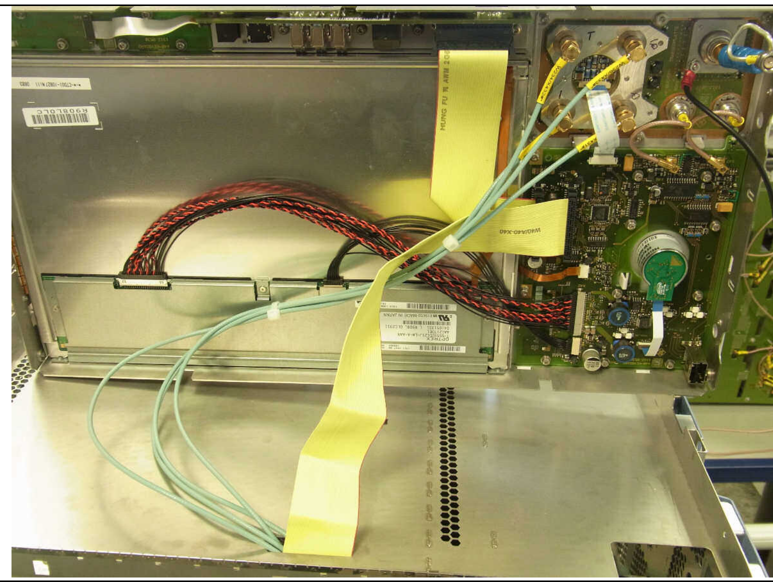
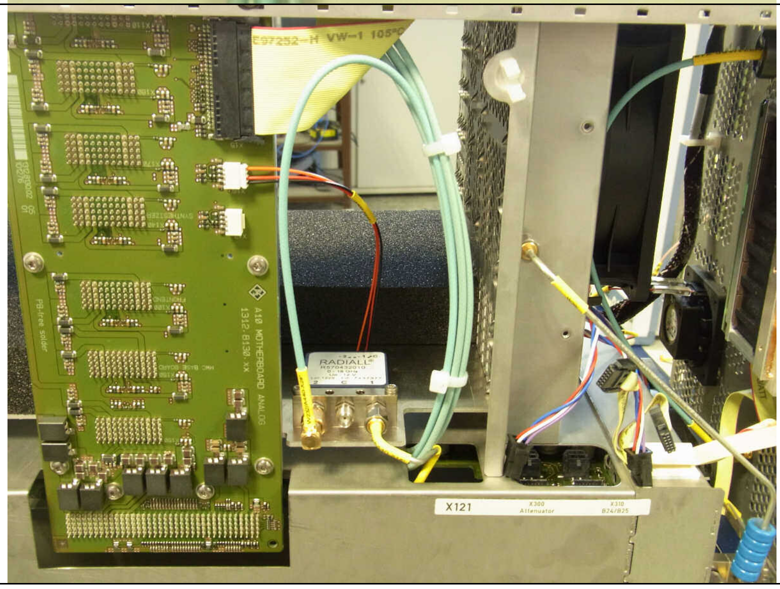
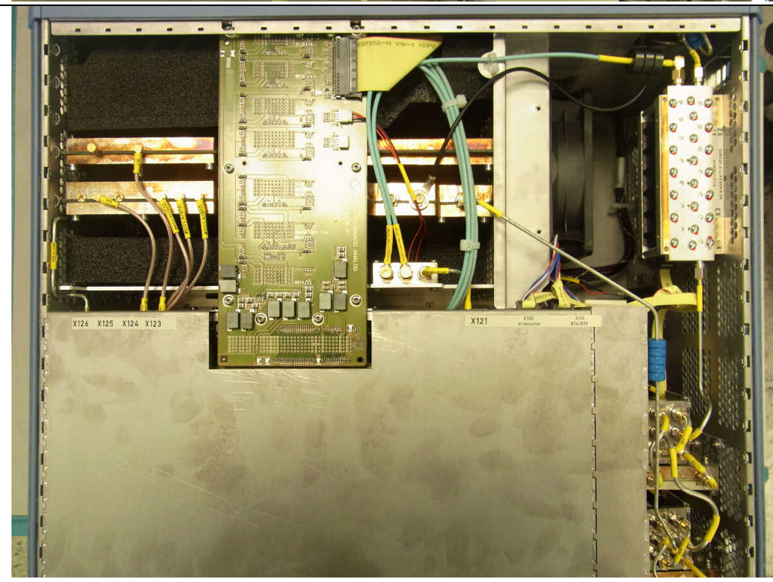
Bestückungszeichnung / layout drawing





Projektionsmethode / Projection Method

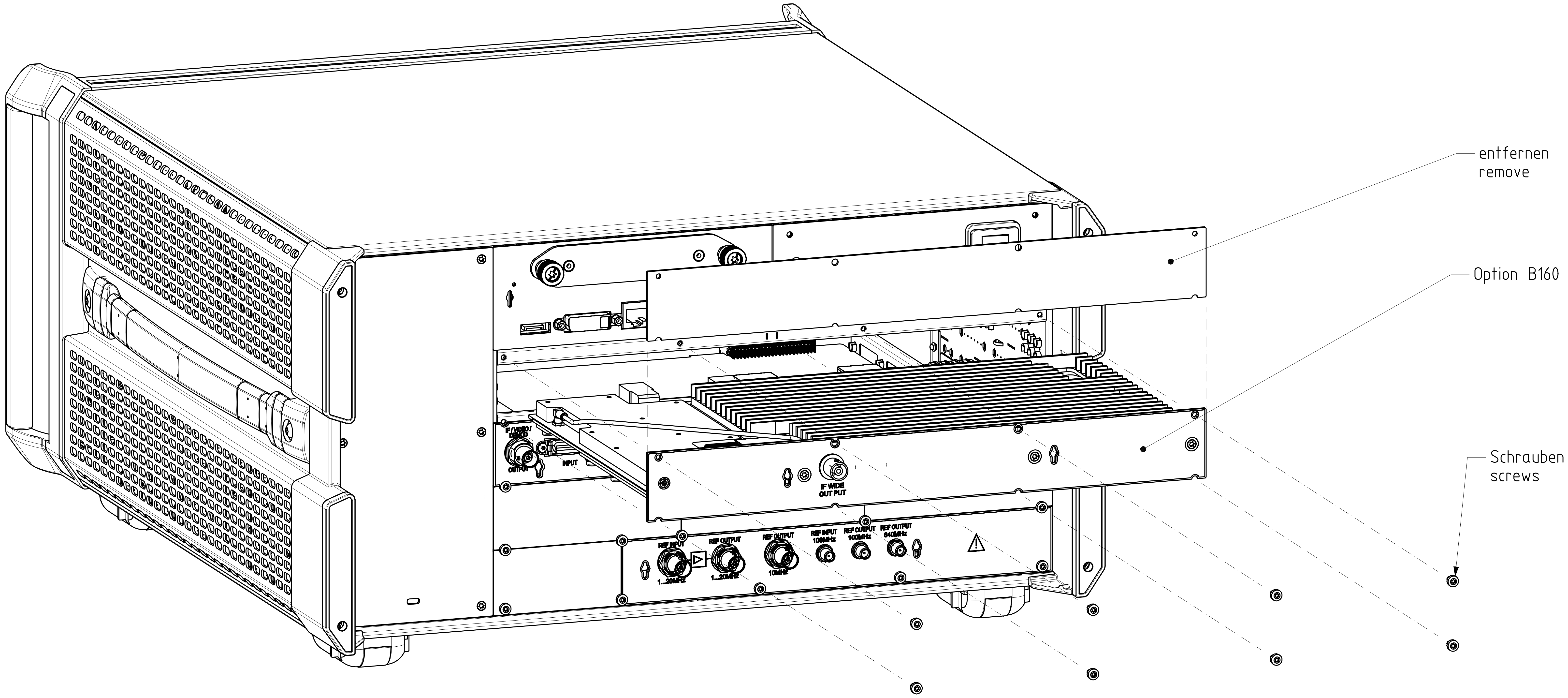
ROHDE&SCHWARZ	IS02768-m	
	EINBAUANWEISUNG B71 / ASSEMBLY INSTRUCTION B71	de en 04.00 1
FSW-B71	2013-01-10 1ESK AN	1313.6082.00 D

1.		Alle blauen Kabel in Motherboard einstecken / Put all blue cables into the motherboard	**4.**		Blaue Kabel (4x) durch Schweißrahmen zur Front führen / Put the blue cables (4x) through to the frontside of the welding frame
2.		Blech montieren / Mounting the sheet metal	**5.**		Blaue Kabel an Flanschkuppler anschliessen / Connect cables on flange plate Kabelbinder montieren / Mounting Ty-raps Fronteinheit montieren / Mounting the front-Unit
3.		Blaue Kabel von oben durch Schweißrahmen einführen (Öffnung) / Put the blue cables from above into the welding frame (opening) Motherboard in Schweißrahmen einschieben / Put the motherboard into the welding frame Blech mit Relais einschieben und Kabel anschliessen / Put the sheet metal with relay into the welding frame	**6.**		Ansicht von unten / Bottom view

Montagereihenfolge am Beispiel FSW 8/13 >> Montage bei höher frequenten Geräten identisch /

Assemble sequence on FSW8/13 >> same assemble for higher-frequency devices

ROHDE&SCHWARZ	Benennung/*Designation* EINBAUANWEISUNG B71 ASSEMBLEY INSTRUCTION B71			Sprach./Lang De en	Ä.I. / C.I 01.00	Blatt/Sheet 2
FSW-B71	Datum/ *Date* 26.09.2012	Abt. / *Dept.* 1ESK	Name / *Name* AN	Dokument Nr. / Document No. 1313.6082.00		



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 the option list for 160 MHz IQ Demod. Bandwidth-B160

Selftest
- 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 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 ob die Optionsliste den Eintrag "160 MHz IQ Demod. Bandwidth-B160" enthält.

Selbsttest
- Selbsttest starten
- Drücken: SETUP: Service+Support: Selftest: Start Selftest
- Warten bis der Selbsttest beendet ist
- Kontrollieren ob "selftest state = PASSED" im Textfeld steht

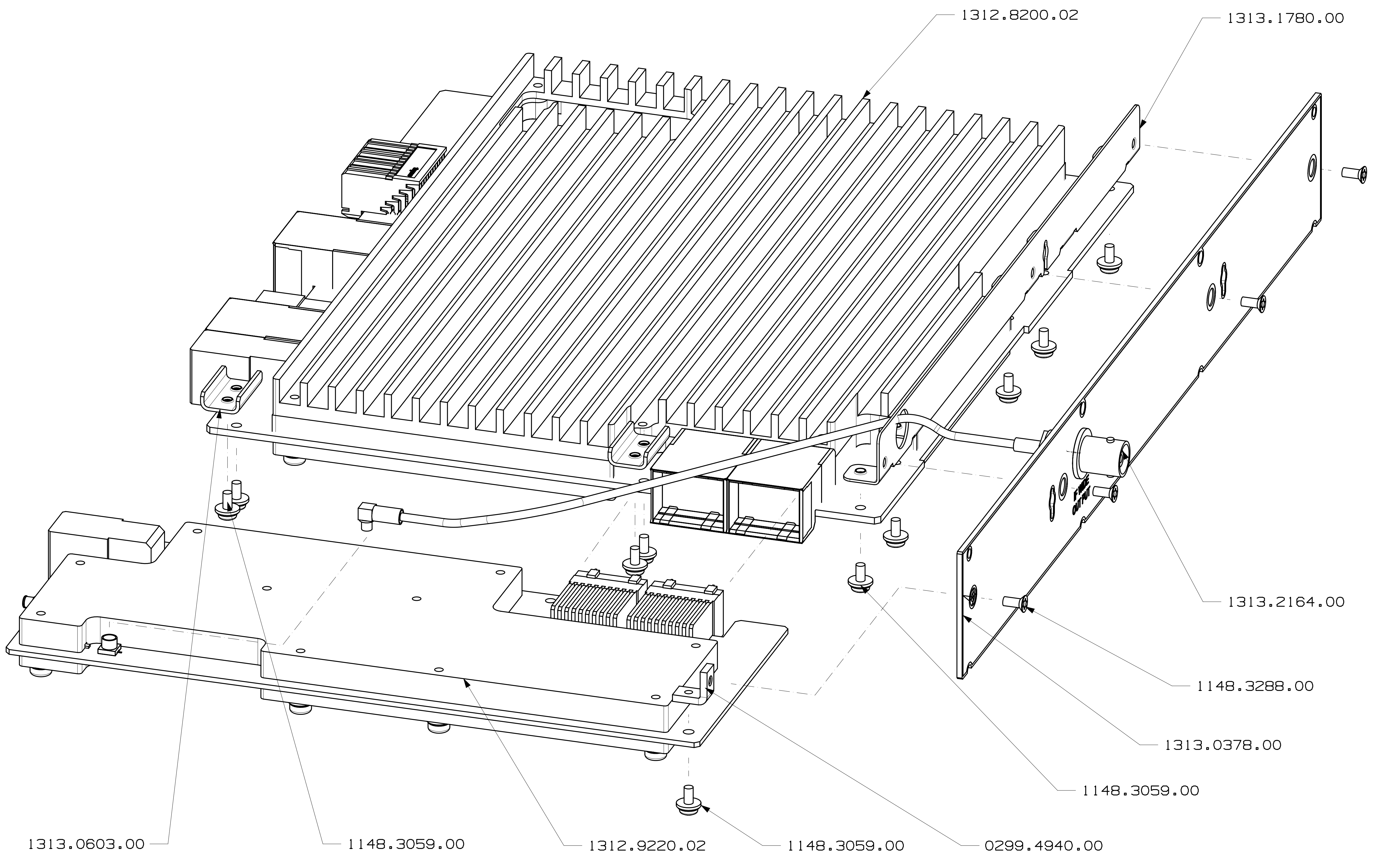
Abgleich
- Selbstabgleich durchführen, ist verpflichtend !
- Drücken Sie: SETUP: Alignment: Start self alignment
- Warten bis der Selbstabgleich beendet ist.
- Kontrollieren ob "Alignment state = PASSED" im Textfeld steht

Keine weiteren Funktionstest erforderlich!

NX

Projektionsmethode
Projection Method

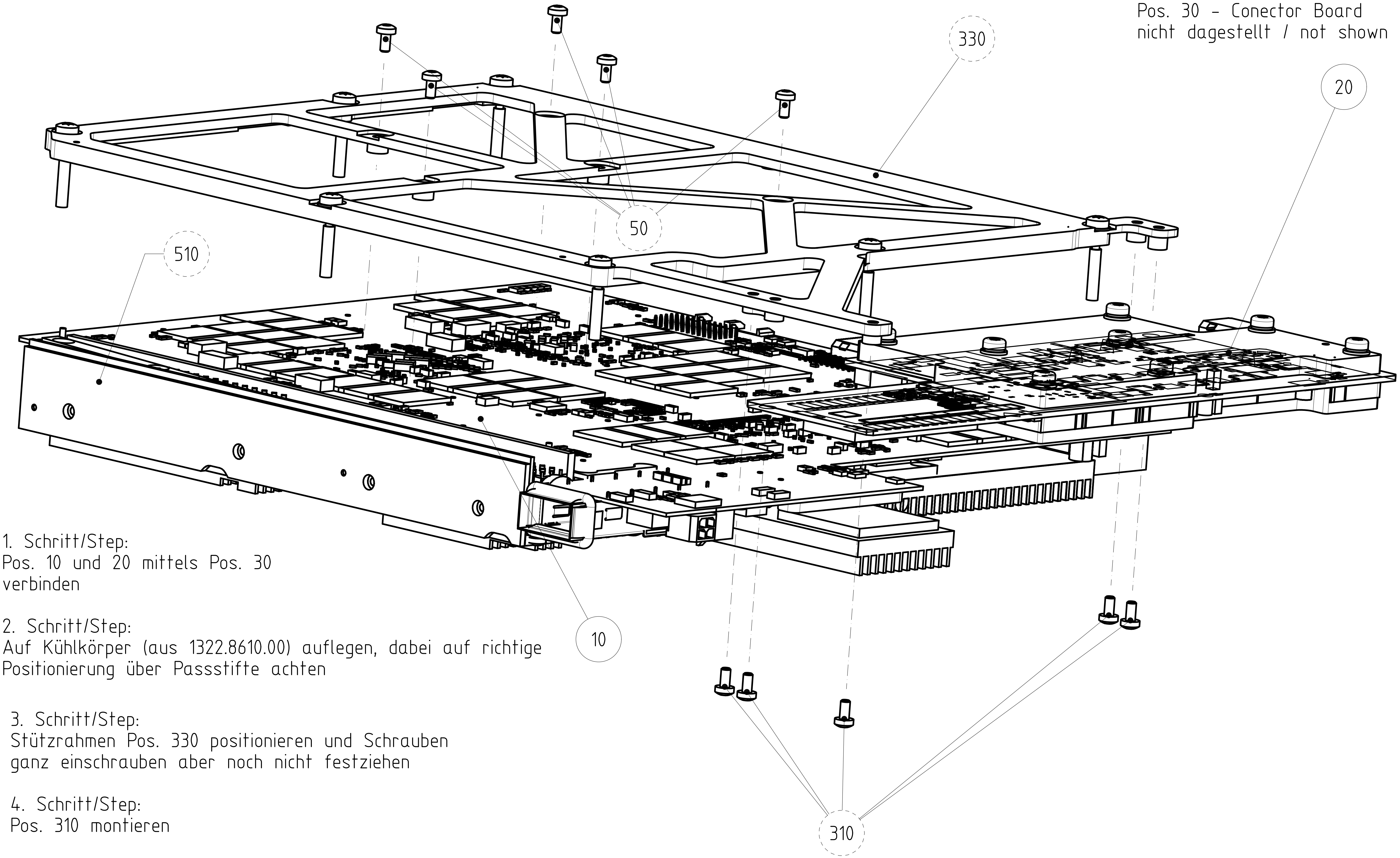
Maßstab / Scale: 1:2	Toleranz / Tol: ISO2768-m	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW OPTION B160 ASSEMBLY INSTRUCTION FSW OPTION B160		Sprache / Lang: de en	Ä.I. / C.I.: 03.00	Blatt / Sh: 1
FSW-B160	Datum / Date: 2012-05-29	Abteilung / Dept: 1ESK	Name: AN	Zeichn.Nr. / Drawing No.: 1313.3777.00	D



Projektions-
methode
Projection
Method

Maßstab / Scale: 1:1	Toleranz / Tol.	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: 160MHZ ANALYSEBANDBREITE 160MHZ ANALYSIS BANDWIDTH	Sprache / Lang.: de en	Aei. / C.I.: 02.00 — Blatt / Sh.: 1
FSW-B160	Datum / Date: 2011-12-05 — Abteilung / Dept.: 1ESK — Name / Name: AN	Zeichn.Nr. / Drawing No.: 1313.1668.01	D

Pos. 30 - Conector Board
nicht dagestellt / not shown



1. Schritt/Step:
Pos. 10 und 20 mittels Pos. 30
verbinden

2. Schritt/Step:
Auf Kühlkörper (aus 1322.8610.00) 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. 510 an Passstifte des Kühlkörpers ausrichten
und mit Sekundenkleber fixieren

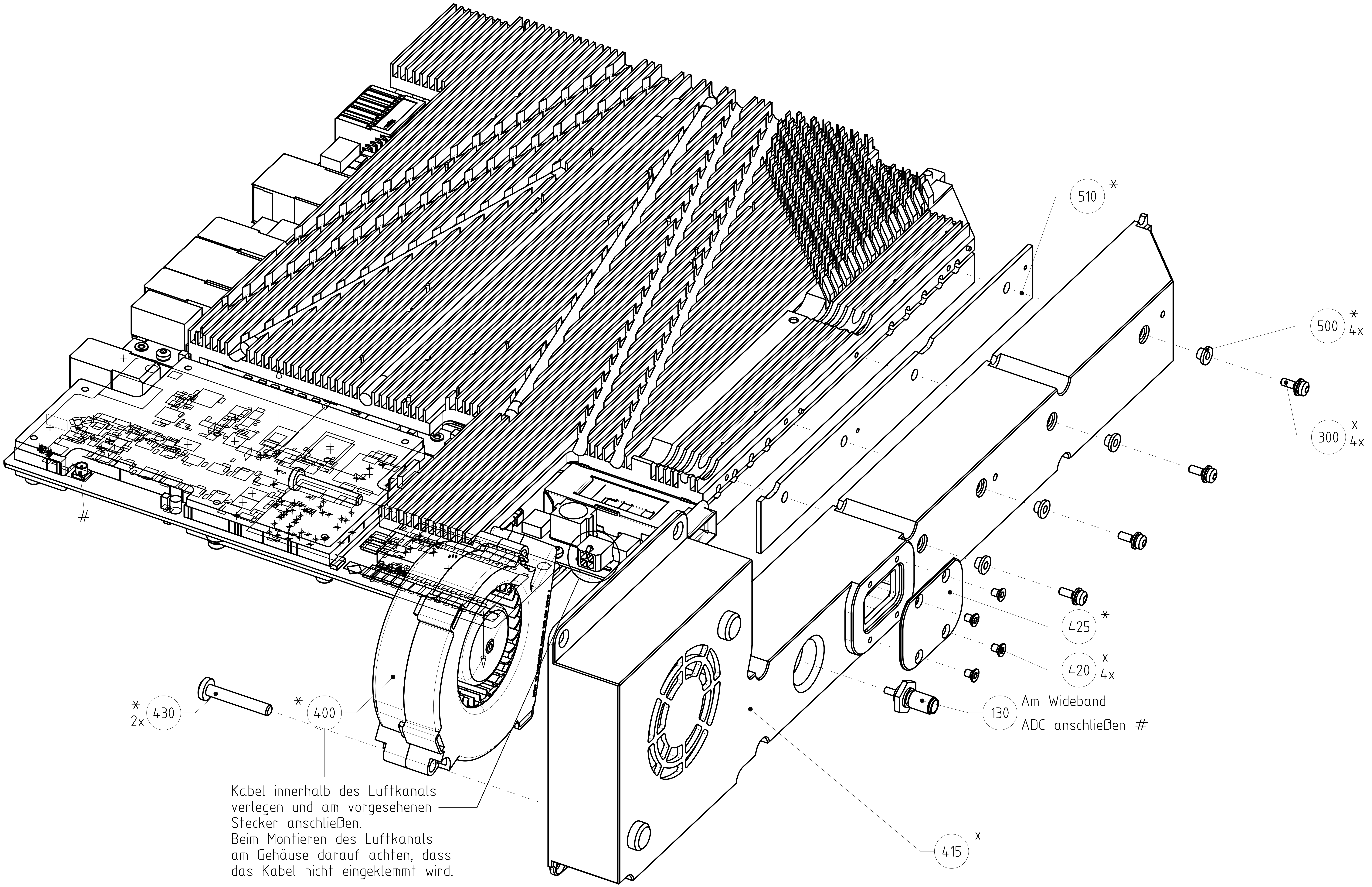
Achtung: dargestellte
Pos. 50; 310; 330 und 510 aus 1322.8610.00 !

NX

Projektions-methode
Projection Method

A3

Maßstab / *Scale*	Toleranz / *Tol.* ISO2768-m	Werkstoff / *Material*				
ROHDE&SCHWARZ	Benennung / *Designation* FSW-B500 ANALYSIS BANDW. 500MHZ FSW-B500 ANALYSIS BANDW. 500MHZ			Sprache / *Lang.* de en	Aei. / *C.I.* 03.00	Blatt / *Sh.* 1
FSW-B500	Datum / *Date* 2013-10-29	Abteilung / *Dept.* 1ESK	Name / *Name* BC/Ba	Zeichn.Nr. / *Drawing No.* 1313.4296.01		D



* Positionsnummern aus 1322.8610.00
order positions from 1322.8610.00

Maßstab / Scale: 1:1	Toleranz / Tol: ISO2768-m	Werkstoff / Material		
ROHDE&SCHWARZ	Benennung / Designation: FSW-B500 ANALYSIS BANDW. 500MHZ FSW-B500 ANALYSIS BANDW. 500MHZ	Sprache / Lang: de en	Rev. / C.I.: 01.00	Blatt / Sh: 2
FSW-B500	Datum / Date: 2013-10-29 · Abteilung / Dept: 1ESK · Name: Ba/Bc	Zeichnungsnr. / Drawing No.: 1313.4296.01		D

Projektionsmethode / Projection Method

A2

5.2 Documents for R&S FSW67

This chapter provides information on the ordering of spare parts and contains the spare part list and the documents for the complete R&S FSW67 unit.

5.2.1 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	1313.6999.00
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
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
50	EL SPEAKER HOLDER 50	1313.0110.00
60	LAUTSPRECHER KABEL	1313.0284.00
71	ED MOTHERBOARD DIGITAL VAR 67	1313.7695.02
650	DV RF CABLE W5	1312.9642.00
655	DV RF CABLE W6	1312.9659.00
703	DV RF CABLE W19	1313.0290.00
705	DV RF CABLE W22	1313.0755.00

ItemNo.	Designation	Stock No.
78	DZ CABLE HOLDER	6124.0368.00
81	ZN HOLDER MOTHERBOARD DIGITAL	1313.7889.00
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	1313.7695.02
125	DZ CABLE-HOLDER	1093.9045.00
137	NJ POWER SUPPLY UNIT	1321.5417.02
141	NR IPC 11/4	1206.3216.00
161	ZN MODULE BACKPLANE IPC11	1322.8661.00
162	KB BACKPLANE IPC11 LABELED	1322.8278.00
163	VS 965/ISR-M2.5X6-A4-PA	1148.3288.00
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
220	ZM SOLID STATE DRIVE FSW	1312.9320.02
250	CHIPCARD SERVICE KIT SLE66 V4.4 SIM FORMAT REMOTE ACTIVATION	1201.5610.03
322	ZE 6-STEP ATTENUATOR 75DB 67GHZ C	1170.0107.03

ItemNo.	Designation	Stock No.
340	DY ATTENUATOR CABLE	1312.9607.00
350	EE SYNTHESIZER 17G	1312.8100.02
356	FJ COAXIAL TERMINATION FEMALE	5354.1422.00
357	TERMINATION 50 OHM	0249.7823.00
360	EE FRONTEND 8 GHZ	1312.8046.02
370	EE DETECTORBOARD	1312.8175.02
380	EE REFERENCE	1312.8075.06
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 MULTIPIER 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 2 (67GHz)		
413	ZE MW CONVERTER UNIT 43GHZ	1312.8323.67
1603	MW CONVERTER FRONTEND 43 GHZ	1321.5681.02
1613	ZE YIG-FILTER 7-50GHZ WITH CABLES	1321.8075.02
1620	ZE TRIPLEXER 50	1301.0503.03
1630	EE TRIPLEXER BOARD 43GHZ	1313.4844.02
None	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
425	AZ INSULATING	3587.8225.00
436	EE MWC50 BASE BOARD	1313.4215.03
450	DG IPASS CABLE 26 PIN	1313.1680.00
455	DZ CABEL TIE	1308.1028.00
520	DY FRONT CABLE W40	1312.9588.00

ItemNo.	Designation	Stock No.
530	AZ LIGHT PIPE	3586.5216.00
560	DV RF-CABLE W50	1312.9388.00
616	FJ ADAPTER RPC-1.85F-M	3589.1292.00
621	DW HF-KABEL W1 (50GHZ)	1313.5486.00
632	DW RF CABLE W2 (50GHZ)	1313.5528.00
640	DW RF-CABLE W3	1312.9465.00
645	DW RF CABLE W4	1312.9471.00
650	DW RF CABLE W5	1312.9642.00
655	DW RF CABLE W6	1312.9659.00
660	DV RF CABLE W7	1312.9507.00
665	DV RF CABLE W8	1312.9513.00
670	DW RF CABLE W9 (LO2)	1312.9520.00
671	DW RF CABLE W9 (LO2) 50GHZ	1313.5886.00
681	DV RF CABLE W11 (43GHZ)	1313.5870.00
687	DW HF-KABEL 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
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 RÜCKWAND ABDECKUNG 1 BEDRUCKT	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
741	MZ GERAETEDECKEL ANALOG 2	1322.7920.00
742	MZ LUEFTERDECKEL FSW T450	1313.6918.00
770	OS INLAYLABEL KEYBOARD FSW	1312.9788.00

ItemNo.	Designation	Stock No.
780	OS INLAYLABEL JACKPANEL FSW	1312.9594.00
900	KN BW2010 5E FRONTGRIFF	1174.3981.00
905	VS SCHR. M4X21-ISR-PA	1096.4996.00
910	MM ABDECKSTOPFEN	1174.5378.00
916	MF FRAESPROFIL FSW	1322.7694.00
917	MZ ABDECKKLEBESTREIFEN	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
930	MZ BW2010 5U T450 SIDE PANEL	1176.3672.00
935	MM BW2010 3E HANDLE T450	1174.6322.00
940	MM BW2010 3E COVERHANDLE	1174.6397.00
946	ZN ABDECKUNG OBEN	1322.8303.00
951	ZN ABDECKUNG UNTEN	1322.8284.00
None	MZ BW2010 ADJUSTMENT SPRING	1174.0860.00
1026	RF-CABLE W134	1313.5905.00
1027	RF CABLE W135	1313.5957.00
1120	SUPPORT RAIL	1313.3790.00
1130	SCREW M2.5X5-ISR-PA	1096.4973.00
1185	FJ ABSCHLUSSW.50OHM SMA 0.5W	0249.7823.00
1186	FJ ABSCHLUSS SMP BU 1W 4GHZ	5354.1422.00
None	LITHIUM BATTERY CR2032	0858.2049.00
None	HS SYSTEM DRIVE WITH SOFTWARE FSW	1312.9336.03
Drawing Frontpanel 1312.8023.01		
1000	KB FRONTCOVER FSW (PRINTED) #	1312.9613.00
	# order also	
	OS INLAYLABEL KEYBOARD FSW	1312.9788.00
	VAR 67	1313.7637.00

ItemNo.	Designation	Stock No.
1020	SF RUBBER KEYPAD SET	1312.8523.00
1036	ED FRONTPANEL KEYBOARD FSW	1312.8530.03
1050	ED FRONTCONNECTOR FSW	1312.8275.02
1100	ZM DISPLAY WITH TOUCHSCREEN 12.1 INCH	1313.1268.00
1150	EM ROTARY PULS-GENERATOR 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-B24 1313.5792.00		
-	GM FSW-B24 RF PREAMPLIFIER 43GHZ	1313.0832.67
Drawing R&S FSW-B4 1313.2758.00		
-	OCXO-OPTION BOARD	1312.8230.02
Drawing R&S FSW-B8		
370	DETECTOR BOARD	1312.8175.08
Drawing FSW-B10 1313.7489.00		
-	EE EXT GEN CONTROL	1313.1751.02
Drawing FSW-B21 1313.1116.00		
2605	ZE MW CONVERTER UNIT 43GHZ	1312.8323.50
Drawing FSW-B71 1313.1651.01		
2710	EE BASIS BAND ADC	1313.1722.02
2730	ED CARRIER PLATE RF-JACKS 26GHZ	1313.3619.02
2731	OS INLAYLABEL JACKPANEL FSW B71 26 GHZ	1313.5986.00
2740	FJ FLANGE PANEL 4X BNC-SMA	1313.6618.00
Drawing R&S FSW-B160 / -B320 1313.3777.00		
-	DETECTOR EXTENSION	1312.8200.02

ItemNo.	Designation	Stock No.
-	WIDE BAND ADC	1312.9220.02
-	REAR PANEL DETECTOR EXTENSION	1322.7542.00
Drawing 500MHz Analysis Bandwidth 1313.4296.01		
20	DETECTOR EXTENSION	1313.3577.03
30	WIDE BAND ADC	1313.6201.02
40	Connecting Board	1313.5934.02
50	RF CABLE W221	1322.9597.00
60	COOLING PAD 48X48	1322.9468.00
70	COOLING PAD 30X30	1322.9474.00
80	SECONDARY FAN B500	1321.6220.00
90	INSULATION BUSH POM	1322.9280.00

5.2.2 Available Power Cables

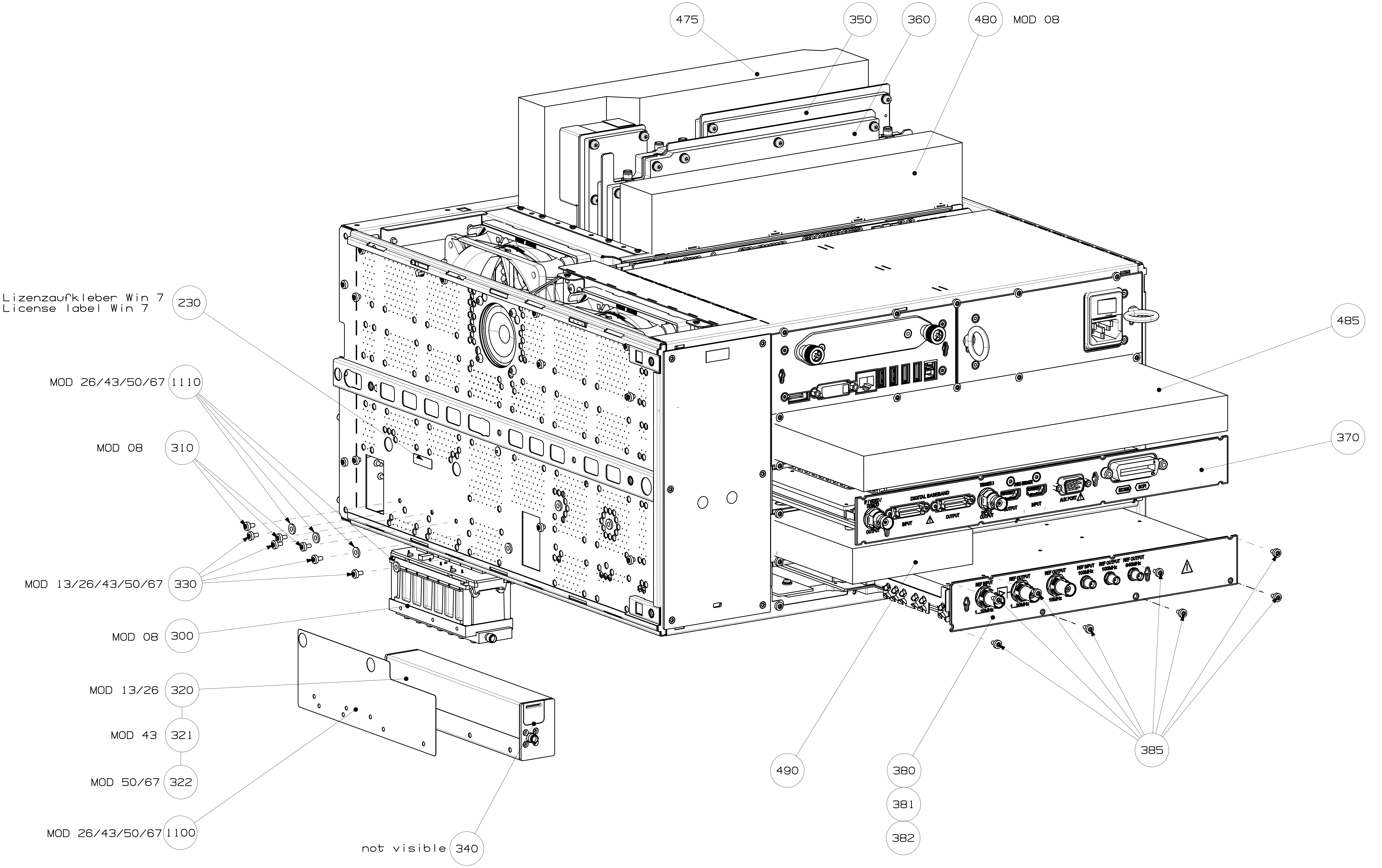
Stock No.	Earthed-contact connector	Preferably used in
DS 0006.7013.00	BS1363: 1967' 10 A, 250 V complying with IEC 83: 1975 standard B2	Great Britain
DS 0006.7020.00	Type 12, 10 A, 250 V complying with SEV-regulation 1011.1059, standard sheet S 24 507	Switzerland
DS 0006.7036.00	Type 498/13, 10 A, 250 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)

5.2.3 Mechanical Drawings

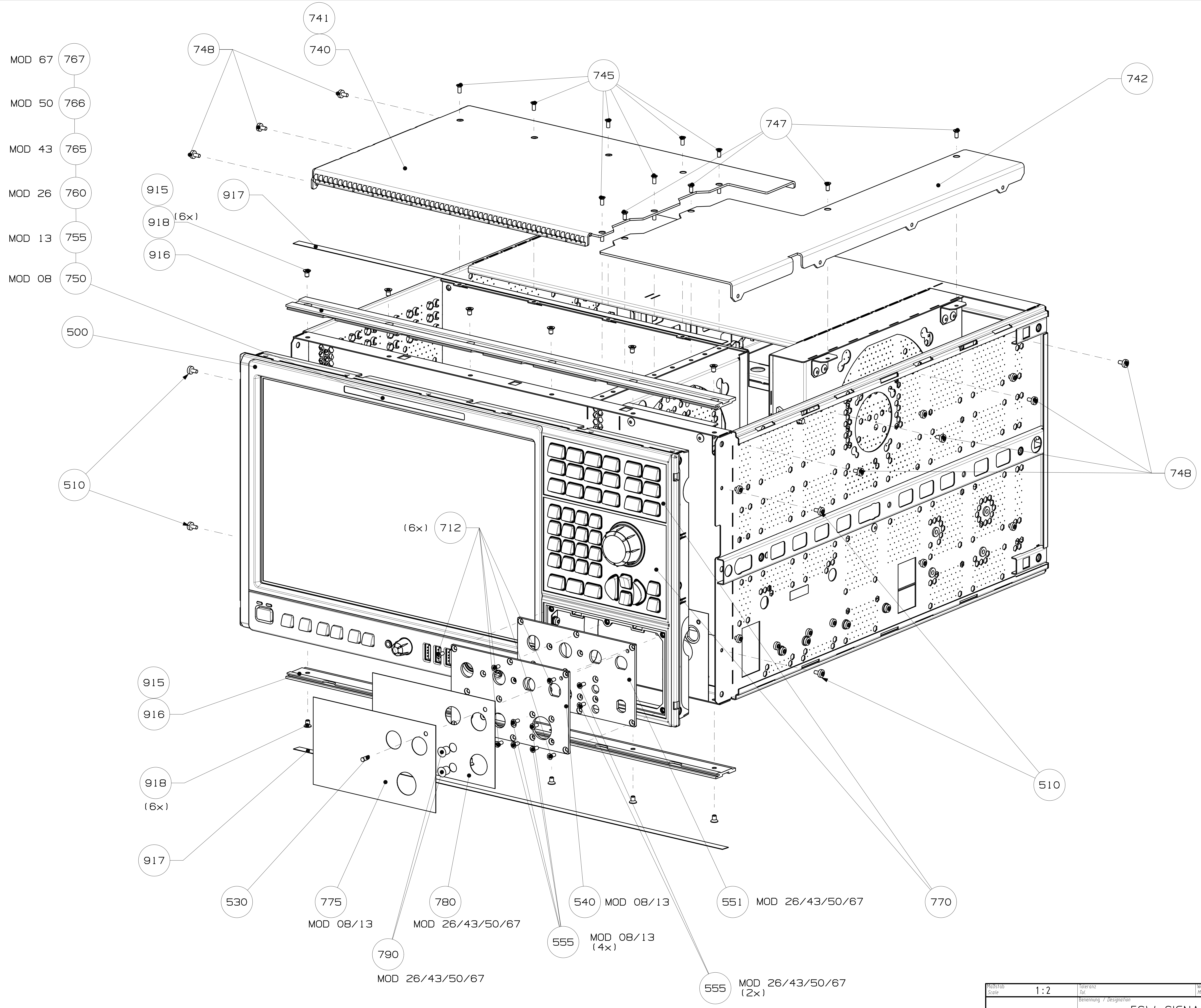
Maßstab / Scale	1:5	Toleranz / Tol.	ISO2768-m	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER				Sprache / Lang.: de en	Aei. / C.I.: 06.00	Blatt / Sh.: 1
FSW	Datum / Date: 2013-08-28	Abteilung / Dept.: 1ESK	Name / Name: AN		Zeichn.Nr. / Drawing No.: 1312.8000.01 D		

Projektions-methode
Projection Method

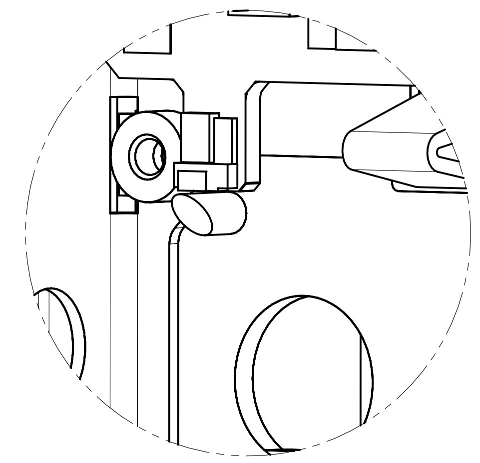


Projektionsmethode
Projection Method

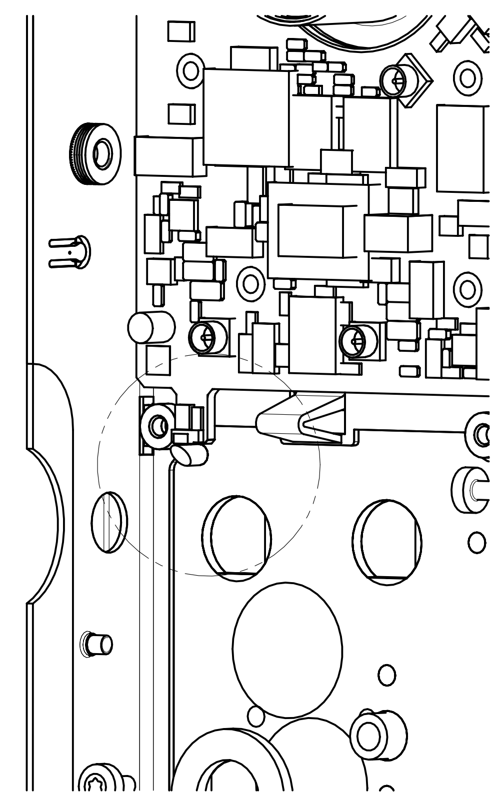
Maßstab Scale	1:2	Toleranz Tol	ISO2768-m	Werkstoff Material			
ROHDE&SCHWARZ	Benennung / Designation: FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER			Sprache / Lang: de en	Rev. / CI: 07.00	Blatt / Sh: 2	
FSW	Datum Date: 2013-08-28	Abteilung Dept: 1ESK	Name: AN	Zeichnr. / Drawing No.: 1312.8000.01	D		



B (2:1)

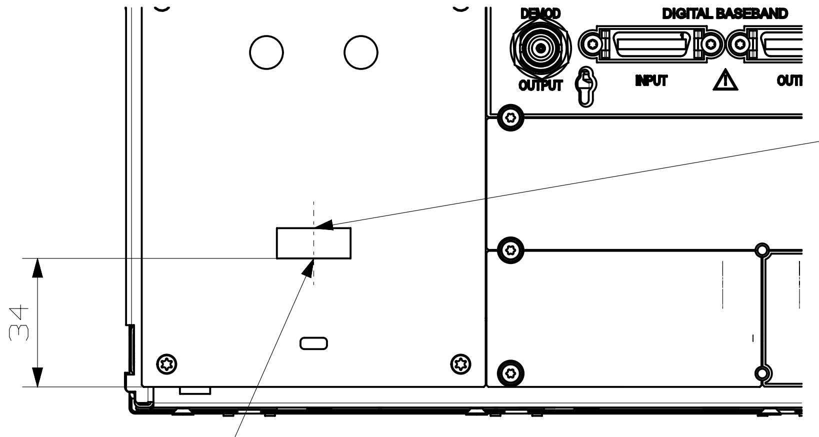


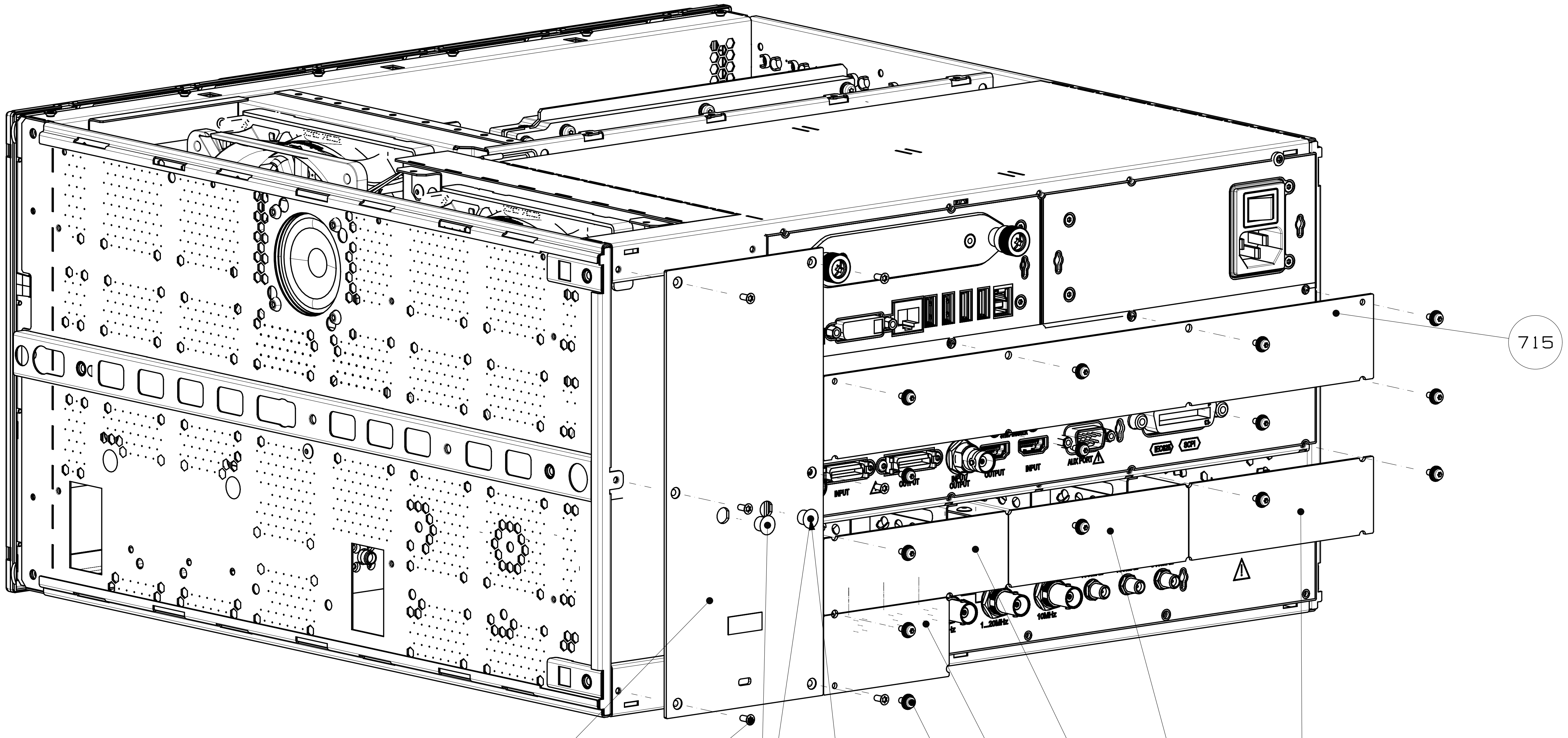
Pos. 530 wie dargestellt einbauen
mount Pos. 530 as shown

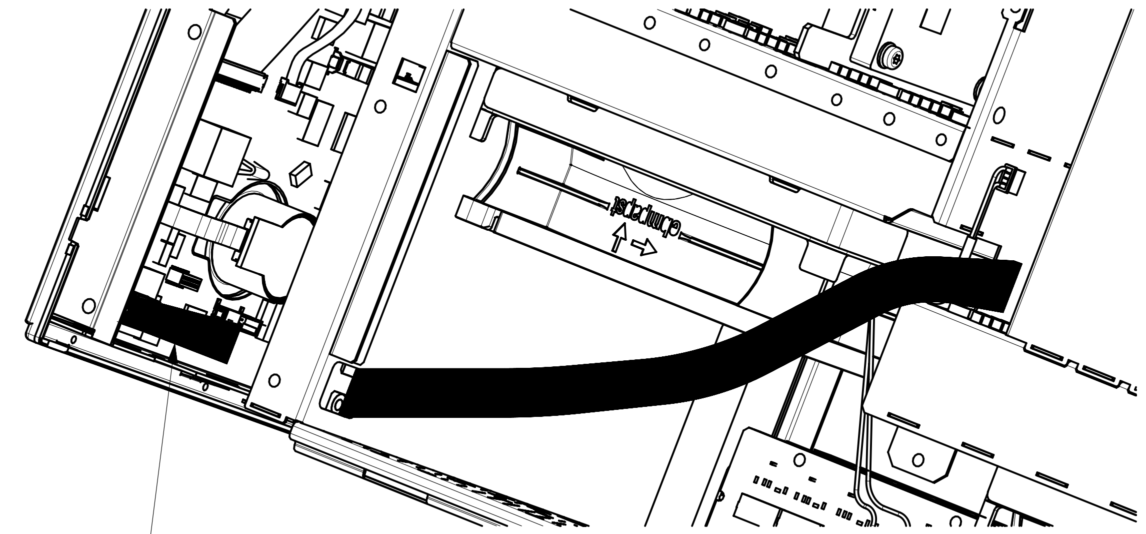


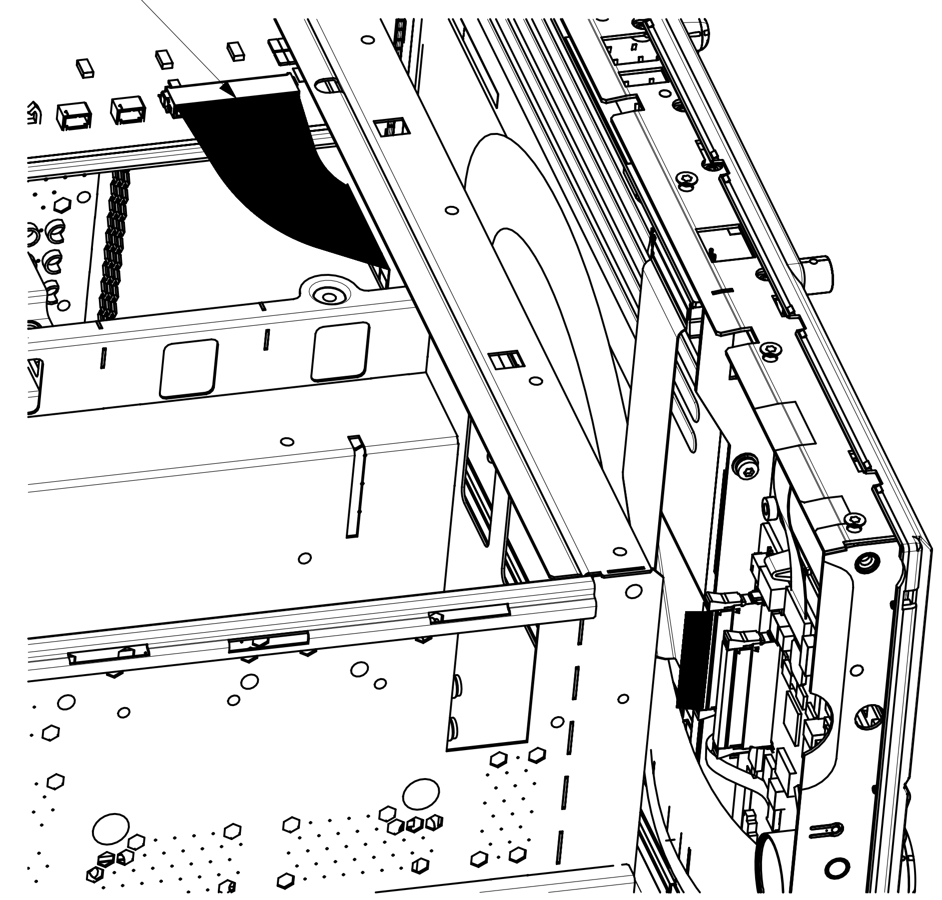
Projektions-methode
Projection Method

Maßstab / Scale: 1:2	Toleranz / Tol.	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: FSW SIGNAL ANALYZER / FSW SIGNAL ANALYZER	Sprache / Lang.: de en	Rev. / E.I.: 08.00 / Blatt / Sh.: 3
FSW	Datum / Date: 2013-08-28 / Abteilung / Dept.: 1ESK / Name: AN	Zeichn.Nr. / Drawing No.: 1312.8000.01	D





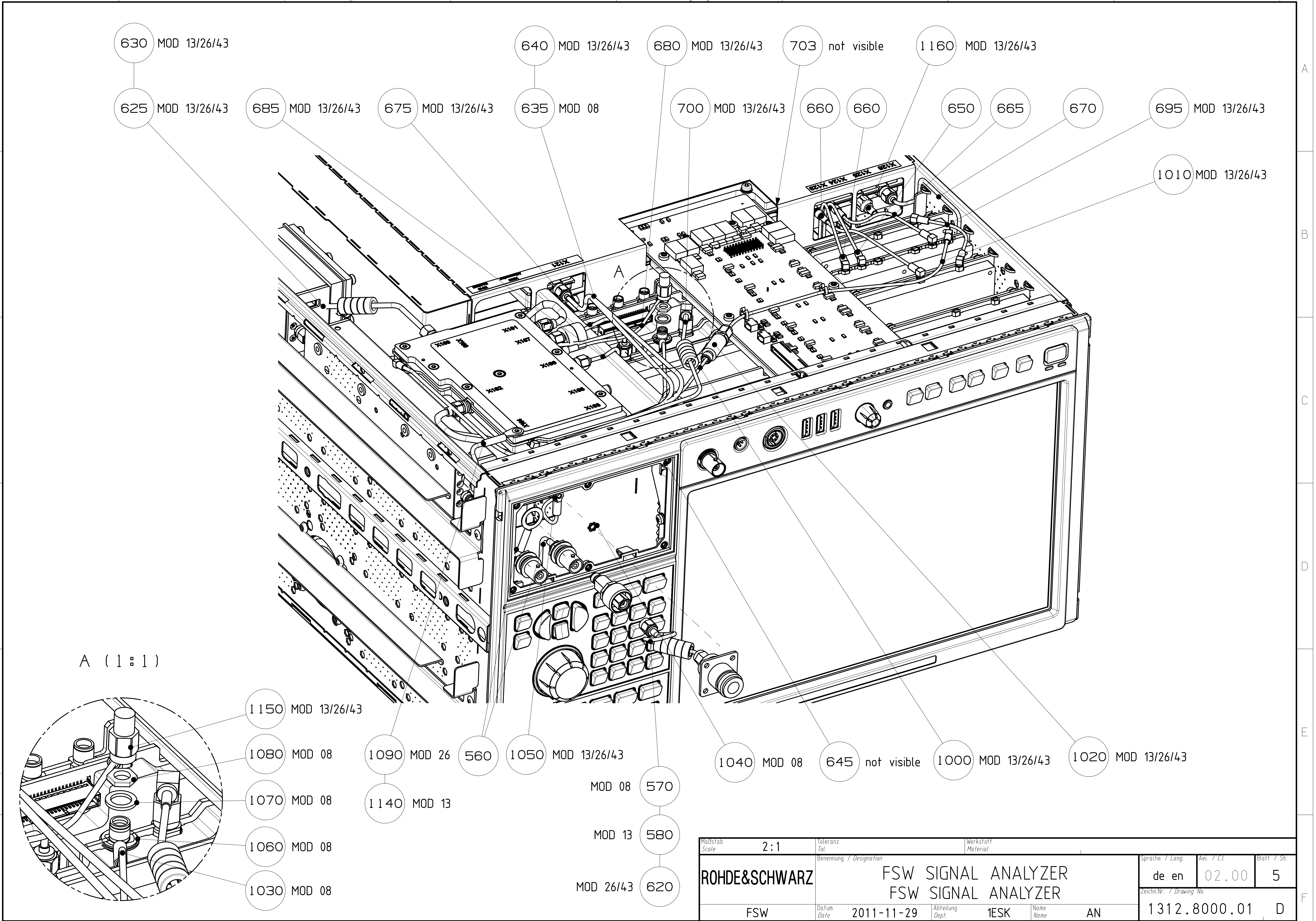




NX

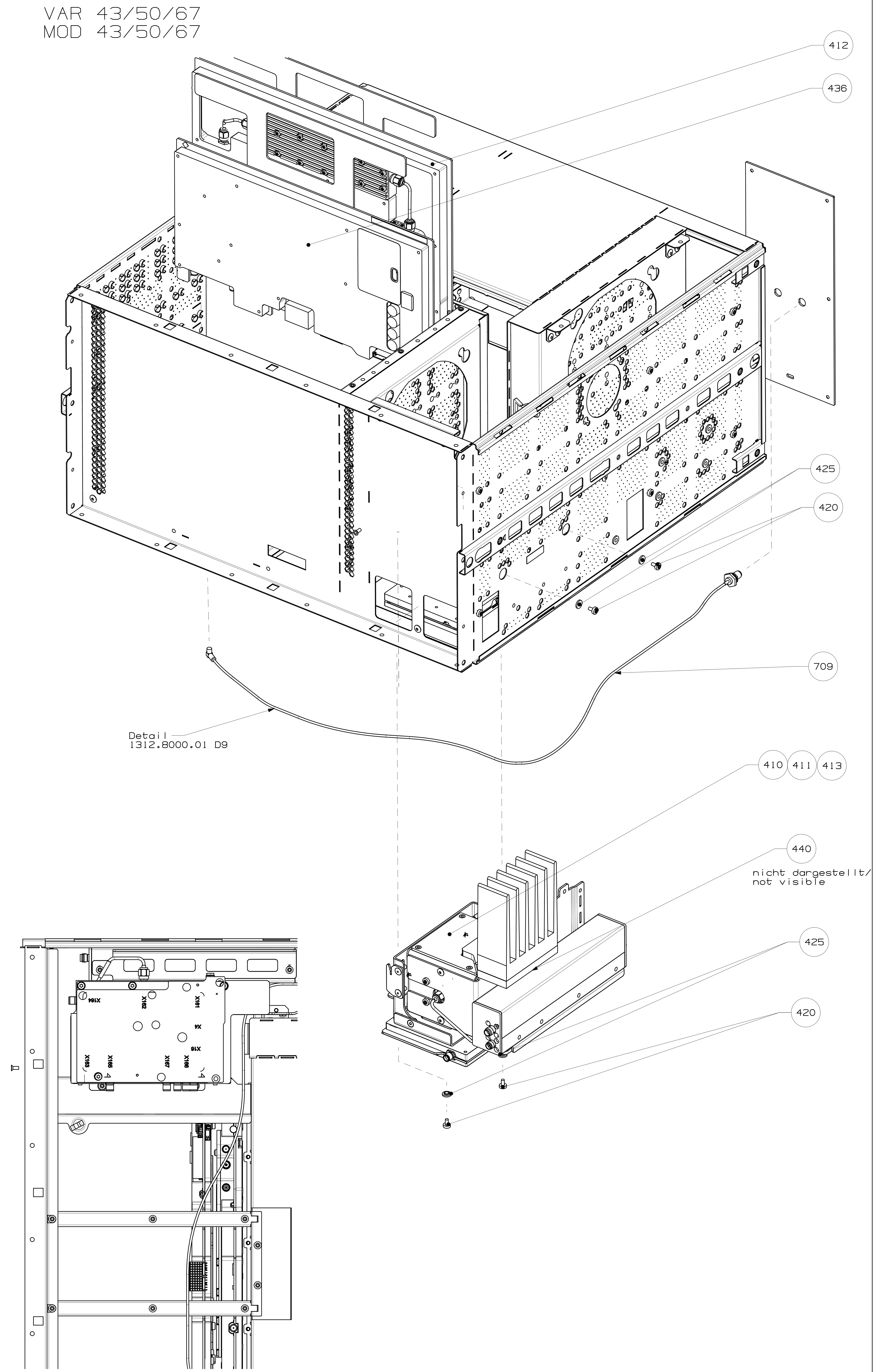
Projektionsmethode
Projection Method

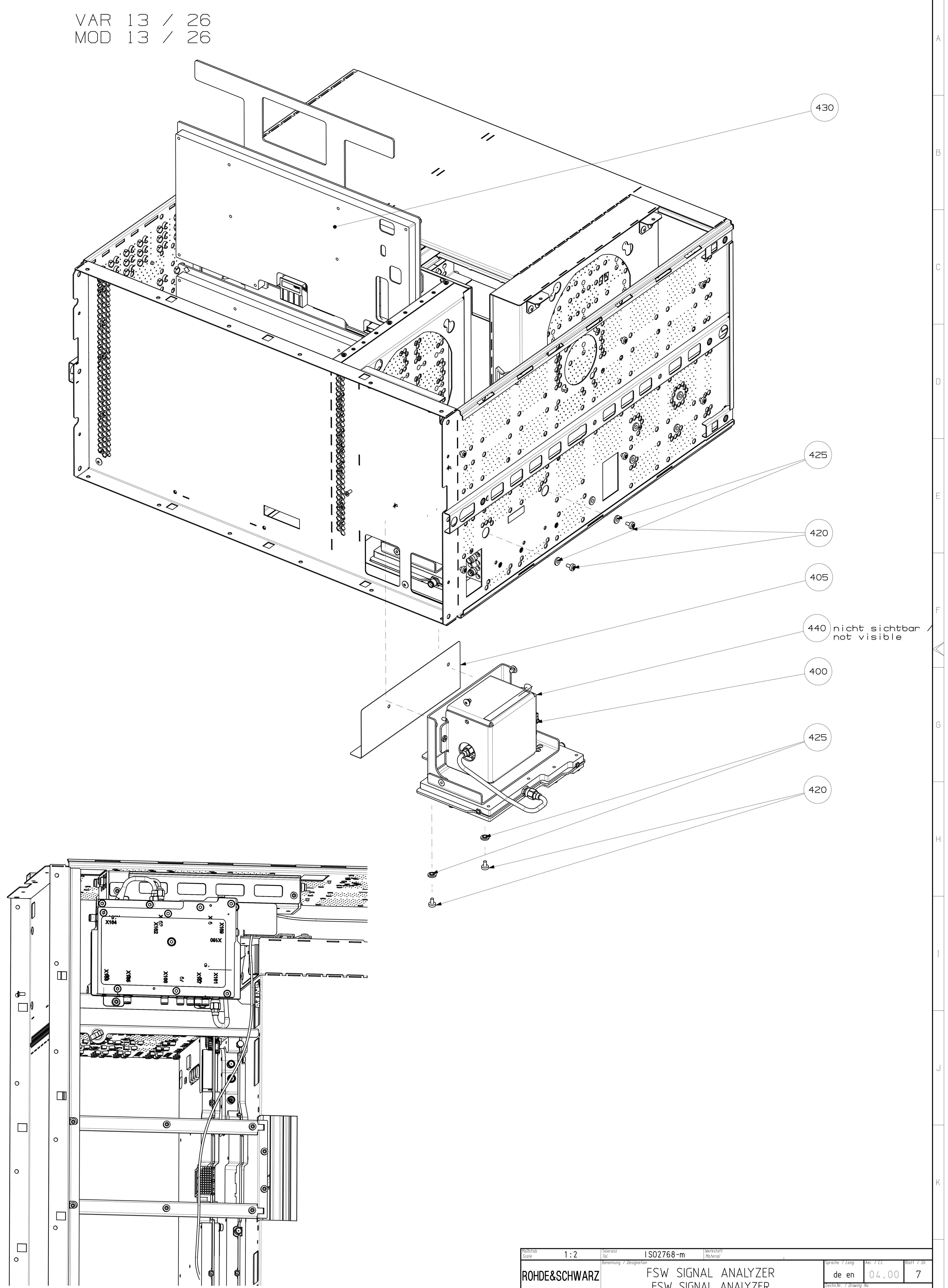
Maßstab / Scale: 1:2	Toleranz / Tol: ISO2768-m	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER	Sprache / Lang: de en	Rev. / CI: 05.00 — Blatt / Sh: 4
FSW	Datum / Date: 2013-08-28 — Abteilung / Dept: 1ESK — Name: AN	Zeichn.Nr. / Drawing No.: 1312.8000.01	D


630 MOD 13/26/43
625 MOD 13/26/43
685 MOD 13/26/43
675 MOD 13/26/43
640 MOD 13/26/43
635 MOD 08
680 MOD 13/26/43
700 MOD 13/26/43
703 not visible
660
660
1160 MOD 13/26/43
650
665
670
695 MOD 13/26/43
1010 MOD 13/26/43
A
A (1:1)
1150 MOD 13/26/43
1080 MOD 08
1070 MOD 08
1060 MOD 08
1030 MOD 08
1090 MOD 26
1140 MOD 13
560
1050 MOD 13/26/43
MOD 08 570
MOD 13 580
MOD 26/43 620
1040 MOD 08
645 not visible
1000 MOD 13/26/43
1020 MOD 13/26/43
NX
Projektions-methode
Projection Method
Maßstab Scale 2:1
Toleranz Tol.
Werkstoff Material
ROHDE&SCHWARZ
Benennung / Designation
FSW SIGNAL ANALYZER
FSW SIGNAL ANALYZER
Sprache / Lang. de en
Aei. / C.I. 02.00
Blatt / Sh. 5
Zeichn.Nr. / Drawing No. 1312.8000.01 D
FSW
Datum Date 2011-11-29
Abteilung Dept. 1ESK
Name Name AN

Projektionsmethode
Projection Method

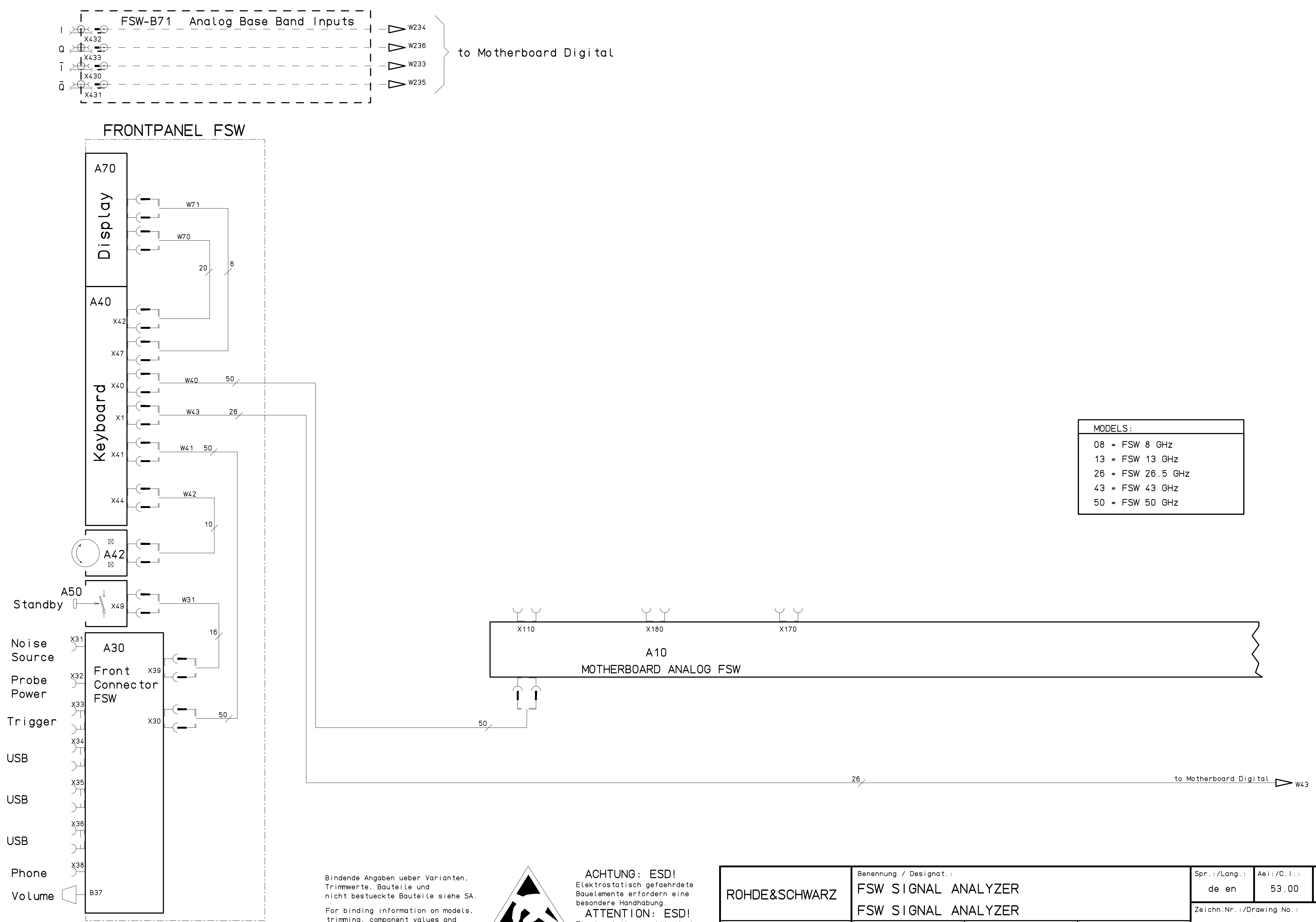
Maßstab / Scale: 1:2	Toleranz / Tol.: IS02768-m	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER	Sprache / Lang: de en	Ä.-Nr. / CI: 05.00
			Blatt / SH: 6
FSW	Datum / Date: 2013-07-03	Abteilung / Dept: 1ESK	Name: AN/BU
		Sachnummer / Drawing No: 1312.8000.01	D





Projektionsmethode
Projection Method

Maßstab / Scale	1:2	Toleranz / Tol.	ISO2768-m	Werkstoff / Material			
ROHDE&SCHWARZ		Benennung / Designation	FSW SIGNAL ANALYZER FSW SIGNAL ANALYZER	Sprache / Lang.	de en	Aei. / C.I. 04.00	Blatt / Sh. 7
FSW		Datum / Date 2013-03-26	Abteilung / Dept. 1ESK	Name / Name AN/BU	Zeichn.Nr. / Drawing No.	1312.8000.01	D



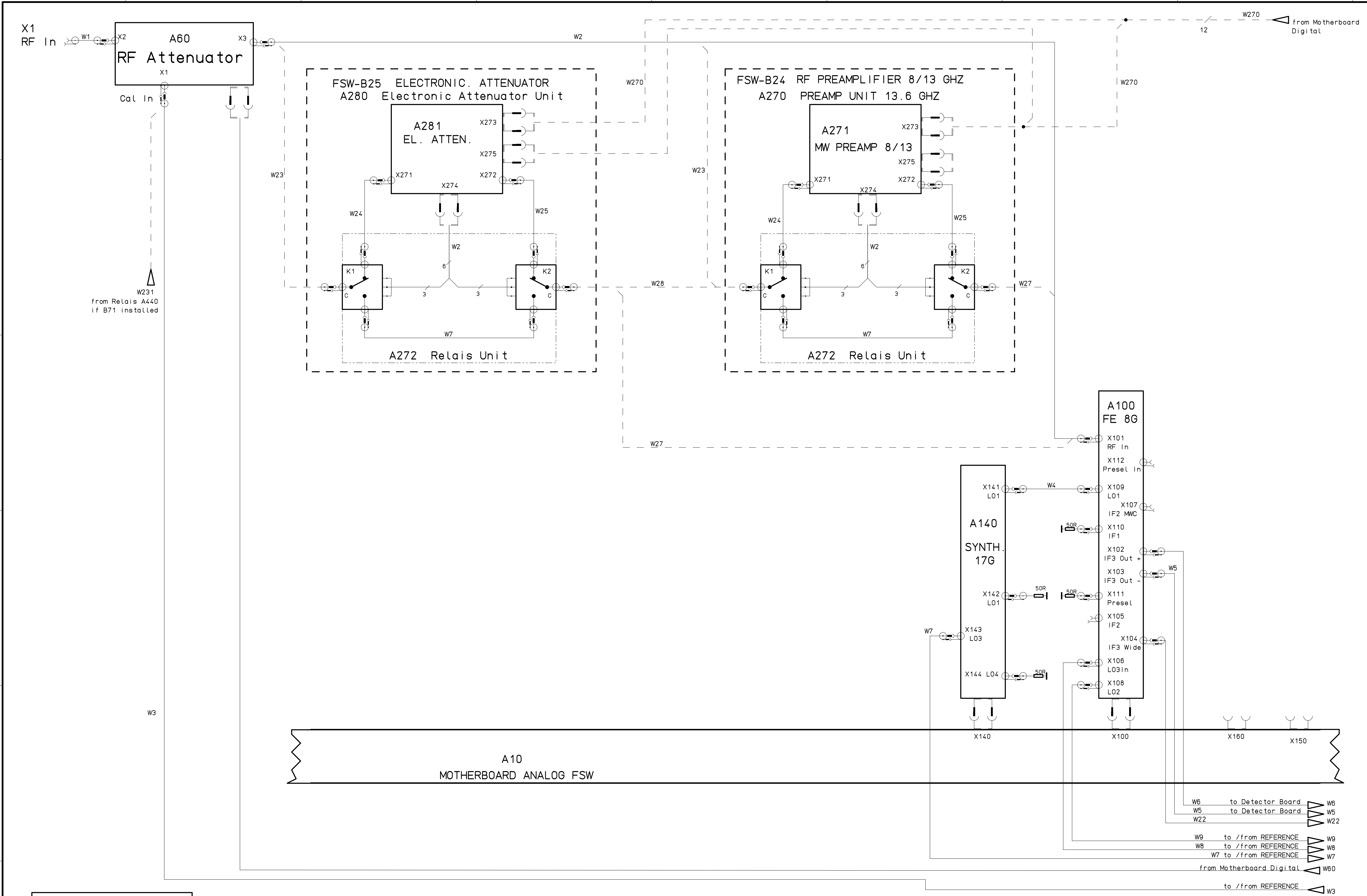
Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

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.: 53.00	Blatt:/Sh.: 1 +
FSW	Datum: / Date: 2013-07-08 — Abteilung: / Dept.: 1ESK — Name: / Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S		



MODELS:
08 = FSW 8 GHz

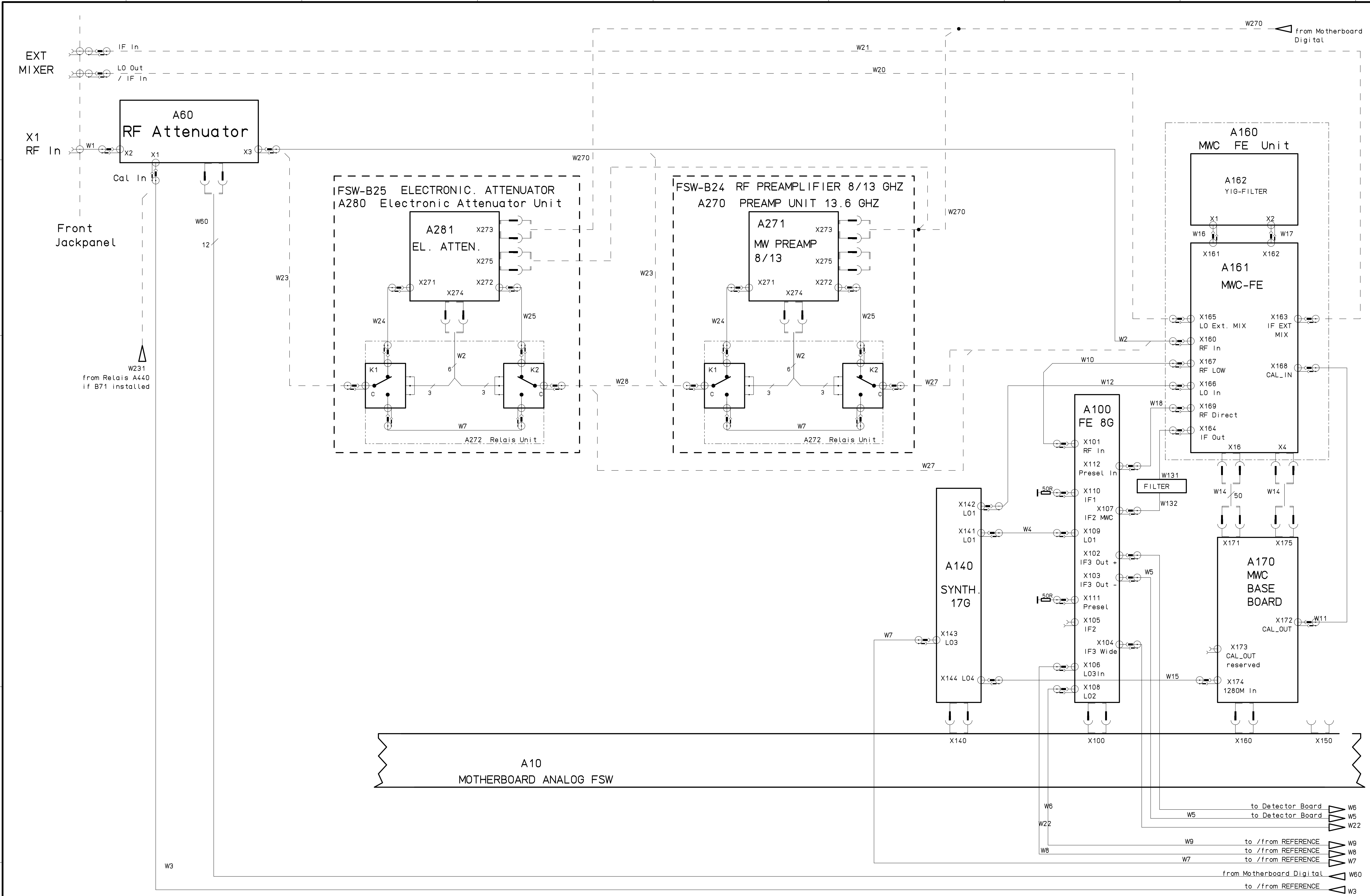
Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

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.: FSW SIGNAL ANALYZER / FSW SIGNAL ANALYZER	Spr.:/Lang.: de en	Aei:/C.I.: 53.00	Blatt:/Sh.: 2 +
FSW	Datum: 2013-07-08	Abteilung: 1ESK	Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S



MODELS:

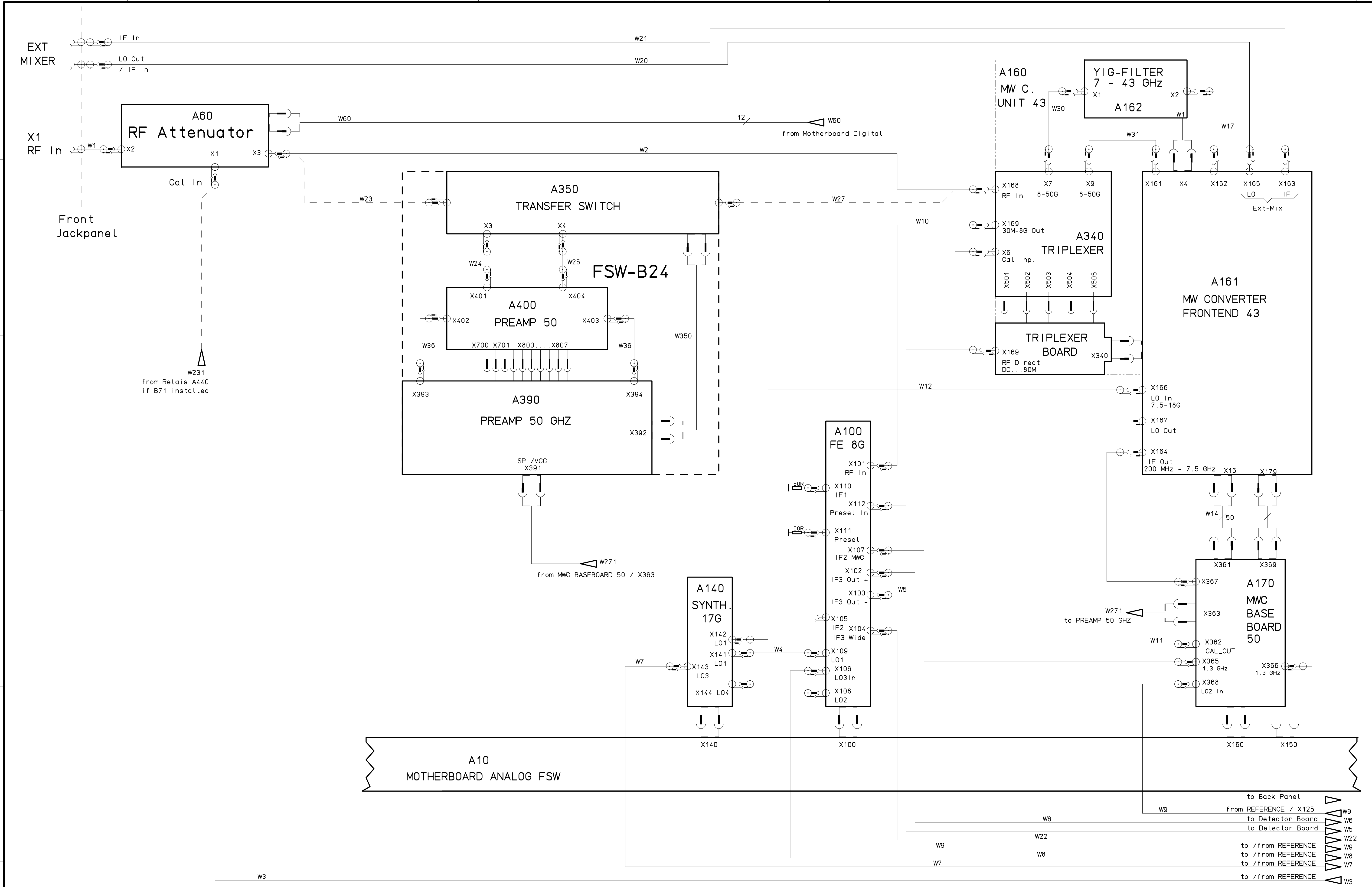
13 = FSW 13 GHz
26 = FSW 26.5 GHz

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	Benennung / Designat.: FSW SIGNAL ANALYZER / FSW SIGNAL ANALYZER	Spr.:/Lang.: de en	Aei:/C.I.: 53.00
FSW	Datum/Date: 2013-07-08; Abteilung/Dept.: 1ESK; Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S	Blatt:/Sh.: 3 +



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 FSW SIGNAL ANALYZER	Spr.:/Lang.: de en	Aei:/C.I.: 53.00	Blatt:/Sh.: 4 +
FSW	Datum: Date: 2013-07-08 · Abteilung: Dept.: 1ESK · Name: Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S		

This Sheet is intentionally left blank

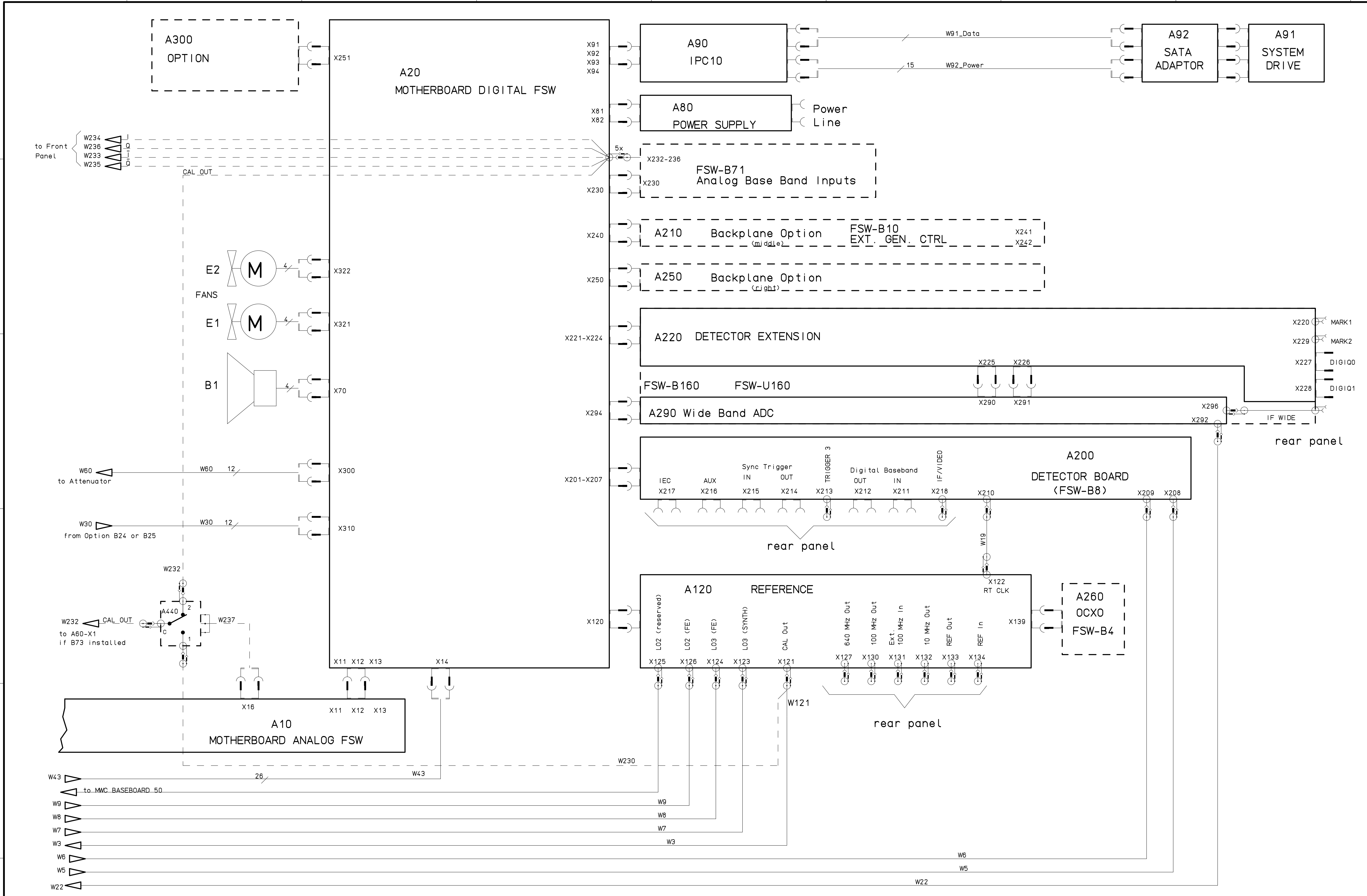
Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

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.: 53.00	Blatt:/Sh.: 5 +
FSW	Datum: / Date: 2013-07-08	Abteilung: / Dept.: 1ESK	Name: / Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S		



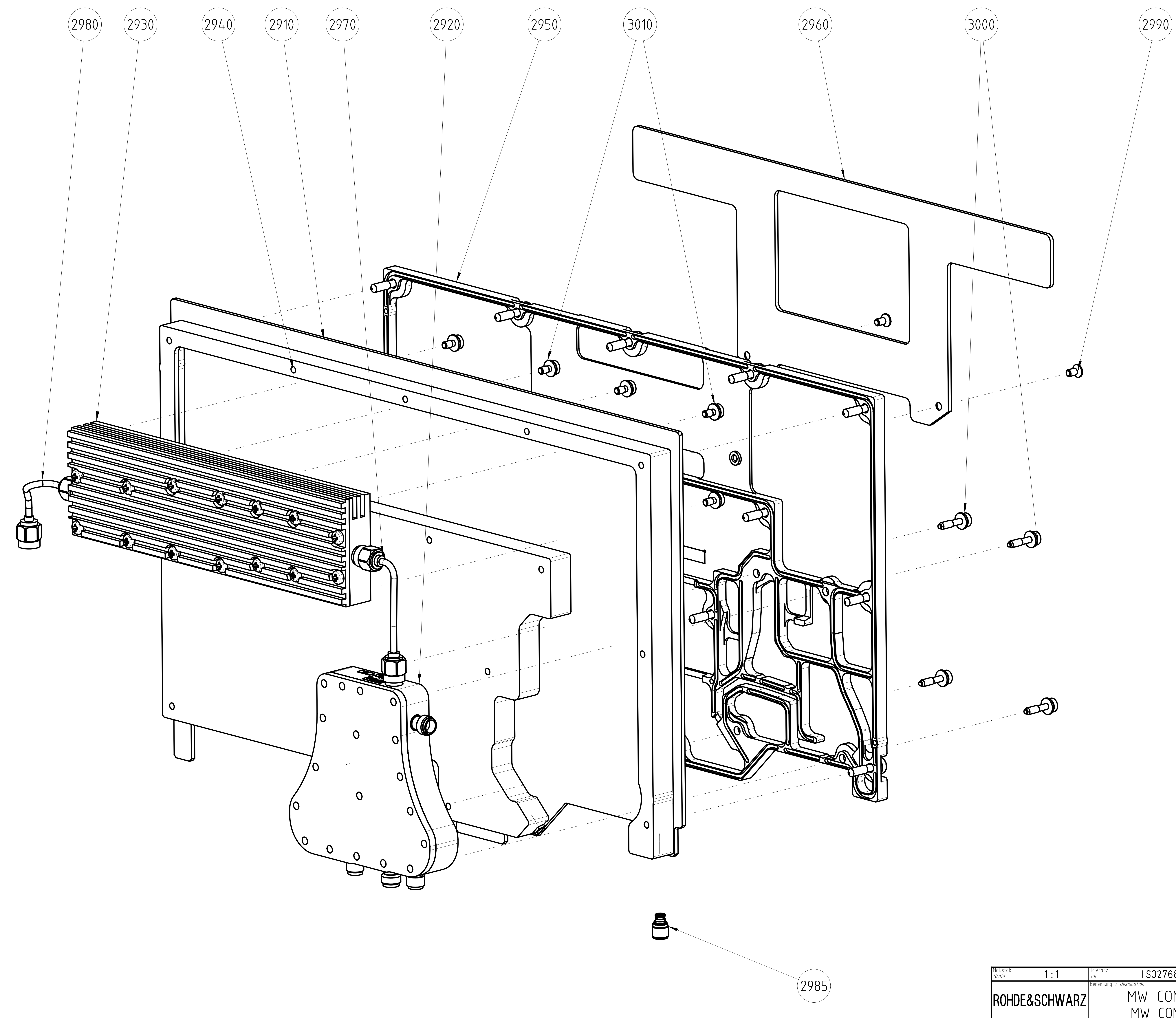
Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

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.: 53.00	Blatt:/Sh.: 6 -
FSW	Datum: Date: 2013-07-08 · Abteilung: Dept.: 1ESK · Name: Name: pfeil_u	Zeichn.Nr.:/Drawing No.: 1312.8000.01 S		

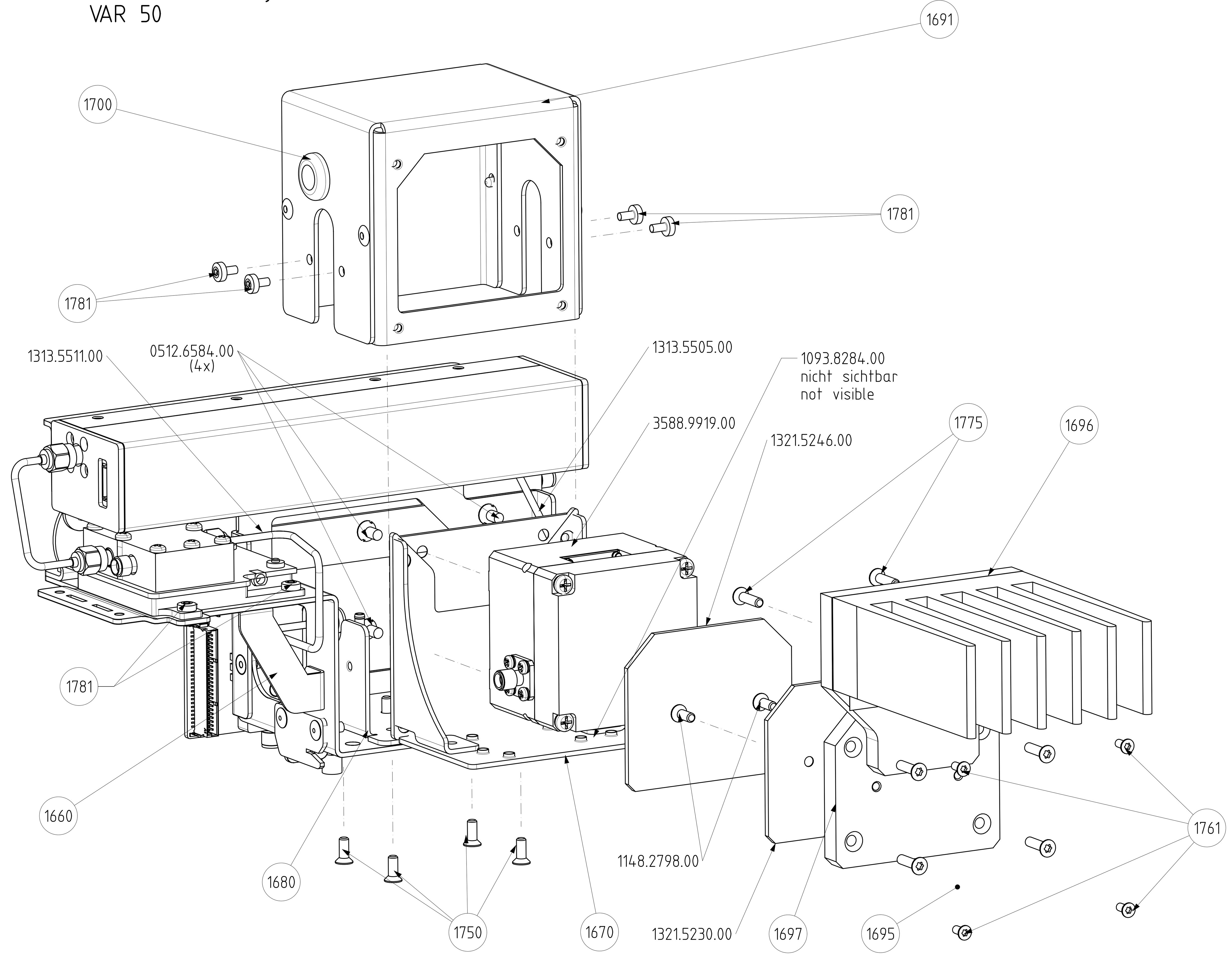


Projektions-methode
Projection Method

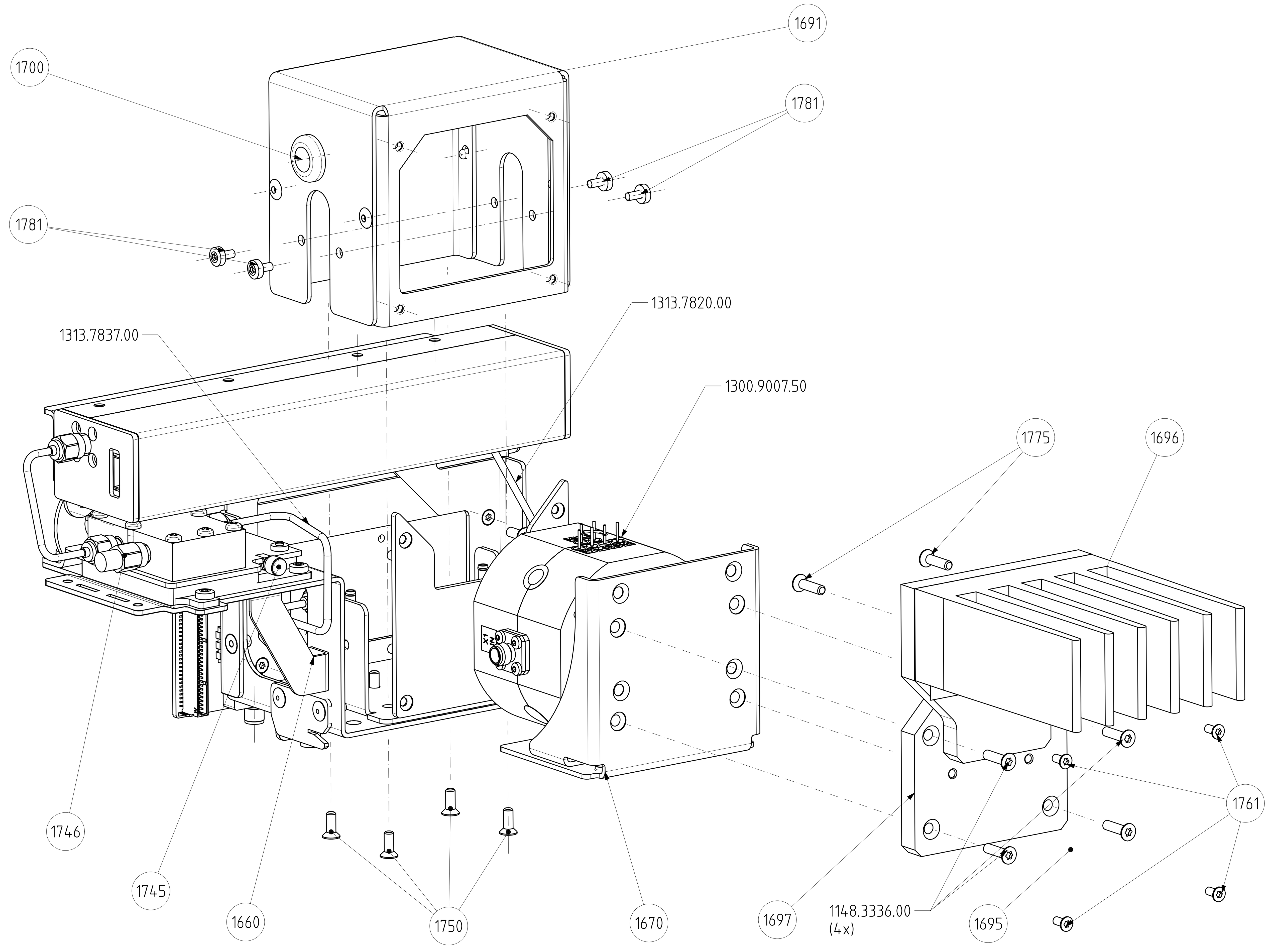
Maßstab / Scale	1:1	Toleranz / Tol.	ISO2768-m	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: MW CONVERTER UNIT 67GHZ MW CONVERTER UNIT 67GHZ				Sprache / Lang.: de en	Aei. / C.I.: 02.00	Blatt / Sh.: 1
FSW67	Datum / Date: 2013-03-20	Abteilung / Dept.: 1ESK	Name / Name: AN		Zeichn.Nr. / Drawing No.: 1321.5300.01 D		

A2

Pos. 1611 YIG Filter Teledyne VAR 50



Pos. 1612 YIG Filter R&S VAR 50 / 67

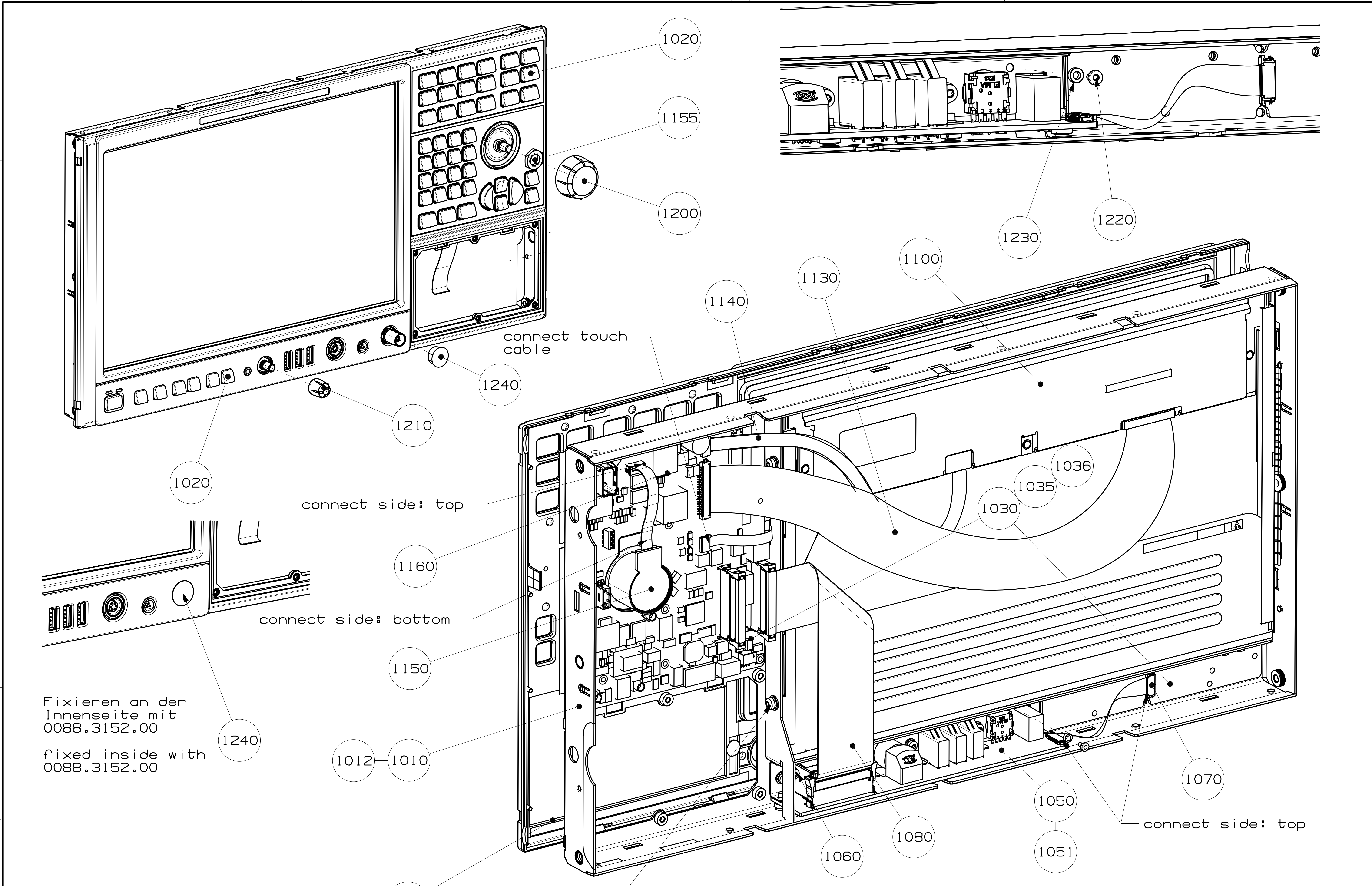


Bei der Montage als erstes Pos.1650 mit 1660 verschrauben
First step in mounting, connect Pos.1650 with 1660

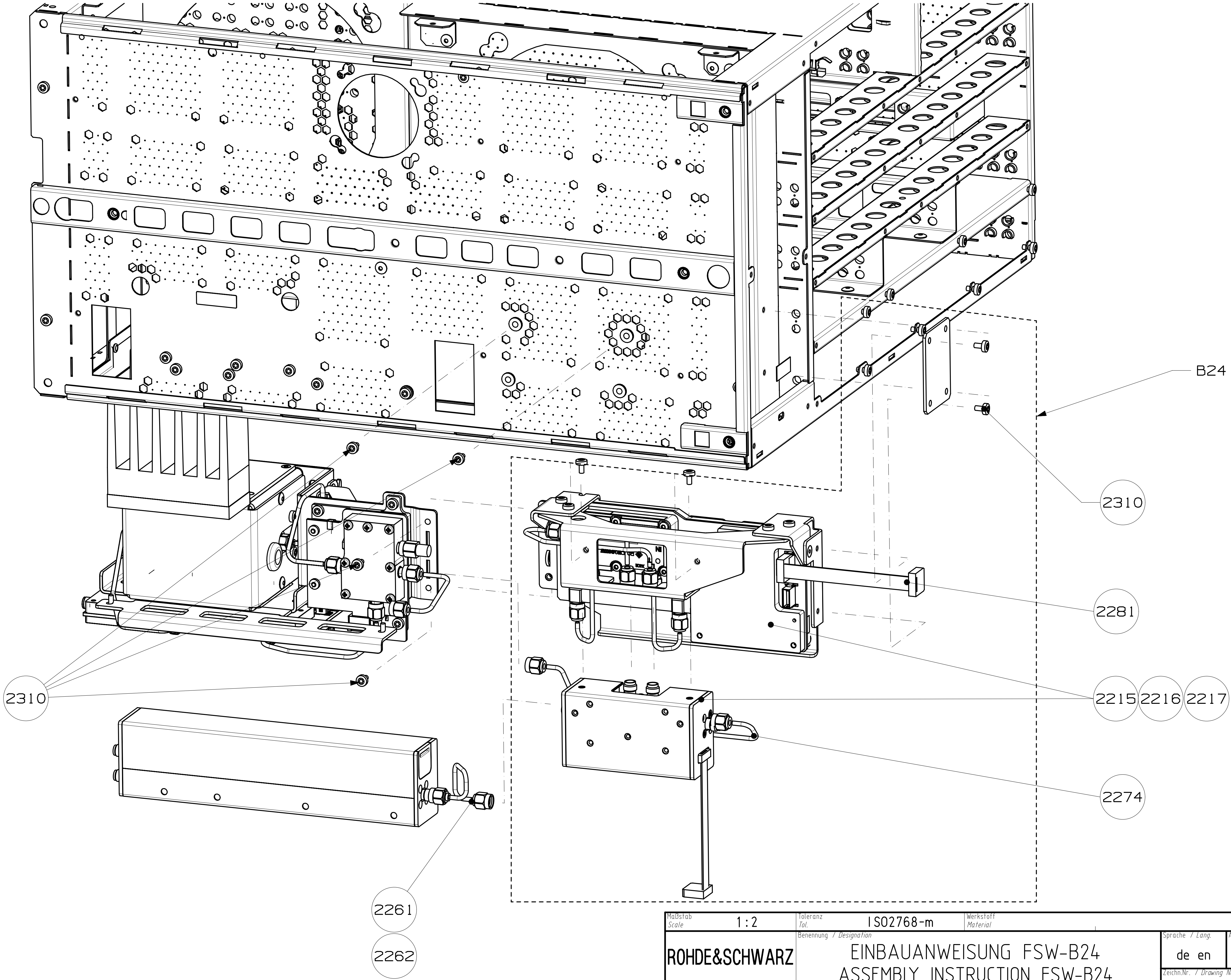
Projektionsmethode / Projection Method

ROHDE&SCHWARZ	MW CONVERTER UNIT 43GHZ MW CONVERTER UNIT 43GHZ	de en · 04.00 · 2
SIRIUS	2013-07-05 · 1ESK · AN/BU	1312.8323.01 D

A1



Maßstab / Scale	Toleranz / Tol.: ISO2768-m	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: FRONTEINHEIT FSW FRONTPANEL FSW		Sprache / Lang.: de en	Aei. / C.I.: 08.00	Blatt / Sh.: 1
FSW	Datum / Date: 2013-08-27	Abteilung / Dept.: 1ESK	Name / Name: AN	Zeichn.Nr. / Drawing No.: 1312.8023.01	D

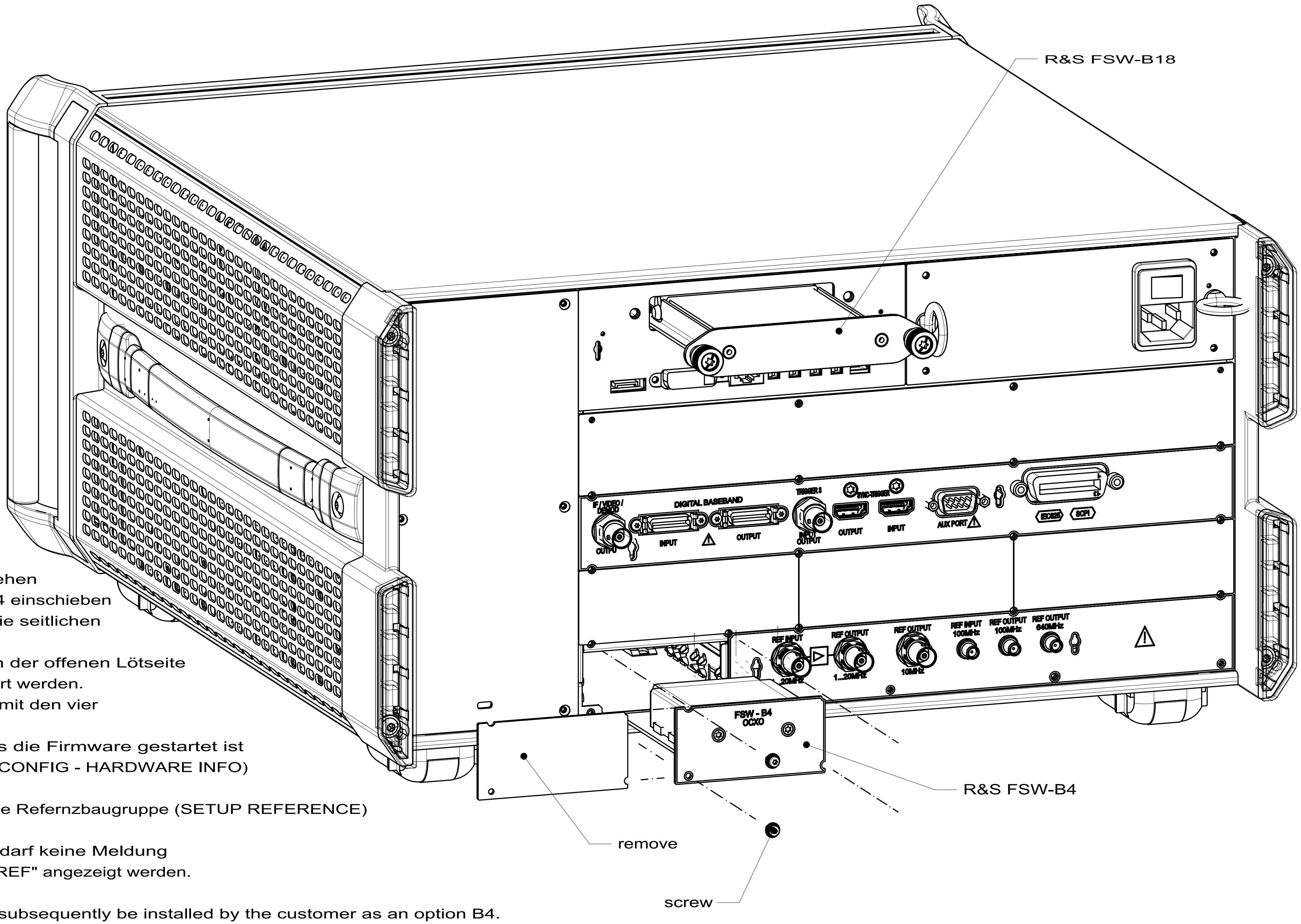


Projektions-
methode

Projection
Method

Maßstab / Scale: 1:2	Toleranz / Tol.: ISO2768-m	Werkstoff / Material:				
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B24 ASSEMBLY INSTRUCTION FSW-B24			Sprache / Lang.: de en	Aei. / C.I.: 03.00	Blatt / Sh.: 1
FSW	Datum / Date: 2013-03-11	Abteilung / Dept.: 1ESK	Name / Name: AN/BU	Zeichn.Nr. / Drawing No.: 1313.5792.00		D

NX

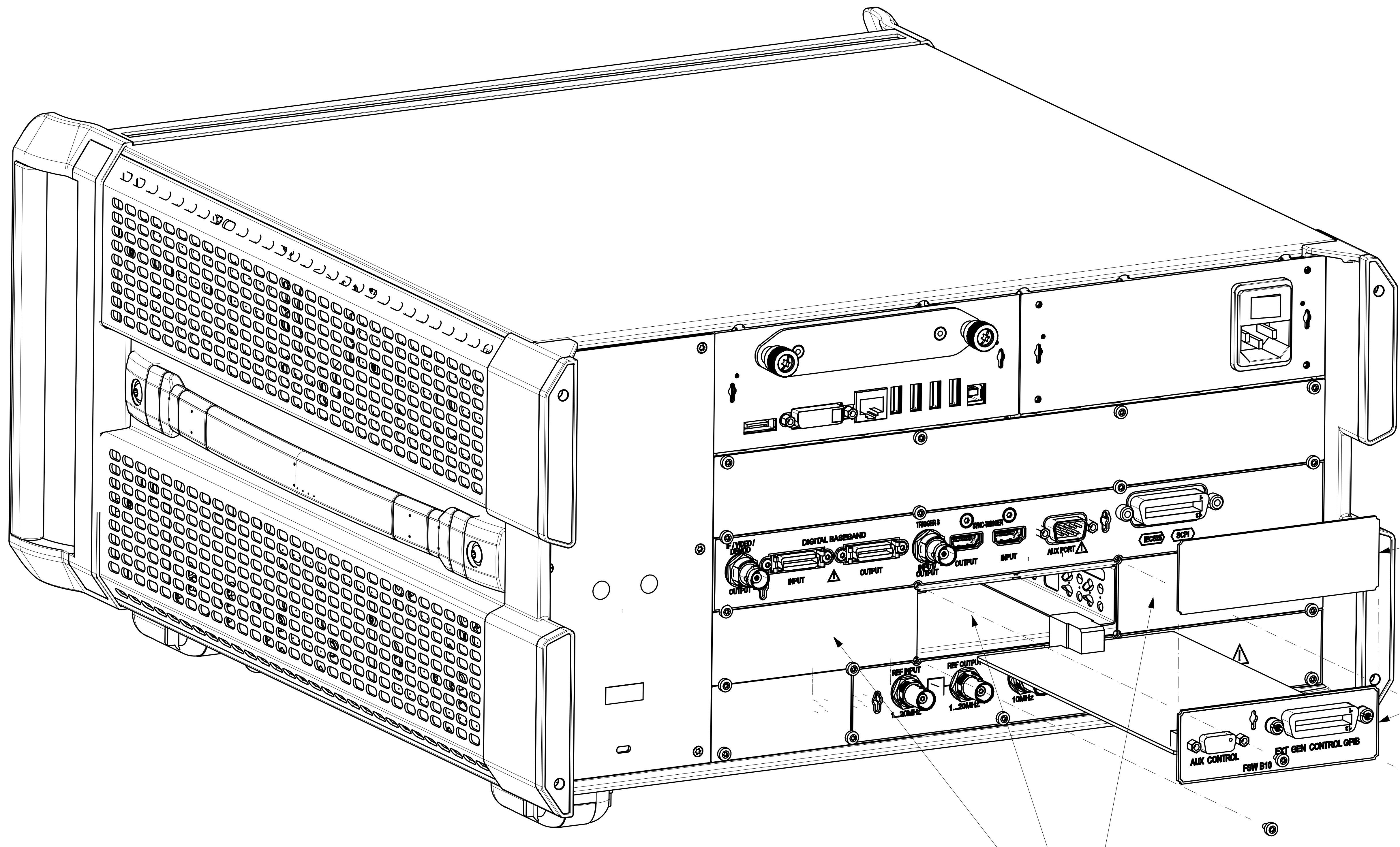


Die OCXO-Baugruppe 1313.0703.02
kann nachträglich vom Kunden als
Option B4 eingebaut werden.
- Gerät ausschalten und Netzstecker ziehen
- Rückwandblech lösen und die Option B4 einschieben
- Beim Einschieben darauf achten das die seitlichen
Führungen getroffen werden
Ansonsten kann es passieren, dass von der offenen Lötseite
der Optionsbaugruppe Bauteile abgeschert 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 Refernzbaugruppe (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 1313.0703.02 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.

Projektions-methode
Projection Method

Maßstab *Scale* –	Toleranz *Tol.*	Werkstoff *Material*		
ROHDE&SCHWARZ	Benennung / *Designation* EINBAUANWEISUNG FSW OPTIONEN ASSEMBLY INSTRUCTION FSW OPTIONS	Sprache / *Lang.* de en	Aei. / *C.I.* 01.00	Blatt / *Sh.* 1
	Datum *Date* 2011-06-10 · Abteilung *Dept.* 1ESK · Name *Name* RN	Zeichn.Nr. / *Drawing No.* 1313.2758.00 D		



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:

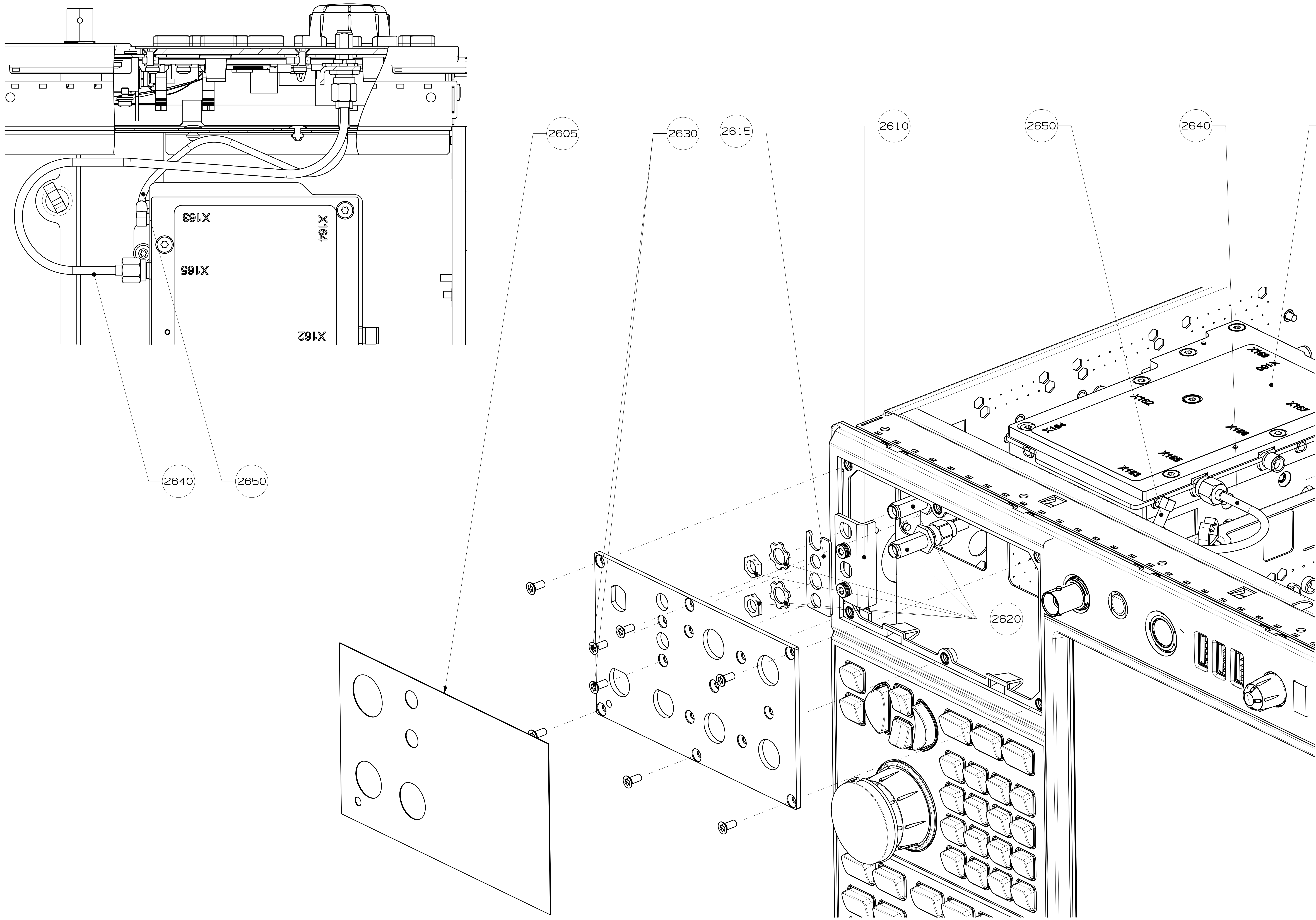
SETUP:System Config: Versions+Options
- Prüfen ob die Optionsliste den Eintrag "B10 Ext. GEN.Control" enthält.

Keine weiteren Funktionstest erforderlich!

NX

Projektions-methode
Projection Method

Maßstab / Scale: 1:2	Toleranz / Tol.	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW - B10 ASSEMBLY INSTRUCTION FSW - B10	Sprache / Lang.: de en	Rev. / CI: 02.00 · Blatt / Sh: 1
FSW-B10	Datum / Date: 2013-02-05 · Abteilung / Dept.: 1ESK · Name: AN	Zeichn.Nr. / Drawing No.: 1313.7489.00 D	

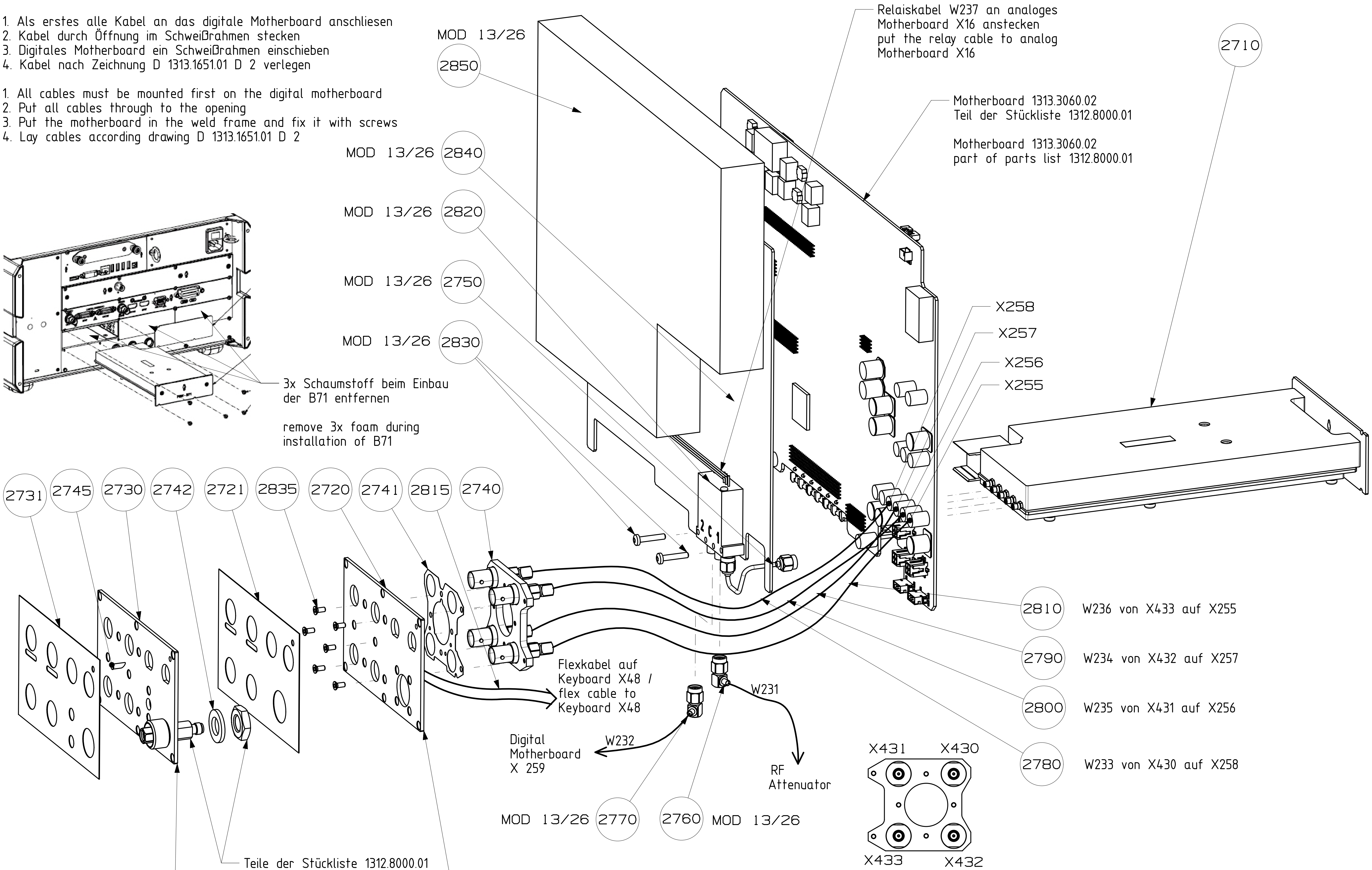


Projektions-methode
Projection Method

Maßstab / Scale: 1:1	Toleranz / Tol: ISO2768-m	Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW-B21 ASSEMBLY INSTRUCTION FSW-B21	Sprache / Lang: de en	Rev. / C.I.: 02.00 · Blatt / Sh: 1
FSW	Datum / Date: 2013-03-04 · Abteilung / Dept: 1ESK · Name: AN	Zeichn.Nr. / Drawing No.: 1313.1116.00	D

1. Als erstes alle Kabel an das digitale Motherboard anschliesen
2. Kabel durch Öffnung im Schweißrahmen stecken
3. Digitales Motherboard ein Schweißrahmen einschieben
4. Kabel nach Zeichnung D 1313.1651.01 D 2 verlegen

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 1313.1651.01 D 2

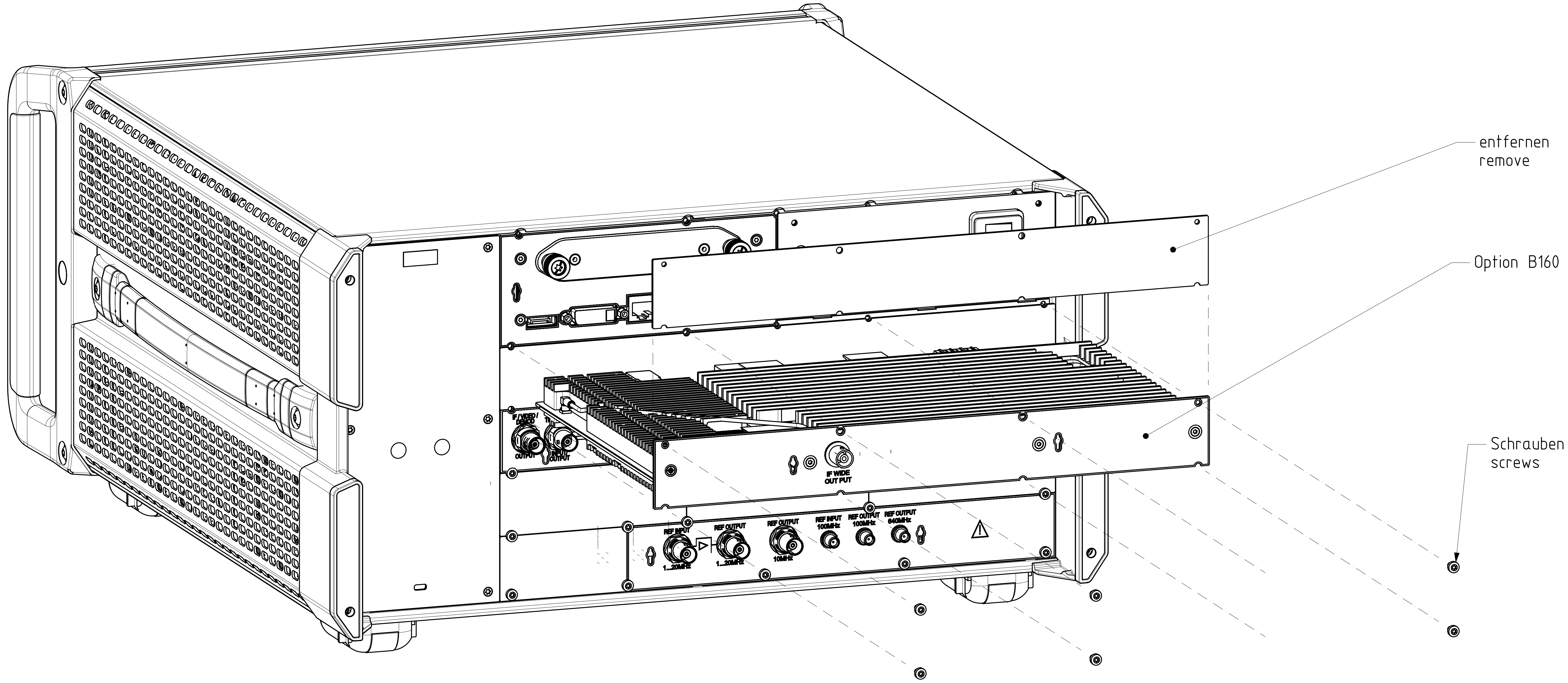


NX

Projektions-methode
Projection Method

A3

Maßstab / Scale	1:2	Toleranz / Tol.		Werkstoff / Material	
ROHDE&SCHWARZ	Benennung / Designation: FSW-B71 ANALOG BASE BAND INPUTS FSW-B71 ANALOG BASE BAND INPUTS	Sprache / Lang.: de en	Aei. / C.I.: 04.00	Blatt / Sh.: 1	
FSW-B71	Datum / Date: 2013-08-28	Abteilung / Dept.: 1ESK	Name: AN	Zeichn.Nr. / Drawing No.: 1313.1651.01	D



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

Selftest
- 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 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

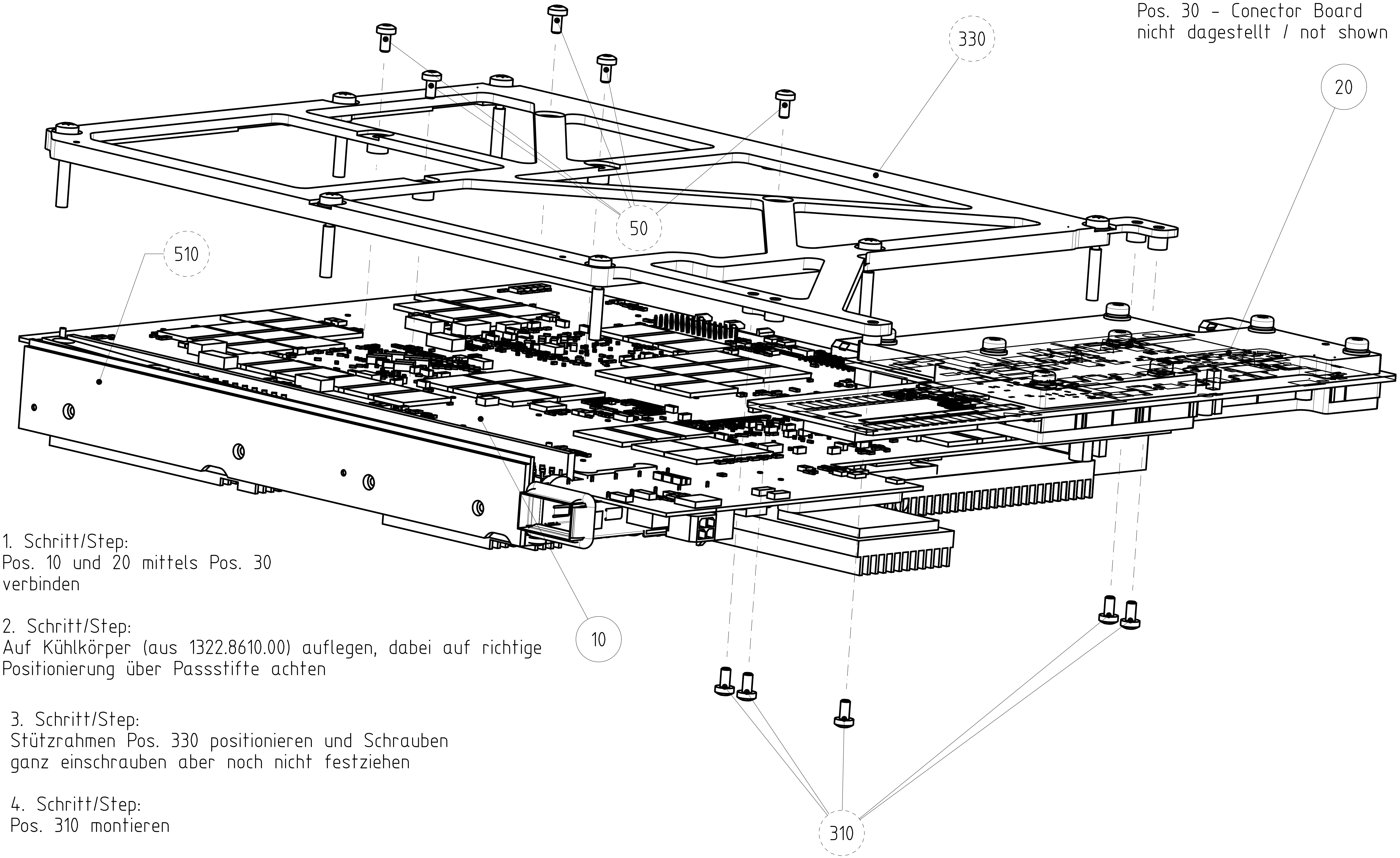
Abgleich
- Selbstabgleich durchführen, ist verpflichtend !
- Drücken Sie: SETUP: Alignment: Start self alignment
- Warten bis der Selbstabgleich beendet ist.
- Kontrollieren ob "Alignment state = PASSED" im Textfeld steht

Keine weiteren Funktionstest erforderlich!

Projektions-methode / Projection Method

Maßstab / Scale	1:2	Toleranz / Tol.	ISO2768-m	Werkstoff / Material		
ROHDE&SCHWARZ	Benennung / Designation: EINBAUANWEISUNG FSW OPTION B160 ASSEMBLY INSTRUCTION FSW OPTION B160			Sprache / Lang.: de en	Änd. / C.I.: 04.00	Blatt / Sh.: 1
FSW-B160	Datum / Date: 2013-07-24	Abteilung / Dept.: 1ESK	Name: AN/BU	Zeichnr. / Drawing No.: 1313.3777.00 D		

Pos. 30 - Conector Board
nicht dagestellt / not shown



1. Schritt/Step:
Pos. 10 und 20 mittels Pos. 30
verbinden

2. Schritt/Step:
Auf Kühlkörper (aus 1322.8610.00) 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. 510 an Passstifte des Kühlkörpers ausrichten
und mit Sekundenkleber fixieren

Achtung: dargestellte
Pos. 50; 310; 330 und 510 aus 1322.8610.00 !

NX

Projektions-methode
Projection Method

A3

Maßstab / Scale	Toleranz / Tol. ISO2768-m	Werkstoff / Material			
ROHDE&SCHWARZ	Benennung / Designation: FSW-B500 ANALYSIS BANDW. 500MHZ FSW-B500 ANALYSIS BANDW. 500MHZ		Sprache / Lang.: de en	Aei. / C.I.: 03.00	Blatt / Sh.: 1
FSW-B500	Datum / Date: 2013-10-29	Abteilung / Dept.: 1ESK	Name / Name: BC/Ba	Zeichn.Nr. / Drawing No.: 1313.4296.01	D