

Service Manual



Signal Generator

R&S® SMF100A
1167.0000.02

Printed in Germany



Dear Customer,

throughout this manual, the Signal Generator R&S® SMF100A is abbreviated as R&S SMF.

The Signal Generator includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>), more details see Quick Start Guide and CD-ROM.

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Grouped Safety Messages

Make sure to read through and observe the following safety instructions!

All plants and locations of the Rohde & Schwarz group of companies make every effort to keep the safety standard of our products up to date and to offer our customers the highest possible degree of safety. Our products and the auxiliary equipment required for them are designed and tested in accordance with the relevant safety standards. Compliance with these standards is continuously monitored by our quality assurance system. The product described here has been designed 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, 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 an intention other than its designated purpose or in disregard of the manufacturer's instructions. The manufacturer shall assume no responsibility for such use of the product.

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

Symbols and safety labels

							
Observe product documentation	Weight indication for units >18 kg	Danger of electric shock	Warning! Hot surface	PE terminal	Ground	Ground terminal	Attention! Electrostatic sensitive devices

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

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 putting the product into operation. It is also absolutely essential to observe the additional safety instructions on personal safety 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.

Tags and their meaning

DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	NOTICE indicates a property damage message.
In the product documentation, the word ATTENTION is used synonymously.	

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

Basic safety instructions

1. The product may be operated only under the operating conditions and in the positions specified by the manufacturer. Its ventilation must not be obstructed during operation. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products:
prescribed operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only in enclosed spaces, max. operation altitude 2000 m above sea level, max. transport altitude 4500 m above sea level.
A tolerance of $\pm 10\%$ shall apply to the nominal voltage and of $\pm 5\%$ to the nominal frequency.
2. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed. The product may be opened only by authorized, specially trained personnel. Prior to performing any work on the product or opening the product, the product must be disconnected from the supply network. Any adjustments, replacements of parts, maintenance or repair must be carried out only by technical personnel authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, PE conductor test, insulation resistance measurement, leakage current measurement, functional test).
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens, e.g. nickel) such as aluminum cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties), consult a physician immediately to determine the cause.
4. If products/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, e.g. for disposal purposes, by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.

Grouped Safety Messages

5. If handling the product yields 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.
6. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn life requires increased protection, pregnant women should be protected by appropriate measures. Persons with pacemakers may also be endangered by electromagnetic radiation. The employer/operator is required to assess workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the danger.
7. Operating the products requires special training and intense concentration. Make certain that persons who use the products are physically, mentally and emotionally fit enough to handle operating the products; otherwise injuries or material damage may occur. It is the responsibility of the employer to select suitable personnel for operating the products.
8. Prior to switching on the product, it must be ensured 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.
9. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with earthing contact and protective earth connection.
10. Intentionally breaking the protective earth connection either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
11. If the product has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases, it must be ensured that the power plug is easily reachable and accessible at all times (corresponding to the length of connecting cable, approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply. If products without power switches are integrated in racks or systems, a disconnecting device must be provided at the system level.
12. Never use the product if the power cable is damaged. Check the power cable on a regular basis to ensure that it is in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by e.g. tripping over the cable or suffering an electric shock.
13. The product may be operated only from TN/TT supply networks fused with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
14. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, this can result in sparks, fire and/or injuries.
15. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
16. For measurements in circuits with voltages $V_{rms} > 30 \text{ V}$, suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
17. Ensure that the connections with information technology equipment comply with IEC 950/EN 60950.
18. 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.
19. If a product is to be permanently installed, the connection between the PE terminal on site and the product's PE conductor must be made first before any other connection is made. The product may be installed and connected only by a license electrician.

Grouped Safety Messages

20. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused in such a way that suitable protection is provided for users and products.
21. Do not insert any objects into the openings in the housing that are not designed for this purpose. Never pour any liquids onto or into the housing. This can cause short circuits inside the product and/or electric shocks, fire or injuries.
22. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a thunderstorm) can reach the product. Otherwise the operating personnel will be endangered by electric shocks.
23. Rohde & Schwarz products are not protected against penetration of liquids, unless otherwise specified (see also safety instruction 1.). If this is not taken into account, there exists the danger of electric shock for the user or damage to the product, which can also lead to personal injury.
24. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product was moved from a cold to a warm environment.
25. Do not close any slots or openings on the product, since they are necessary for ventilation and prevent the product from overheating. Do not place the product on soft surfaces such as sofas or rugs or inside a closed housing, unless this is well ventilated.
26. Do not place the product on heat-generating devices such as radiators or fan heaters. The temperature of the environment must not exceed the maximum temperature specified in the data sheet.
27. Batteries and storage batteries must not be exposed to high temperatures or fire. Keep batteries and storage batteries away from children. Do not short-circuit batteries and storage batteries.
If batteries or storage batteries are improperly replaced, this can cause an explosion (warning: lithium cells). Replace the battery or storage battery only with the matching Rohde & Schwarz type (see spare parts list). Batteries and storage batteries must be recycled and kept separate from residual waste. Batteries and storage batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.
28. Please be aware that in the event of a fire, toxic substances (gases, liquids etc.) that may be hazardous to your health may escape from the product.
29. The product can be very heavy. Be careful when moving it to avoid back or other physical injuries.
30. 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).
31. Handles on the products are designed exclusively for personnel to hold or carry the product. It is therefore not permissible to use handles for fastening the product to or on means of transport such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport and for observing the safety regulations of the manufacturer of the means of transport. Noncompliance can result in personal injury or material damage.
32. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. The driver is always responsible for the safety of the vehicle. The manufacturer assumes no responsibility for accidents or collisions.
33. If a laser product (e.g. a CD/DVD drive) is integrated in a Rohde & Schwarz product, do not use any other settings or functions than those described in the product documentation. Otherwise this may be hazardous to your health, since the laser beam can cause irreversible damage to your eyes. Never try to take such products apart, and never look into the laser beam.
34. Prior to cleaning, disconnect the product from the AC supply. Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluent for cellulose lacquers.

Informaciones elementales de seguridad

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

El principio del grupo de empresas Rohde & Schwarz consiste en tener nuestros productos siempre al día con los estándares de seguridad y de ofrecer a nuestros clientes el máximo grado de seguridad. Nuestros productos y todos los equipos adicionales son siempre fabricados y examinados según las normas de seguridad vigentes. Nuestra sección de gestión de la seguridad de calidad controla constantemente que sean cumplidas estas normas. El presente producto ha sido fabricado y examinado según el comprobante de conformidad adjunto según las normas de la CE 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 despreciando las informaciones de seguridad 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 dentro de las instrucciones de la correspondiente documentación de 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 profundos y conocimientos básicas del idioma inglés. Por eso se debe tener en cuenta que el producto sólo pueda ser operado por personal especializado o personas minuciosamente instruidas con las capacidades correspondientes. Si fuera necesaria indumentaria de seguridad para el uso de productos de R&S, encontrará 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 entréguela a usuarios posteriores.

Símbolos y definiciones de seguridad

							
Ver documentación de producto	Informaciones para maquinaria con un peso de > 18kg	Peligro de golpe de corriente	¡Advertencia! Superficie caliente	Conexión a conductor protector	Conexión a tierra	Conexión a masa conductora	¡Cuidado! Elementos de construcción con peligro de carga electrostática

					
Potencia EN MARCHA/PARADA	Indicación Stand-by	Corriente continua DC	Corriente alterna AC	Corriente continua/- alterna DC/AC	El aparato está protegido en su totalidad por un aislamiento de doble refuerzo

Informaciones elementales de seguridad

Tener en cuenta las informaciones de seguridad sirve para tratar de evitar daños y peligros de toda clase. Es necesario de que se lean las siguientes informaciones de seguridad concienzudamente y se tengan en cuenta debidamente antes de la puesta en funcionamiento del producto. También deberán ser tenidas en cuenta las informaciones para la protección de personas que encontrarán en el capítulo correspondiente de la documentación de producto y que también son obligatorias de seguir. En las informaciones de seguridad actuales hemos juntado todos los objetos vendidos por el grupo de empresas Rohde & Schwarz bajo la denominación de „producto“, entre ellos también aparatos, instalaciones así como toda clase de accesorios.

Palabras de señal y su significado

PELIGRO	Identifica un peligro directo con riesgo elevado de provocar muerte o lesiones de gravedad si no se toman las medidas oportunas.
ADVERTENCIA	Identifica un posible peligro con riesgo medio de provocar muerte o lesiones (de gravedad) si no se toman las medidas oportunas.
ATENCIÓN	Identifica un peligro con riesgo reducido de provocar lesiones de gravedad media o leve si no se toman las medidas oportunas.
AVISO	Indica la posibilidad de utilizar mal el producto y a consecuencia dañarlo. En la documentación del producto se emplea de forma sinónima el término CUIDADO.

Las palabras de señal corresponden a la definición habitual para aplicaciones civiles en el área económica europea. Pueden existir definiciones diferentes a esta definición en otras áreas económicas o en aplicaciones militares. Por eso se deberá tener en cuenta que las palabras de señal aquí descritas sean utilizadas siempre solamente en combinación con la correspondiente documentación de 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 malinterpretaciones y tener por consecuencia daños en personas u objetos.

Informaciones de seguridad elementales

- El producto solamente debe ser utilizado según lo indicado por el fabricante referente a la situación y posición de funcionamiento sin que se obstruya la ventilación. Si no se convino de otra manera, es para los productos R&S válido lo que sigue:
como posición de funcionamiento se define por principio la posición con el suelo de la caja para abajo, modo de protección IP 2X, grado de suciedad 2, categoría de sobrecarga eléctrica 2, utilizar solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4.500 m sobre el nivel del mar.
Se aplicará una tolerancia de $\pm 10\%$ sobre el voltaje nominal y de $\pm 5\%$ sobre la frecuencia nominal.

En todos los trabajos deberán ser tenidas en cuenta las normas locales de seguridad de trabajo y de prevención de accidentes. El producto solamente debe de ser abierto por personal especializado autorizado. Antes de efectuar trabajos en el producto o abrirlo deberá este ser desconectado de la corriente. El ajuste, el cambio de partes, la manutención y la reparación deberán ser solamente efectuadas por electricistas autorizados por R&S. Si se reponen partes con importancia para los aspectos de seguridad (por ejemplo el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada recambio de partes elementales para la seguridad deberá ser efectuado un control de seguridad (control a primera vista, control de conductor protector, medición de resistencia de aislamiento, medición de la corriente conductora, control de funcionamiento).
-

Informaciones elementales de seguridad

3. Como en todo producto de fabricación industrial no puede ser excluido en general de que se produzcan al usarlo elementos que puedan generar alergias, los llamados elementos alergénicos (por ejemplo el níquel). Si se produjeran en el trato con productos R&S reacciones alérgicas, como por ejemplo urticaria, estornudos frecuentes, irritación de la conjuntiva o dificultades al respirar, se deberá consultar inmediatamente a un médico para averiguar los motivos de estas reacciones.
 4. Si productos / elementos de construcción son tratados fuera del funcionamiento definido de forma mecánica o térmica, pueden generarse elementos peligrosos (polvos de sustancia de metales pesados como por ejemplo plomo, berilio, níquel). La partición elemental del producto, como por ejemplo sucede en el tratamiento de materias residuales, debe de ser efectuada solamente por personal especializado para estos tratamientos. La partición elemental efectuada inadecuadamente puede generar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes al tratamiento de materias residuales.
 5. En el caso de que se produjeran agentes de peligro o combustibles en la aplicación del producto que debieran de ser transferidos a un tratamiento de materias residuales, como por ejemplo agentes refrigerantes que deben ser repuestos en periodos definidos, o aceites para motores, deberán ser tenidas en cuenta las prescripciones de seguridad del fabricante de estos agentes de peligro o combustibles y las regulaciones regionales para el tratamiento de materias residuales. Cuiden también de tener en cuenta en caso dado las prescripciones de seguridad especiales en la descripción del producto.
 6. Ciertos productos, como por ejemplo las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. En vista a la protección de la vida en desarrollo deberían ser protegidas personas embarazadas debidamente. También las personas con un bypass pueden correr peligro a causa de la radiación electromagnética.
- El empresario/usuario está comprometido a valorar y señalar áreas de trabajo en las que se corra un riesgo aumentado de exposición a radiaciones para evitar riesgos.
7. La utilización de los productos requiere instrucciones especiales y una alta concentración en el manejo. Debe de ponerse por seguro de que las personas que manejen los productos estén a la altura de los requerimientos necesarios referente a sus aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario lleva la responsabilidad de seleccionar el personal usuario apto para el manejo de los productos.
 8. Antes de la puesta en marcha del producto se deberá tener por seguro de que la tensión preseleccionada en el producto equivalga a la de la red de distribución. Si es necesario cambiar la preselección de la tensión también se deberán en caso dado cambiar los fusibles correspondientes del producto.
 9. Productos de la clase de seguridad I con alimentación móvil y enchufe individual de producto solamente deberán ser conectados para el funcionamiento a tomas de corriente de contacto de seguridad y con conductor protector conectado.
 10. Queda prohibida toda clase de interrupción intencionada del conductor protector, tanto en la toma de corriente como en el mismo producto. Puede tener como consecuencia el peligro de golpe de corriente por el producto. Si se utilizaran cables o enchufes de extensión se deberá poner al seguro que es controlado su estado técnico de seguridad.
 11. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de distribución como interruptor. En estos casos deberá asegurar de que el enchufe sea de fácil acceso y nabejo (según la medida del cable de distribución, aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para el corte de la red eléctrica. Si los productos sin interruptor están integrados en bastidores o instalaciones, se deberá instalar el interruptor al nivel de la instalación.

Informaciones elementales de seguridad

12. No utilice nunca el producto si está dañado el cable eléctrico. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegure a través de las medidas de protección y de instalación adecuadas de que el cable de eléctrico no pueda ser dañado o de que nadie pueda ser dañado por él, por ejemplo al tropezar o por un golpe de corriente.
13. Solamente está permitido el funcionamiento en redes de distribución TN/TT aseguradas con fusibles de como máximo 16 A (utilización de fusibles de mayor amperaje sólo previa consulta con el grupo de empresas Rohde & Schwarz).
14. 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. Si no tiene en consideración estas indicaciones se arriesga a que se originen chispas, fuego y/o heridas.
15. No sobrecargue las tomas de corriente, los cables de extensión o los enchufes de extensión ya que esto pudiera causar fuego o golpes de corriente.
16. En las mediciones en circuitos de corriente con una tensión de entrada de $U_{eff} > 30 \text{ V}$ se deberá tomar las precauciones debidas para impedir cualquier peligro (por ejemplo medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
17. En caso de conexión con aparatos de la técnica informática se deberá tener en cuenta que estos cumplan los requisitos del estándar IEC950/EN60950.
18. 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 heridas, fuego o daños en el producto.
19. Si un producto es instalado fijamente en un lugar, se deberá primero conectar el conductor protector fijo con el conductor protector del aparato antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
20. En caso de que los productos que son instalados fijamente en un lugar sean sin protector implementado, autointerruptor o similares objetos de protección, el circuito de suministro de corriente deberá estar protegido de manera que usuarios y productos estén suficientemente protegidos.
21. Por favor, no introduzca ningún objeto que no esté destinado a ello en los orificios de la caja del aparato. No vierta nunca ninguna clase de líquidos sobre o en la caja. Esto puede producir cortocircuitos en el producto y/o puede causar golpes de corriente, fuego o heridas.
22. Asegúrese con la protección adecuada de que no pueda originarse en el producto una sobrecarga por ejemplo a causa de una tormenta. Si no se verá el personal que lo utilice expuesto al peligro de un golpe de corriente.
23. Los productos R&S no están protegidos contra líquidos si no es que exista otra indicación, ver también punto 1. Si no se tiene en cuenta esto se arriesga el peligro de golpe de corriente para el usuario o de daños en el producto lo cual también puede llevar al peligro de personas.
24. No utilice el producto bajo condiciones en las que pueda producirse y se hayan producido líquidos de condensación en o dentro del producto como por ejemplo cuando se desplaza el producto de un lugar frío a un lugar caliente.
25. Por favor no cierre ninguna ranura u orificio del producto, ya que estas son necesarias para la ventilación e impiden que el producto se caliente demasiado. No pongan el producto encima de materiales blandos como por ejemplo sofás o alfombras o dentro de una caja cerrada, si esta no está suficientemente ventilada.
26. No ponga el producto sobre aparatos que produzcan calor, como por ejemplo radiadores o calentadores. La temperatura ambiental no debe superar la temperatura máxima especificada en la hoja de datos.

27. Baterías y acumuladores no deben de ser expuestos a temperaturas altas o al fuego. Guardar baterías y acumuladores fuera del alcance de los niños. No cortocircuitar baterías ni acumuladores. Si las baterías o los acumuladores no son cambiados con la debida atención existirá peligro de explosión (atención células de litio). Cambiar las baterías o los acumuladores solamente por los del tipo R&S correspondiente (ver lista de piezas de recambio). Las baterías y acumuladores deben reutilizarse y no deben acceder a los vertederos. Las baterías y acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de evacuación y reciclaje.
28. Por favor tengan en cuenta que en caso de un incendio pueden desprenderse del producto agentes venenosos (gases, líquidos etc.) que pueden generar daños a la salud.
29. El producto puede poseer un peso elevado. Muévelo con cuidado para evitar lesiones en la espalda u otras partes corporales.
30. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptas para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (por ejemplo paredes y estantes).
31. Las asas instaladas en los productos sirven solamente de ayuda para el manejo que solamente está previsto para personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como por ejemplo grúas, carretillas elevadoras de horquilla, carros etc. El usuario es responsable de que los productos sean sujetados de forma segura a los medios de transporte y de que las prescripciones de seguridad del fabricante de los medios de transporte sean observadas. En caso de que no se tengan en cuenta pueden causarse daños en personas y objetos.
32. Si llega a utilizar el producto dentro de un vehículo, queda en la responsabilidad absoluta del conductor que conducir el vehículo de manera segura. Asegure el producto dentro del vehículo debidamente para evitar en caso de un accidente las lesiones u otra clase de daños. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Siempre queda en la responsabilidad absoluta del conductor la seguridad del vehículo. El fabricante no asumirá ninguna clase de responsabilidad por accidentes o colisiones.
33. Dado el caso de que esté integrado un producto de láser en un producto R&S (por ejemplo CD/DVD-ROM) no utilice otras instalaciones o funciones que las descritas en la documentación de producto. De otra manera pondrá en peligro su salud, ya que el rayo láser puede dañar irreversiblemente sus ojos. Nunca trate de descomponer estos productos. Nunca mire dentro del rayo láser.
34. Antes de proceder a la limpieza, desconecte el producto de la red. Realice la limpieza con un paño suave, que no se deshilache. No utilice de ninguna manera agentes limpiadores químicos como, por ejemplo, alcohol, acetona o nitrodiluyente.

Safety Instructions

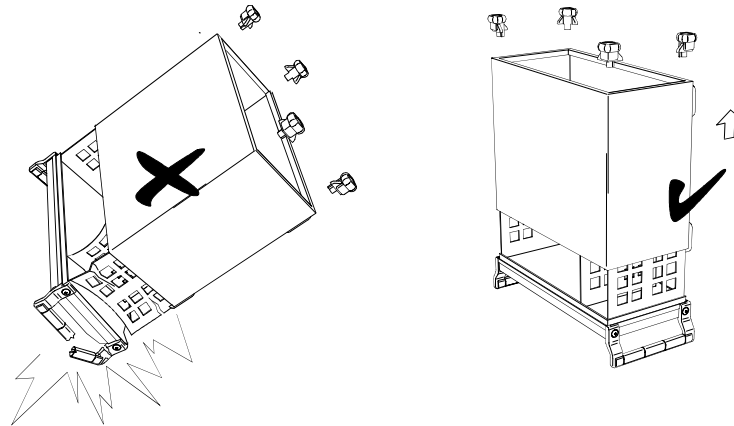
WARNING



Danger of injuries

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

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

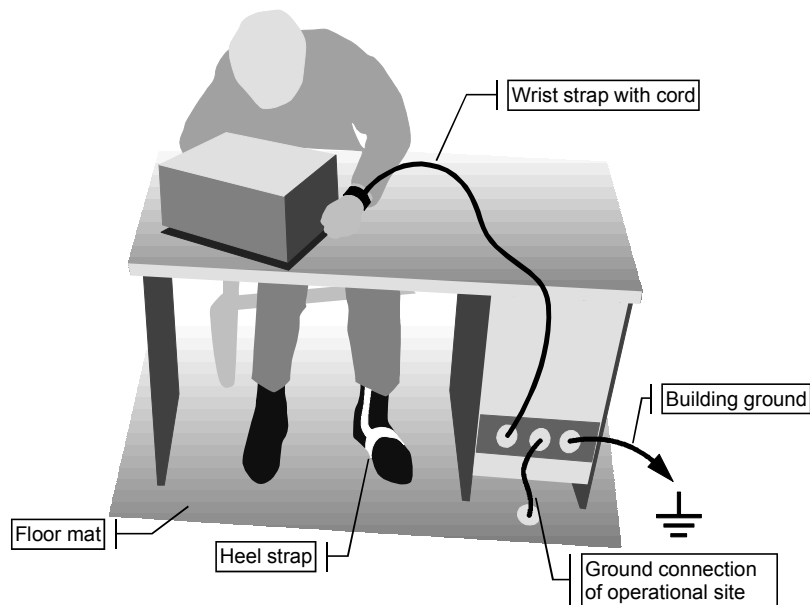


When mounting the cabinet take care not to pen in the fingers. Also pay attention not to damage or pull off cables. Screw the rear feet back on immediately after mounting the cabinet. Do not move the unit with the rear feet missing.

ATTENTION



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*

Certified Quality System

DIN EN ISO 9001 : 2000
DIN EN 9100 : 2003
DIN EN ISO 14001 : 2004

DQS REG. NO 001954 QM UM

QUALITÄTSZERTIFIKAT

Sehr geehrter Kunde,

Sie haben sich für den Kauf eines Rohde & Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Managementsystems entwickelt, gefertigt und geprüft.

Das Rohde & Schwarz Managementsystem ist zertifiziert nach:

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:2004

CERTIFICATE OF QUALITY

Dear Customer,

you have decided to buy a Rohde & Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards.

The Rohde & Schwarz quality management system is certified according to:

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:2004

CERTIFICAT DE QUALITÉ

Cher Client,

vous avez choisi d'acheter un produit Rohde & Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité.

Le système de gestion qualité de Rohde & Schwarz a été homologué conformément aux normes:

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:2004



ROHDE & SCHWARZ

Customer Support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz equipment, contact one of our Customer Support Centers. A team of highly qualified engineers provides telephone support and will work with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz equipment.

Up-to-date information and upgrades

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish.

We will take care that you will get the right information.

USA & Canada

Monday to Friday (except US public holidays)

8:00 AM – 8:00 PM Eastern Standard Time (EST)

Tel. from USA 888-test-rsa (888-837-8772) (opt 2)

From outside USA +1 410 910 7800 (opt 2)

Fax +1 410 910 7801

E-mail CustomerSupport@rohde-schwarz.com

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* 0.14 €/Min within the German fixed-line telephone network, varying prices for the mobile telephone network and in different countries.



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- ◆ Sales Locations
- ◆ Service Locations
- ◆ National Websites

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.

Shipping of Instrument

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

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

- Instrument type designation
- Instrument stock number
- Instrument serial number
- Firmware version
- Indication whether the instrument should be updated to the latest firmware version during service or the existing firmware retained
- Detailed error description in case of repair
- Indication of desired calibration
- Contact person for possible questions

In some countries, an RMA process is available for the return shipment of the instrument. The RMA process allows faster and more efficient repair of your instrument at no additional cost. The progress of repair may be viewed at all times, and the transport costs are already included. 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 calibration of the test systems it produces. The calibration documentation fulfills ISO 17025 requirements.

Ordering Spare Parts

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

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

- Stock number (see list of spare parts in chapter “Documents”)
- Designation
- Component number as indicated in 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

Shipping Defective Modules

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

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

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

Exception:

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

Refurbished Modules

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

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

Taking Back Defective Replaced Modules

Defective replaced modules that cannot be repaired are taken back within three months following delivery. A repurchasing value is credited.

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

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

- Stock number, serial number and designation of the removed part
- Detailed error description
- Stock number, serial number and type of instrument from which the module was removed
- Date of removal
- Name of the engineer/technician who replaced the module
- Rohde & Schwarz customer order number (is indicated on the accompanying document for returned merchandise)
- Service reference number (if available)

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1 Checking the Rated Characteristics

This performance test describes the steps for testing the R&S SMF100A Signal Generator with respect to function and compliance with specifications.

In the following, the term DUT (Device Under Test) is used for the signal generator to be tested.

Measuring Equipment and Accessories

Table 1-1 Measuring equipment and accessories

Item	Type of Instrument	Required Characteristics	Suitable Instrument	R&S Order No.
1	Frequency counter (included in item 18)	1 Hz to 43.5 GHz, resolution 0.1 Hz		
2	Digital sampling oscilloscope	100 kHz to 43.5 GHz	Tektronix TDS8000B	
3	Storage oscilloscope	300 M samples/s, two channels		
4	Controller	Industry standard PC/XT/AT with IEC-60625 interface and USB interface	R&S PSM17	1116.5004.70
5	Signal generator	100 kHz to 43.5 GHz	R&S SMF100A with R&S SMF-B144 and R&S SMF-B2	1167.0000.02 1167.7204.02 1167.4005.02
6	Phase noise test assembly	Mixer: 10 MHz to 40 GHz, branching filter 20 MHz, switchable attenuator to 0 and 40 dB, preamplifier with gain of approx. 30 dB, input noise < 2 nV (1 Hz), bandwidth 10 MHz, DC decoupling after the mixer for oscilloscope		
7	Oscilloscope (usually included in item 3)	Bandwidth > 100 MHz, two channels with DC coupling		
8	RF power meter	100 kHz to 40 GHz in addition for R&S SMF100A with R&S SMF-B144 50 MHz to 43.5 GHz -30 dBm to +20 dBm	R&S NRP with R&S NRP-Z55	1143.8500.02 1138.2008.02
9	Low-noise preamplifier	10 MHz to 40 GHz, gain > 20 dB, noise figure < 10 dB		
10	Feed-through termination	50 Ω , BNC system	R&S RAD	0289.8966.00
11	DC voltage source	Setting range 0 to 10 V	R&S NGMD35	0117.7127.02
12	Zero Bias Schottky Detector	50 Ω , 10 MHz to 40 GHz	Krytar 203SK	
13	Pulse generator (included in item 5)	Pulse repetition frequency up to 10 MHz		
14	AC/DC voltmeter	10 Hz to 10 MHz	R&S URE3	350.5315.03
15	Broadband FM demodulator	included in spectrum analyzer item 18		
16	Low frequency low-noise preamplifier	Low Noise Preamplifier 10 Hz to 30kHz, >30dB Gain		

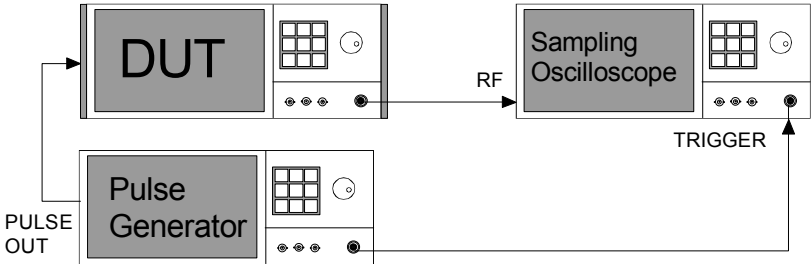
Item	Type of Instrument	Required Characteristics	Suitable Instrument	R&S Order No.
17	RF attenuator	DC to 40 GHz, 3 dB, system K		
18	RF analyzer & Demodulator for analog modulations & FM-demodulator	100 kHz to 43.5 GHz	R&S FSMR50 equipped with option R&S FSMR-B2	1166.3311.50 1157.1903.50

Test Assemblies

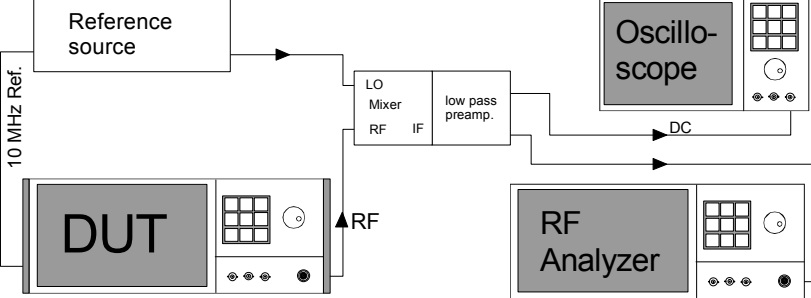
Standard Test Assembly for Analog Modulations

Test equipment	- RF analyzer (Table 1-1, item 18) - Signal generator (Table 1-1, item 5)
Test setup	The RF analyzer is used as a modulation analyzer. The signal generator is used as modulation source in case of external modulation.

Test Assembly for Pulse Modulation Rise and Fall Time

Test equipment	- Digital Sampling Oscilloscope (Table 1-1, item 2) - Pulse generator (Table 1-1, item 13)
Test setup	The DUT is pulse modulated by the pulse generator. The pulsed RF is analyzed with the digital sampling oscilloscope.
	

Test Assembly for SSB Phase Noise

Test equipment	- Reference signal source (Table 1-1 item 5), - Phase noise test assembly consisting of mixer with lowpass filter and preamplifier (Table 1-1 item 6) - Oscilloscope (Table 1-1 item 7) - Spectrum analyzer (Table 1-1 item 18)
Test setup	

Preparation, Recommended Test Frequencies and Levels

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

- Allow for a minimum **warm-up time of 30 minutes** at ambient temperature.
- Carry out all **internal adjustments** (see operating manual, chapter 4, section "Internal Adjustment - Setup-System").
- Press **[PRESET]** to establish a defined **initial** state before configuring a new measurement.

The following sections describe the **procedures** for checking the rated values. The **values** are specified in the **data sheet** and in the **performance test report**. Aging and temperature effect of the reference frequency are only specified in the **data sheet**. Additional uncertainties introduced by the measurement equipment must be taken into account when checking the rated values.

The following table lists the important internal switchpoint frequencies and the recommended measurement frequencies derived from these frequencies. We recommend measurements at these frequencies unless particular test frequencies are specified.

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

a) R&S SMF100A with Option R&S SMF-B122

Range	Frequency	Hardware switching points	Recommended test frequencies in MHz
Divider /4	$1 \text{ GHz} \leq f < 1.5 \text{ GHz}$	Lowpass filter: 1.5 GHz	1000, 1499
Divider /2	$1.5 \text{ GHz} \leq f < 3 \text{ GHz}$	Lowpass filters: 1.5 GHz, 2.2 GHz	1500, 2000, 2500, 2999
Base band	$3 \text{ GHz} \leq f < 11 \text{ GHz}$	Lowpass filters: 3 GHz, 4.2 GHz, 6 GHz, 8.4 GHz	3000, 3500, ...10999
Multiplier x2	$11 \text{ GHz} \leq f < 22 \text{ GHz}$	Lowpass filters: 12 GHz, 16 GHz, 22 GHz	11000, 11500, ...22000

b) R&S SMF100A with Option R&S SMF-B144

Range	Frequency	Hardware switching points	Recommended test frequencies in MHz
Divider /4	$1 \text{ GHz} \leq f < 1.5 \text{ GHz}$	Lowpass filter: 1.5 GHz	1000, 1499
Divider /2	$1.5 \text{ GHz} \leq f < 3 \text{ GHz}$	Lowpass filters: 1.5 GHz, 2.2 GHz	1500, 2000, 2500, 2999
Base band	$3 \text{ GHz} \leq f < 11 \text{ GHz}$	Lowpass filters: 3 GHz, 4.2 GHz, 6 GHz, 8.4 GHz	3000, 3500, ...10999
Multiplier x2	$11 \text{ GHz} \leq f < 21 \text{ GHz}$	Lowpass filters: 12 GHz, 16 GHz	11000, 11500, ...20999
Multiplier x4	$21 \text{ GHz} \leq f \leq 43.5 \text{ GHz}$	Lowpass filters: 22 GHz, 27.2 GHz, 36.8 GHz	21000, 21500, ...43500

c) R&S SMF100A with Option R&S SMF-B2 and R&S SMF-B122

Range	Frequency	Hardware switching points	Recommended test frequencies in MHz
Mixer	$100 \text{ kHz} \leq f < 375 \text{ MHz}$	Lowpass filters: 15.3 MHz, 23.4 MHz, 36.1 MHz, 56 MHz, 91.7 MHz, 133.5 MHz, 214 MHz, 331.6 MHz	10, 12.6, 15.2, 15.4, 19.35, 23.3, 23.5, 29.75, 36, 36.2, 46.05, 55.9, 56.1, 73.85, 91.6, 91.8, 112.6, 133.4, 133.6, 173.75, 213.9, 214.1, 272.8, 331.5, 331.7, 374.9
Divider /8	$375 \text{ MHz} \leq f < 750 \text{ MHz}$	Lowpass filters: 525 MHz	428.3, 524.9, 525.1, 637.5, 749.9
Divider /4	$750 \text{ MHz} \leq f < 1.5 \text{ GHz}$	Lowpass filters: 750 MHz, 1 GHz	750.1, 875, 999.9, 1000.1, 1499
Divider /2	$1.5 \text{ GHz} \leq f < 3 \text{ GHz}$	Lowpass filters: 1.5 GHz, 2.2 GHz	1500, 2000, 2500, 2999
Base band	$3 \text{ GHz} \leq f < 11 \text{ GHz}$	Lowpass filters: 3 GHz, 4.2 GHz, 6 GHz, 8.4 GHz	3000, 3500, ...10999
Multiplier x2	$11 \text{ GHz} \leq f \leq 22 \text{ GHz}$	Lowpass filters: 12 GHz, 16 GHz, 22 GHz	11000, 11500, ...22000

d) R&S SMF100A with Option R&S SMF-B2 and R&S SMF-B144

Range	Frequency	Hardware switching points	Recommended test frequencies in MHz
Mixer	$100 \text{ kHz} \leq f < 375 \text{ MHz}$	Lowpass filters: 15.3 MHz, 23.4 MHz, 36.1 MHz, 56 MHz, 91.7 MHz, 133.5 MHz, 214 MHz, 331.6 MHz	10, 12.6, 15.2, 15.4, 19.35, 23.3, 23.5, 29.75, 36, 36.2, 46.05, 55.9, 56.1, 73.85, 91.6, 91.8, 112.6, 133.4, 133.6, 173.75, 213.9, 214.1, 272.8, 331.5, 331.7, 374.9
Divider /8	$375 \text{ MHz} \leq f < 750 \text{ MHz}$	Lowpass filters: 525 MHz	428.3, 524.9, 525.1, 637.5, 749.9
Divider /4	$750 \text{ MHz} \leq f < 1.5 \text{ GHz}$	Lowpass filters: 750 MHz, 1 GHz	750.1, 875, 999.9, 1000.1, 1499
Divider /2	$1.5 \text{ GHz} \leq f < 3 \text{ GHz}$	Lowpass filters: 1.5 GHz, 2.2 GHz	1500, 2000, 2500, 2999
Base band	$3 \text{ GHz} \leq f < 11 \text{ GHz}$	Lowpass filters: 3 GHz, 4.2 GHz, 6 GHz, 8.4 GHz	3000, 3500, ...10999
Multiplier x2	$11 \text{ GHz} \leq f \leq 21 \text{ GHz}$	Lowpass filters: 12 GHz, 16 GHz, 22 GHz	11000, 11500, ...20999
Multiplier x4	$21 \text{ GHz} \leq f \leq 43.5 \text{ GHz}$	Lowpass filters: 22 GHz, 27.2 GHz, 36.8 GHz	21000, 21500, ...43500

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

The recommended **test levels** are at the upper and lower switching threshold of the attenuator. The mechanical attenuator of the DUT is switched depending on frequency, modulation parameters and level according to an internal stored table in approximately 10 dB steps. The switching thresholds can be detected under **Attenuator fixed range** in the **Level** menu. After setting all other parameters, the threshold level can be detected by level variation. The level at which the attenuator fixed range changes is the threshold. By measuring at the last level setting of one range and the first level setting of the next range, the internal setting range borders are used. In the following, $P_{\min}$ is the lowest level before switching the attenuator, and $P_{\max}$ the highest. For best measurement results, levels at the crossover from 0 to 10 dB attenuation are recommended.

Test Procedures

Reference Frequency

Output of Internal Reference

Important: Allow the DUT to warm up for at least 30 minutes before the measurement.

Test equipment	- RF power meter (Table 1-1, item 8) - Frequency counter (Table 1-1, item 1)
Test setup	➤ Connect an RF power meter to the REF OUT output (on rear panel).
Measurement	➤ Measure the output level. It should be within ± 3 dB of the data sheet specifications.
Test setup	➤ Connect a calibrated frequency counter to the REF OUT output (on rear panel).
Measurement	➤ Measure the frequency. ⇒ The frequency deviation must not exceed the sum of deviations resulting from the frequency error in the rated temperature range and from aging.

Input for External Reference

Test equipment	- Frequency counter (Table 1-1, item 1) - Signal generator (Table 1-1, item 5)
Test setup	➤ Connect the signal generator to the REF IN input for the external reference (on rear panel) and connect a calibrated frequency counter to the RF output.
Measurement	➤ Measure the frequency with the setting Reference Oscillator Settings/Source External . ⇒ <i>The pull-in range has to be tested only at 10 MHz input frequency by measuring the output frequency (e.g. at 1 GHz). There must be no relative frequency error and no error message. At the other input frequencies, a function test at nominal frequency is sufficient. The level of the signal generator has to be varied over the specified range.</i>

Frequency

Frequency Setting

Test equipment	- Frequency counter (Table 1-1 , item 1)
Test method	The frequency setting is checked using a frequency counter whose reference frequency is synchronized with that of the DUT.
Measurement	➤ Setting on DUT: - Frequency: test frequency unmodulated, recommended frequencies: according to Table 1-2 - Level: 0 dBm ⇒ The measured values must be exactly within the framework of the counter resolution.

Spectral Purity

Harmonics

Test equipment	Spectrum analyzer (Table 1-1 , item 18)
Test setup	➤ Connect the spectrum analyzer to the RF output of the DUT. ➤ Synchronize reference frequencies of analyzer and DUT.
Recommended settings on the spectrum analyzer	➤ Reference level = test level + 3 dB, 10 dB/div. Span 0 Hz, Resolution bandwidth 1 kHz, Video bandwidth 30 Hz, Sample detector

NOTE:

These values are typical values that depend on the analyzer used.

The necessary measurement resolution must be verified prior to the measurement.

Measurement	➤ Settings on DUT: - Frequency: test frequencies, unmodulated - Level: test level ➤ First measure the level of the fundamental as a reference. Then find signals at twice and three times the carrier frequency. ⇒ The harmonic spacing is the measured level referred to the fundamental (dBc = referred to the carrier).
Recommended test frequencies and levels	test frequencies according to Table 1-2 for harmonics up to 22 GHz for R&S SMF with R&S [®] SMF-122 frequency option or up to 43.5 GHz for R&S SMF with R&S [®] SMF-144 frequency option) levels: specified levels of data sheet

Subharmonics

Test equipment	Same as for harmonics measurement
Test setup	Same as for harmonics measurement
Measurement	➤ First the level of the fundamental frequency f is measured as reference, then a signal is searched for at frequencies $0.25*f$, $0.5*f$ and $1.5*f$. For test frequency ≥ 21 GHz additional at $0.75*f$. ⇒ The subharmonic spacing is the measured level referred to the reference level (dBc = referred to the carrier).
Recommended test frequencies and levels	Test frequencies from 11 GHz for subharmonics up to 22 GHz for R&S SMF with R&S[®]SMF-122 frequency option or up to 43.5 GHz for R&S SMF with R&S[®]SMF-144 frequency option) level: specified levels of data sheet

Nonharmonics

Test equipment	Same as for harmonics measurement
Test setup	Same as for harmonics measurement
Measurement	➤ Setting on analyzer: AMPT/MIXER/MIXER LVL MANUAL –2 dBm ➤ First the level is measured at the test frequency as reference, then a signal is searched for at the analyzer frequency. ⇒ The nonharmonic spacing is the measured level referred to the reference level (dBc = referred to the carrier).
	Some of the nonharmonics suppression values to be measured are outside analyzer specifications. In case of doubt, the measurement should be repeated with a 3 dB attenuator at the analyzer input. If the nonharmonic spacing changes, the nonharmonic comes from the analyzer. Alternative: Check with a second source (not R&S SMF, or equipped with different options)

Measurement

- Settings on DUT:
 - Test frequencies of [Table 1-2](#), for extensive tests use random frequencies in each band (mixer, divider,...).
 - Test level +3 dBm unmodulated
- Recommended settings on analyzer:
 - Max peak detector
 - Filter Type: FFT
 - Average count: 10

Measurement range

- > 10 kHz offset from carrier
- Recommended settings for span and resolution bandwidth

Offset in kHz	Span in kHz	RBW in Hz	Partitions
10 to 103	93	10	1
103 to 303	100	20	2
303 to 603	100	50	3
603 to 1103	500	200	1
1103 to 2103	1000	1000	1
2103 to 20000	1000	1000	18

During the scan, you should use an overlap of at least 1% for the measurement partitions.

Note: *Some of the nonharmonics suppression values to be measured are outside analyzer specifications. In case of doubt, the measurement must be repeated with a 3 dB attenuator at the analyzer input. If the nonharmonics suppression changes, the nonharmonics come from the analyzer. Because of the bell-shaped noise of the analyzer in the vicinity of the carrier, smaller resolution bandwidths may have to be used. To exclude amplitude independent nonharmonics of the analyzer, use a second generator with a different synthesis architecture.*

SSB Phase Noise

Test assembly	See section " Test Assembly for SSB Phase Noise ", page 1.3.
Test method	The two generators are set to the test frequency and synchronized with a phase offset of 90° (phase quadrature). Mixing to 0 Hz suppresses the RF carrier, and due to the phase quadrature the mixer supplies a voltage corresponding to the phase difference between the input signals. This is measured by the LF spectrum analyzer and can be converted into SSB phase noise.
Measurement	➤ Set the levels of the two generators in accordance with the specifications of the mixer used. ➤ For calibration, switch the attenuator of the test assembly to 40 dB and detune one signal generator by 20 kHz. Check the signal for harmonics; the 2nd and 3rd harmonic should be more than 30 dB below the fundamental. Measure the reference value at 20 kHz at the analyzer and note it down. ➤ Set the detuned signal generator to the previous frequency and set the signal generators for phase quadrature. To this end, switch the attenuator to 0 dB and call Delta Phase in the Frequency/Phase menu. Observe the output voltage of the mixer on the oscilloscope and vary the phase until the voltage becomes zero. ➤ Read the noise voltage, normalized to a bandwidth of 1 Hz (noise level) from the analyzer.
Evaluation	➤ Determine the difference relative to the reference level and add to the value found 6 dB for the second (correlated) sideband and 40 dB for level switchover. If the S/N ratio of the reference source is not at least 10 dB better than that of the DUT, the noise component of the reference signal generator must be determined and subtracted as well. This will apply, when using a second R&S SMF100A as reference source instead of item 2. ⇒ The corrected S/N ratio is the wanted measured value. Example: The measured reference level is assumed to be 12 dBm. A noise level of -78 dBm (1 Hz) is determined at 20 kHz. The difference is 90 dB, plus the correction for the second sideband (6 dB) and level switchover (40 dB), yielding an S/N ratio of -136 dB or a noise level of -136 dBc (dB referred to the carrier power). If two identical signal generators have been used, the result must be reduced by 3 dB for the (uncorrelated) noise power of the reference signal generator. The final result is then -139 dBc.

Level Data

Level Flatness and Uncertainty

Test method	The level uncertainty is measured in two steps. First, the level flatness or frequency response is measured at a fixed level with high frequency resolution. Then the level dependant uncertainty is measured at fixed frequencies over the specified range.
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Test equipment	- Power meter (Table 1-1, item 8) - Spectrum analyzer (Table 1-1, item 18) - Low-noise preamplifier (Table 1-1, item 9)
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Test method for levels in measurement range of power meter

Test setup	Connect power meter to RF output socket.
Measurement	➤ Setting on DUT: - Level : 0dBm, Level Mode ALC ON ➤ Measure the level at output frequencies of 100 kHz to 43.5 GHz ⇒ The level error is the deviation of the measured level from the set value.
Recommended test frequencies for the level frequency response measurement	100 kHz, 300 kHz, 1 MHz, 10 MHz, 20 MHz, ... 990 MHz, 999.9 MHz, 1 GHz, 1.1 GHz, ... 43.5GHz
Recommended test frequencies and levels for the level dependant measurement.	100 kHz, 300 kHz, 1 MHz, 10 MHz, 20 MHz, ... 990 MHz, 999.9 MHz 1 GHz, 1.1 GHz, ... 43.5 GHz Test level: from 0 dBm in 5 dB steps down to the minimum specified level and from 0 dBm in 5 dB steps up to the maximum specified level.

Test method for low levels

Test principle	Levels below the measurement range of the power meter can be determined by means of a relative measurement referred to the measurements performed with the power meter, using a high-linearity spectrum analyzer (digital IF). After switching the analyzer attenuator a continuity calibration is to be carried out. It is therefore recommended to switch the attenuator not until reaching approx. 50 dB under full scale, since the linearity errors are very small in the range up to -50 dBfs (referred to full scale). If the measurement is started at ($P_{\max} - 40$) dBm, no error occurs due to alternating internal impedance of the DUT.
Test setup	➤ Connect the spectrum analyzer to the RF output of the DUT with hermetically sealed RF measurement cables.
Measurement	➤ Settings on DUT Frequency test frequency Level ($P_{\max} - 40$) dBm, unmodulated ➤ Setting on the analyzer - Test frequency - SPAN 0 Hz - RES BW 10 Hz - SWEEP TIME 500 ms - Read out marker as rms summary - Reference level ($P_{\max} - 40$) dBm ➤ Read the level at the analyzer and define the correction factors as a function of the frequency from the measurements performed with the power meter. ➤ Now the measurements between ($P_{\max} - 45$) dBm and ($P_{\max} - 100$) dBm can be carried out. ➤ In order to obtain enough spacing to the noise limit of the analyzer, a low-noise preamplifier (Table 1-1, item 9) is looped between the DUT and the analyzer (Caution: hermetically sealed RF cables!). A continuity calibration at ($P_{\max} - 100$) dBm is thus required, the reference level of the analyzer should be set such that the measured level is close to the reference level. The sweep time is to be increased with lower levels to maintain measurement accuracy. ➤ Now the level steps down to the lowest can be measured.

LF Generator

The R&S SMF100A signal generator includes two sine generators with a frequency range from DC to 10 MHz.

Test equipment	Spectrum analyzer (Table 1-1 , item 18) AC/DC voltmeter (Table 1-1 , item 14)
Test setup	➤ Connect the spectrum analyzer to the LF socket of the DUT. For level measurement connect the AC/DC Voltmeter to the LF socket of the DUT.
Measurement of frequency settings and distortion	➤ Settings on DUT: LF Output menu: State Path1 On Source Path1 Generator 1 Path1 Output Voltage 0.5 Vp Vary LF Frequency Gen.1 from 0.1 Hz to 10 MHz ➤ Settings of the spectrum analyzer: RF INPUT DC AMPT REF LEVEL 10 dBm FREQ CENTER = LF Gen Frequency SPAN = LF Gen Frequency / 10 ➤ Read the actual frequency from the spectrum analyzer using Marker function SIGNAL COUNT. ➤ Settings of the spectrum analyzer: FREQ START = LF Gen Frequency / 2 STOP = LF Gen Frequency * 5 at higher frequencies use TRACE AVERAGE to smooth display ➤ Use MARKER to read the power of the fundamental and the harmonic spectral lines. ⇒ The distortion is calculated from the summed power of the spectral lines of the harmonics related to the fundamental.
Recommended test frequencies for frequency settings	1 kHz, 10 kHz, 100 kHz, 1 MHz, 10 MHz
Recommended test frequencies for distortion	1 kHz, 10 kHz, 20 kHz
Measurement of the level	➤ Settings on DUT: LF Output menu: LF Frequency Gen. 1 1 kHz Set Path1 Output Voltage to 1 Vp ➤ Measure the output level with the AC/DC voltmeter.

Frequency response

Test equipment	AC voltmeter (Table 1-1 , item 14)
Test setup	➤ Connect the AC voltmeter to the LF socket of the DUT.
Measurement	➤ Settings on DUT: LF Output menu: Vary LF Frequency Gen.1 from 10 Hz to 10 MHz. Recommendation: logarithmic with 4 steps/decade. ➤ Measure the output level. ⇒ The frequency response is the difference between the highest and the lowest level.

Amplitude Modulation

AM Setting Uncertainty

Test assembly	See section " Standard Test Assembly for Analog Modulations ", page 1.2.
Measurement	➤ Settings on DUT: RF On RF Frequency 22 GHz RF Level 0 dBm Amplitude Modulation menu: State Path1 On Source Path1 LF Generator 1 LF Frequency Gen.1 1 kHz ➤ Settings on R&S RF SPECTRUM ANALYZER: AMPTD / REF LEVEL test level + 6 dB , FREQ / CENTER test frequency FMDEMOD, FMDEMOD ON, RESULT DISPLAY / AM DEMOM BW > 3* fmod, RANGE / DEVIATION PER DIV 20 % MEAS TIME 3/fmod for distortion (up to 3rd harmonic) RESULT DISPLAY / AM / AF SPECTRUM DEMOM BW > 7 * fmod, MEAS TIME 16/fmod
Recommended settings	➤ AM Depth m = 10 % to 80 % in at least 10 steps

AM Distortion

Test assembly	See section " Standard Test Assembly for Analog Modulations ", page 1.2.
Measurement	➤ Settings on DUT: RF On Level 0 dBm Amplitude Modulation menu: State Path1 On Source Path1 LF Generator 1 AM depth Path1 60%. LF Frequency Gen.1 1 kHz ➤ Vary the carrier frequency from 10 MHz to 40 GHz. ➤ Read THD from the display. To convert to percent calculate THDpct = 100 * 10 ^{^(THDdB/20)}.

AM Frequency Response

Test assembly	See section " Standard Test Assembly for Analog Modulations ", page 1.2.
Measurement	➤ Settings on DUT: RF On Level 0 dBm Amplitude Modulation menu: State Path1 On Source Path1 EXT 1 AM depth Path1 60%. External Coupling DC ➤ Vary the carrier frequency from 10 MHz to 40 GHz. Recommended test frequencies 10 MHz; 100 MHz, 374.9 MHz; 375.1 MHz 1 GHz, 3 GHz, 11 GHz, 22 GHz, 40 GHz. ➤ Setting on the signal generator: - LF Output ON - LFGen Voltage 1 V (V_{peak}). ➤ Vary the generator frequency to determine the modulation frequency response. Measure the modulation depth as described above under 'Uncertainties'. ⇒ The modulation frequency response is the difference between the greatest and the smallest modulation depth. ➤ Repeat the measurement at RF = 1 GHz with the internal modulation generator with the setting Source Internal. ➤ Repeat the measurement with the internal modulation generator at $f_{mod} = 100$ kHz. Vary the carrier frequency from 10 MHz to 40 GHz. Measure the modulation depth as described above under 'Uncertainties' ⇒ Check the modulation depth for 60%

Frequency Modulation

Test Methodes

Test assembly	See section " Standard Test Assembly for Analog Modulations ", page 1.2.
Test Method "Spectrum Measurement"	- The FM/PhiM deviation is determined by a spectrum measurement. All relevant spectral components of the modulation spectrum are measured and modulation index m is computed via Bessel functions. To suppress AM components, left and right spectral lines are averaged. From the ratio of the averaged spectral components a recalculation is done to get the modulation index m. Since the ratio of the spectral lines is used, the result is correct, when a sufficient number of lines is used. Missing lines at the spectrum borders do not deteriorate the result. - Restrictions: This method is suitable only with sine shaped modulation signal. Measuring large deviations at low modulation frequencies tends to get time consuming, since many spectrum lines are to be measured and recalculation may be ambiguous. It is recommended to use this method up to modulation index 100. ➤ Settings on spectrum analyzer: AMPT REF LEVEL test level FREQ CENTER test frequency Set SPAN to $f_{mod}/4$, maximal 80 kHz and resolution bandwidth to $f_{mod}/20$, maximal 20 kHz. ➤ First measure the carrier amplitude as zero order of Bessel function, then determine the n orders up to $\text{int}(m + 1)$ by measuring the spectral lines $CF + (n * f_{mod})$ and $CF - (n * f_{mod})$. Calculate the average of the amplitude of both lines for each order. Now the measured modulation index m can be calculated by numerical search for the error minimum. ⇒ The PhiM deviation equals the modulation index m, FM deviation is calculated as $m * f_{mod}$.

Test Method "FFT Demodulation (Option R&S FS-K7)"	- The FM deviation and distortion are determined by digital signal processing in the spectrum analyzer. - Restrictions: At large deviations and low modulation rates the settable measuring time maybe insufficient to determine deviation (1 period minimum needed) or distortion. At high deviations and high modulation rates the settable demodulation bandwidth maybe insufficient. Missing lines at the spectrum borders deteriorate the result. ➤ Settings on R&S RF SPECTRUM ANALYZER: AMPTD / REF LEVEL test level, FREQ / CENTER test frequency FMDEMOD, FMDEMOD ON, RESULT DISPLAY / FM resp. PM DEMOD BW > 2 * (deviation + fmod) for FM, DEMOD BW > 2 * fmod * (1 + deviation) for PM, RANGE / DEVIATION PER DIV 0.5 * deviation MEAS TIME 3/fmod for distortion (up to 3rd harmonic) RESULT DISPLAY / FM resp. PM / AF SPECTRUM DEMOD BW > 2 * (deviation + 3.5 * fmod) for FM, DEMOD BW > 7 * fmod * (1 + deviation) for PM, MEAS TIME 16/fmod
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FM Setting Uncertainty

Test Method	➤ Spectrum Measurement (see chapter " Test Methodes ").
Measurement	➤ Settings on DUT: RF On RF Frequency: 3 GHz Level: 0 dBm Frequency Modulation menu: State Path1 On Source Path1 LF Generator 1 FM Mode Normal
Recommended settings	➤ LFGGen1 Freq = 1 kHz, 1 MHz FM Deviation = 100 kHz. ➤ Deviation sweep Measurement at CF 3 GHz, $f_{mod} = 100$ kHz, deviation 3 kHz to 500 kHz in logarithmic steps, 4 steps per decade (1, 1.8, 3.2, 5.6) ➤ Repeat measurements with changing settings to Source Path1 EXT 1 Coupling EXT1 AC Impedance EXT1 50 Ohm feed in a 100 kHz external modulation signal at FM/PM EXT connector

FM Distortion

Test Method	FFT Demodulation (see chapter " Test Methodes ").
Measurement	➤ Settings on DUT: RF On RF Frequency 3 GHz Level 0 dBm Frequency Modulation menu: State Path1 On Source Path1 Ext 1 FM deviation Path1 100 kHz FM Mode Normal ➤ Settings on signal generator: Function Sinus Voltage 1 Vs ➤ Settings on RF spectrum analyzer: DEMOM BW 5 MHz, RANGE / DEVIATION PER DIV Deviation/5, RESULT DISPLAY / FM, AF SPECTRUM, SWEEP / MEAS TIME 6.8 ms, FREQ / AF STOP 560 kHz. ➤ Read THD from the display. To convert to percent calculate $THD_{pct} = 100 * 10^{(THD_{dB}/20)}$.
Recommended settings	➤ LF Generator Frequencies: 1 kHz, 20 kHz, 50 kHz.

FM Frequency Response

Test Method	FFT Demodulation Spectrum Measurement (see chapter " Test Methodes ").
Measurement	➤ Settings on DUT: RF On RF Frequency 22 GHz Level 0 dBm Frequency Modulation menu: State Path1 On Source Path1 EXT 1 FM Mode Normal FM deviation Path1 100kHz Coupling EXT1 AC Impedance EXT1 50 Ohm ➤ Setting on the signal generator: - for frequencies up to 300 kHz the internal LF generator of the signal generator is used, >300 kHz the RF output. It is recommended to use an AC voltmeter (Item 14 of) to control the correct input voltage. - LFGGen Voltage 2 V_{eff} (equivalent to 1 V peak at 50 Ohm) - State ON - RF level 10 dBm (equivalent to 1 V peak voltage). ➤ Settings on R&S RF SPECTRUM ANALYZER: - Up to f_{mod} = 300 kHz settings for FFT Demodulation - f_{mod} > 300 kHz settings for Spectrum Measurement. ➤ Vary the signal generator frequency and measure the modulation depth. ⇒ The modulation frequency response is the difference between the greatest and the smallest modulation depth.
Recommended settings	➤ LF Generator Frequencies: 10 Hz to 10 MHz in logarithmic steps, 4 steps per decade (1, 1.8, 3.2, 5.6).

Carrier Frequency Offset with FM

Test assembly	See section " Standard Test Assembly for Analog Modulations ", page 1.2.
➤ Measurement	➤ Settings on DUT: RF On Frequency 22 GHz Level 0dBm Frequency Modulation menu: FM Path1 State On FM Path1 Source External FM Mode Normal FM Path1 deviation 10 MHz Ext1 Impedance 50 Ohm Ext1 Coupling DC ➤ Settings on spectrum analyzer: AMPT / REF LEVEL 0 dBm FREQ / CENTER 40 GHz SPAN 10 kHz MKR / SIGNAL COUNT / NEXT / CNT RESOL 10 Hz ➤ Execute a single sweep. Using MKR→ / PEAK, read counted marker frequency. ⇒ The offset is the difference between marker frequency and set carrier frequency.

Phase Modulation

PhiM Setting Uncertainty

Test Method	Spectrum Measurement (see chapter " Test Methodes ").
Measurement	➤ Settings on DUT: RF On Level 0 dBm Phase Modulation menu: PhiM Path1 State on PhiM Path1 Source EXT1 PhiM Mode High Deviation Ext1 Impedance 50 Ohm Ext1 Coupling AC - feed in external modulation signal at EXT1 connector ➤ Settings on spectrum analyzer: see chapter "Test Methodes".
Recommended settings	➤ RF Frequencies: 10 MHz, 3 GHz Modulation signal: 1 kHz, sine ➤ Deviation sweep Measurement at RF Frequencies. Deviation 1 mrad to 10 rad in logarithmic steps, 4 steps per decade (1, 1.8, 3.2, 5.6)

PhiM Distortion

Test Method	FFT Demodulation (see chapter " Test Methodes ").
Measurement	➤ Settings on DUT: RF On Level 0 dBm Phase Modulation menu: State on PhiM Path1 Source EXT1 PhiM Path1 Mode High Deviation PhiM Path1 Deviation 20 rad Ext1 Impedance 50 Ohm Ext1 Coupling AC - feed in external modulation signal at EXT1 connector ➤ Settings on RF spectrum analyzer: see chapter "Test Methodes". SWEEP / MEAS TIME 2.5 ms, FREQ / AF STOP 50 kHz, AMPTD / REF LEVEL 0 dBm, FREQ / CENTER test frequency. ➤ Read THD from the Display. To convert to percent calculate $THD_{pct} = 100 * 10^{(THD_{dB}/20)}$.
Recommended settings	➤ RF Frequency 3 GHz Modulation signal: 1 kHz, 20 kHz, 50 kHz, sine, 1 V_{peak}

PhiM Frequency Response

Test method	Spectrum measurement (see chapter " Test Methodes ").
Measurement	➤ Settings on DUT: RF On Level 0 dBm Phase Modulation menu: PhiM Path1 Source External PhiM Path1 Mode Low Noise PhiM Path1 Deviation 5 rad Ext1 Impedance 50 Ohm Ext1 Coupling AC ➤ Setting on the signal generator: for frequencies up to 10 MHz the internal LF generator of the signal generator is used, > 10 MHz the RF output. It is recommended to use an AC voltmeter (Item 14 of Table 1-1) to control the correct input voltage. - LFGen Voltage 2 V_{emf} (equivalent to 1 V peak at 50 Ohm) - State ON - RF level 10 dBm (equivalent to 1 V peak voltage). ➤ Settings on R&S RF SPECTRUM ANALYZER: see chapter "Test Methodes". ➤ Vary the signal generator frequency and measure the modulation depth. ⇒ The modulation frequency response is the difference between the greatest and the smallest modulation depth.
Recommended settings	➤ RF Frequency 22 GHz ➤ LF in logarithmic steps from 100 Hz to 1 MHz, 4 steps per decade (1, 1.8, 3.2, 5.6).

Pulse Modulation

ON/OFF Ratio

Test equipment	- Spectrum analyzer (Table 1-1, item 18) - Pulse generator (Table 1-1, item 13)
Test setup	➤ To determine the ON/OFF ratio, connect the spectrum analyzer to the RF output socket of the DUT and the pulse generator to the PULSE EXT socket on the rear of the DUT.
Measurement	➤ Setting on DUT: Pulse Modulation menu: Source External State On ➤ Setting on Analyzer FREQ/CENTER test frequency SPAN 0 Hz AMPT/REF LEVEL test level BW/RES BW MANUAL 3 kHz BW/VID BW MANUAL 300 Hz ➤ Determine the output level of the DUT at various carrier frequencies with a "high" and a "low" signal applied. ⇒ The difference between the output level with a "high" signal applied and that with a "low" signal applied is the ON/OFF ratio.
Recommended test frequencies	500 MHz, 0.99 GHz, 1 GHz, 10.9 GHz, 11.1 GHz, 20.9 GHz, 21.1 GHz, 40 GHz
Recommended test level	0 dBm

Rise and Fall Time

Test assembly	See section “Test Assembly for Pulse Modulation Rise and Fall Time” , page 1.3.
Test method	The DUT is pulse modulated by an external pulse generator. The rise and fall time of the pulsed RF signal is measured by means of a digital sampling oscilloscope.
Measurement	➤ Settings on pulse generator: Pulse periode 1 μs Pulse width 0.5 μs TTL level ➤ Setting on DUT: RF On Level 0dBm Pulse Modulation menu: State On Source External State On Source External Polarity Normal Input impedance 50 Ω ➤ Setting on oscilloscope: Trigger external (use sync signal of pulse generator as trigger source) ➤ Measurement: Evaluate the pulse-modulated RF signal on the oscilloscope. ⇒ Rise time = time between 10% and 90% of RF amplitude Fall time = time between 90% and 10% of RF amplitude
Recommended test frequencies	500 MHz, 0.99 GHz, 1 GHz, 10.9 GHz, 11.1 GHz, 20.9 GHz, 21.1 GHz, 40 GHz

Video Crosstalk

Test assembly	As above for ON/OFF Ratio
Measurement	➤ Setting on pulse generator: Squarewave pulse sequence with a frequency of 1 MHz, TTL level ➤ Setting on DUT: RF On Frequencies: test frequency (see below) Level: - 7dBm Pulse Modulation State: On ➤ Settings on the Analyzer FREQ CENTER 1 MHz, SPAN 10 kHz. ➤ Evaluate the signal on the analyzer. ⇒ The Video Crosstalk is the peak-to-peak amplitude of the spectral line found at 1 MHz.
Recommended test frequencies	500 MHz, 0.99 GHz, 1 GHz, 1.85 GHz, 2.6 GHz, 3.6 GHz, 5.1 GHz, 10.9 GHz, 11.1 GHz, 20.9 GHz, 21.1 GHz, 40 GHz

Performance Test Report

ROHDE&SCHWARZ	R&S SMF100A Signal Generator
Serial number:	
Person testing:	
Date:	
Signature:	

For nominal data and limit values refer to the data sheet supplied with the instrument.

Page	Characteristic	Min.	Actual	Max.	Unit
1.6	Reference Frequency				
	Output Level	typ. 2	_____	typ. 8	dBm
	Reference Frequency, Drift,	see data sheet	_____	see data sheet	Hz
	Input for External Reference	O.K.	_____		-
1.7	Frequency Setting	O.K.	_____		-
1.7	Spectral Purity				
	Harmonics Suppression with R&S®SMF-B122 frequency option, level +10 dBm (with R&S®SMF-B2 level +6 dBm for $f \geq 1$ GHz)				
	Without R&S®SMF-B31 high output power option				
	100 kHz $\leq f < 300$ kHz		_____	typ. -25	dBc
	300 kHz $\leq f < 10$ MHz		_____	-30	dBc
	10 MHz $\leq f < 200$ MHz		_____	-40	dBc
	200 MHz $\leq f < 1$ GHz		_____	-50	dBc
	1 GHz $\leq f \leq 22$ GHz		_____	-50	dBc
	With R&S®SMF-B31 high output power option				
	100 kHz $\leq f < 300$ kHz		_____	typ. -25	dBc
	300 kHz $\leq f < 10$ MHz		_____	-30	dBc
	10 MHz $\leq f < 200$ MHz		_____	-40	dBc
	200 MHz $\leq f < 1$ GHz		_____	-50	dBc
	1 GHz $\leq f \leq 22$ GHz		_____	-30	dBc

Page	Characteristic	Min.	Actual	Max.	Unit
1.7	Spectral Purity Harmonics Suppression with R&S®SMF-B144 frequency option, level +10 dBm (with R&S®SMF-B2 level +6 dBm for $f \geq 1$ GHz) or maximum specified level, whichever is lower Without R&S®SMF-B31 high output power option $100 \text{ kHz} \leq f < 300 \text{ kHz}$ $300 \text{ kHz} \leq f < 10 \text{ MHz}$ $10 \text{ MHz} \leq f < 200 \text{ MHz}$ $200 \text{ MHz} \leq f < 1 \text{ GHz}$ $1 \text{ GHz} \leq f \leq 22 \text{ GHz}$ $21 \text{ GHz} \leq f \leq 43.5 \text{ GHz}$ With R&S®SMF-B31 high output power option $100 \text{ kHz} \leq f < 300 \text{ kHz}$ $300 \text{ kHz} \leq f < 10 \text{ MHz}$ $10 \text{ MHz} \leq f < 200 \text{ MHz}$ $200 \text{ MHz} \leq f < 1 \text{ GHz}$ $1 \text{ GHz} \leq f \leq 22 \text{ GHz}$ $21 \text{ GHz} \leq f \leq 43.5 \text{ GHz}$				
				typ. -25	dBc
				-30	dBc
				-40	dBc
				-50	dBc
				-50	dBc
				-40	dBc
				typ. -25	dBc
				-30	dBc
				-40	dBc
				-50	dBc
				-30	dBc
				-40	dBc
1.7	Spectral Purity Subharmonics with R&S®SMF-B122 frequency option, level +10 dBm Without R&S®SMF-B31 high output power option $f < 11 \text{ GHz}$ $11 \text{ GHz} \leq f \leq 22 \text{ GHz}$ With R&S®SMF-B31 high output power option $f < 11 \text{ GHz}$ $11 \text{ GHz} \leq f < 22 \text{ GHz}$				
				none	dBc
				-55	dBc
				none	dBc
				-50	dBc

Page	Characteristic	Min.	Actual	Max.	Unit
1.7	Spectral Purity Subharmonics with R&S®SMF-B144 frequency option, level +10 dBm Without R&S®SMF-B31 high output power option $f < 11 \text{ GHz}$ $11 \text{ GHz} \leq f < 36 \text{ GHz}$ $36 \text{ GHz} \leq f \leq 43.5 \text{ GHz}$ With R&S®SMF-B31 high output power option $f < 11 \text{ GHz}$ $11 \text{ GHz} \leq f < 36 \text{ GHz}$ $36 \text{ GHz} \leq f \leq 43.5 \text{ GHz}$		_____ _____ _____ _____ _____ _____ _____	none -50 -30 none -50 -30	dBc dBc dBc dBc dBc dBc
1.8	Spectral Purity Nonharmonics, CW, Offset > 3 kHz level +10 dBm or maximum specified level, whichever is lower $100 \text{ kHz} \leq f < 300 \text{ kHz}$ $300 \text{ kHz} \leq f < 40 \text{ MHz}$ $40 \text{ MHz} \leq f < 375 \text{ MHz}$ $375 \text{ MHz} \leq f < 1 \text{ GHz}$ $1 \text{ GHz} \leq f < 3 \text{ GHz}$ $3 \text{ GHz} \leq f < 11 \text{ GHz}$ $11 \text{ GHz} \leq f < 21 \text{ GHz}$ with R&S®SMF-B122 frequency option $21 \text{ GHz} \leq f \leq 22 \text{ GHz}$ with R&S®SMF-B144 frequency option $21 \text{ GHz} \leq f \leq 43.5 \text{ GHz}$		_____ _____ _____ _____ _____ _____ _____ _____ _____ _____	typ. -67 -67 -55 -75 -68 -62 -56 -56 -50	dBc dBc dBc dBc dBc dBc dBc dBc dBc
1.10	Spectral Purity SSB Phase Noise without R&S®SMF-B1 option, carrier offset 100 Hz, measurement bandwidth 1 Hz, CW $f = 250 \text{ MHz}$ $f = 1 \text{ GHz}$ $f = 2 \text{ GHz}$ $f = 4 \text{ GHz}$ $f = 10 \text{ GHz}$ $f = 20 \text{ GHz}$ $f = 40 \text{ GHz}$		_____ _____ _____ _____ _____ _____ _____	-90 -95 -89 -83 -75 -69 -63	dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz

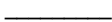
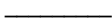
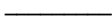
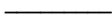
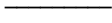
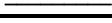
1.10	Spectral Purity SSB Phase Noise without R&S®SMF-B1 option, carrier offset 20 kHz, measurement bandwidth 1 Hz, CW f = 250 MHz f = 1 GHz f = 2 GHz f = 4 GHz f = 10 GHz f = 20 GHz f = 40 GHz		_____ _____ _____ _____ _____ _____ _____	–130 –135 –129 –123 –115 –109 –103	dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz
1.10	Spectral Purity SSB Phase Noise with R&S®SMF-B1 option, measurement bandwidth 1 Hz, CW frequency offset from carrier 10 Hz f = 250 MHz f = 1 GHz f = 2 GHz f = 4 GHz f = 10 GHz f = 20 GHz f = 40 GHz		_____ _____ _____ _____ _____ _____ _____	–72 –77 –71 –65 –57 –51 –45	dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz
	frequency offset from carrier 100 Hz f = 250 MHz f = 1 GHz f = 2 GHz f = 4 GHz f = 10 GHz f = 20 GHz f = 40 GHz		_____ _____ _____ _____ _____ _____ _____	–90 –95 –89 –83 –75 –69 –63	dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz
	frequency offset from carrier 1 kHz f = 250 MHz f = 1 GHz f = 2 GHz f = 4 GHz f = 10 GHz f = 20 GHz f = 40 GHz		_____ _____ _____ _____ _____ _____ _____	–115 –120 –114 –108 –100 –94 –88	dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz

	frequency offset from carrier 10 kHz				
	f = 250 MHz		_____	-128	dBc/Hz
	f = 1 GHz		_____	-133	dBc/Hz
	f = 2 GHz		_____	-129	dBc/Hz
	f = 4 GHz		_____	-123	dBc/Hz
	f = 10 GHz		_____	-115	dBc/Hz
	f = 20 GHz		_____	-111	dBc/Hz
	f = 40 GHz		_____	-105	dBc/Hz
	frequency offset from carrier 100 kHz				
	f = 250 MHz		_____	-128	dBc/Hz
	f = 1 GHz		_____	-133	dBc/Hz
	f = 2 GHz		_____	-127	dBc/Hz
	f = 4 GHz		_____	-121	dBc/Hz
	f = 10 GHz		_____	-113	dBc/Hz
	f = 20 GHz		_____	-107	dBc/Hz
	f = 40 GHz		_____	-101	dBc/Hz
1.10	Level Level Uncertainty, 100 kHz ≤ f ≤ 50 MHz				
	>+10 dBm	-0.6	_____	0.6	dB
	+10 dBm to >-10 dBm	-0.6	_____	0.6	dB
	-10 dBm to >-70 dBm	-0.9	_____	0.9	dB
	-70 dBm to >-90 dBm	-1.0	_____	1.0	dB
	-90 dBm to -100 dBm	-1.6	_____	1.6	dB
	Level Uncertainty, 50 MHz ≤ f < 2 GHz				
	>+10 dBm	-0.6	_____	0.6	dB
	+10 dBm to >-10 dBm	-0.6	_____	0.6	dB
	-10 dBm to >-70 dBm	-0.7	_____	0.7	dB
	-70 dBm to >-90 dBm	-0.8	_____	0.8	dB
	-90 dBm to -100 dBm	-1.4	_____	1.4	dB
	Level Uncertainty, 2 GHz ≤ f < 22 GHz				
	>+10 dBm	-0.8	_____	0.8	dB
	+10 dBm to >-10 dBm	-0.8	_____	0.8	dB
	-10 dBm to >-70 dBm	-0.9	_____	0.9	dB
	-70 dBm to >-90 dBm	-1.0	_____	1.0	dB
	-90 dBm to -100 dBm	-1.7	_____	1.7	dB
	Level Uncertainty, 22 GHz ≤ f ≤ 40 GHz				
	>+10 dBm	-1.0	_____	1.0	dB
	+10 dBm to >-10 dBm	-1.2	_____	1.2	dB
	-10 dBm to >-70 dBm	-1.2	_____	1.2	dB
	-70 dBm to >-90 dBm	-2.0	_____	2.0	dB
	-90 dBm to -100 dBm	-2	_____	2	dB

	Level Uncertainty, 40 GHz < f ≤ 43.5 GHz +10 dBm to >-10 dBm -10 dBm to >-70 dBm -70 dBm to >-90 dBm -90 dBm to -100 dBm	-1.0 -1.5 -2.5 -4.2	_____ _____ _____ _____	1.0 1.5 2.5 4.2	dB dB dB dB
1.13	Internal LF Generator (R&S®SMF-B20 option, waveform sine) Frequency setting f = 1 kHz f = 10 kHz f = 100 kHz f = 1 MHz f = 10 MHz	see data sheet see data sheet see data sheet see data sheet see data sheet	_____ _____ _____ _____ _____	see data sheet see data sheet see data sheet see data sheet see data sheet	Hz Hz Hz Hz Hz
	Distortion f = 1 kHz f = 10 kHz f = 20 kHz		_____ _____ _____	0.5 0.5 0.5	% % %
	Level Setting Accuracy, f = 1 kHz Level (Vp) = 1 V		_____	1.11	V
	Frequency response 10 Hz ≤ f ≤ 500 kHz 500 kHz < f ≤ 10 MHz		_____ _____	0.5 3	dB dB
	Amplitude Modulation (R&S®SMF-B20 option) AM Setting Uncertainty, f _{RF} = 22 GHz, f _{mod} = 1 kHz m = 10 % m = 20 % m = 30 % m = 40 % m = 50 % m = 60 % m = 70 % m = 80 %	8.5 18.0 27.5 37.0 46.5 56.0 65.5 75.0	_____ _____ _____ _____ _____ _____ _____ _____	11.50 22.0 32.5 43.0 53.5 64.0 74.5 85.0	% % % % % % % %
	AM Distortion, f _{mod} = 1 kHz, m = 60% f = 1 MHz f = 999 MHz f = 1 GHz f = 3 GHz f = 11 GHz f = 22 GHz f = 40 GHz f = 43.5 GHz		_____ _____ _____ _____ _____ _____ _____ _____	2.5 1.0 1.0 1.0 1.0 1.0 1.0 1.0	% % % % % % % %

	AM Frequency Response $10 \text{ Hz} \leq f_{\text{mod}} \leq 100 \text{ kHz}$, $m = 60 \%$ $f = 10 \text{ MHz}$ $f = 100 \text{ MHz}$ $f = 374.9 \text{ MHz}$ $f = 375.1 \text{ MHz}$ $f = 1 \text{ GHz}$ $f = 3 \text{ GHz}$ $f = 11 \text{ GHz}$ $f = 22 \text{ GHz}$ $f = 40 \text{ GHz}$		_____ _____ _____ _____ _____ _____ _____ _____ _____	3 3 3 3 3 3 3 3 3	dB dB dB dB dB dB dB dB dB
1.17	Frequency Modulation (R&S®SMF-B20 option) FM Setting Uncertainty $f_{\text{RF}} = 3 \text{ GHz}$, deviation = 100 kHz $f_{\text{mod}} = 1 \text{ kHz}$ $f_{\text{mod}} = 1 \text{ MHz}$	97 90	_____ _____	103 110	kHz kHz
	FM Distortion $f_{\text{RF}} = 3 \text{ GHz}$, deviation = 100 kHz $f_{\text{mod}} = 1 \text{ kHz}$ $f_{\text{mod}} = 20 \text{ kHz}$ $f_{\text{mod}} = 50 \text{ kHz}$		_____ _____ _____	0.5 0.5 0.5	% % %
	FM Frequency response $f_{\text{RF}} = 22 \text{ GHz}$, deviation = 100 kHz $10 \text{ Hz} \leq f_{\text{mod}} \leq 10 \text{ MHz}$		_____	3	dB
	FM Carrier frequency offset $f_{\text{RF}} = 22 \text{ GHz}$, deviation = 10 MHz	9.98	_____	10.020	MHz
1.22	Phase Modulation (R&S®SMF-B20 option) PhiM Setting Uncertainty $f_{\text{mod}} = 1 \text{ kHz}$, deviation = 10 rad $f = 10 \text{ MHz}$ $f = 3 \text{ GHz}$	9.5 9.5	_____ _____	10.5 10.5	rad rad
	PhiM Distortion $f_{\text{RF}} = 3 \text{ GHz}$, deviation = 20 rad $f_{\text{mod}} = 1 \text{ kHz}$ $f_{\text{mod}} = 20 \text{ kHz}$ $f_{\text{mod}} = 50 \text{ kHz}$		_____ _____ _____	0.5 0.5 0.5	% % %
	PhiM Frequency response $f_{\text{RF}} = 22 \text{ GHz}$, deviation = 5 rad $100 \text{ Hz} \leq f_{\text{mod}} \leq 1 \text{ MHz}$		_____	3	dB

	Pulse Modulation (R&S®SMF-K3 option) On/Off Ratio				
	f = 500 MHz	80	_____		dB
	f = 990 MHz	80	_____		dB
	f = 1 GHz	80	_____		dB
	f = 10.9 GHz	80	_____		dB
	f = 11.1 GHz	80	_____		dB
	f = 20.9 GHz	80	_____		dB
	f = 21.1 GHz	80	_____		dB
	f = 40 GHz	80	_____		dB
1.24	Rise and Fall Time				
	f = 500 MHz		_____	20	ns
	f = 990 MHz		_____	20	ns
	f = 1 GHz		_____	10	ns
	f = 10.9 GHz		_____	10	ns
	f = 11.1 GHz		_____	10	ns
	f = 20.9 GHz		_____	10	ns
	f = 21.1 GHz		_____	10	ns
	f = 40 GHz		_____	10	ns
	Video Crosstalk Without R&S®SMF-K3 option				
	f = 500 MHz		_____	150	peak-to-peak
	f = 990 MHz		_____	150	peak-to-peak
	f = 1 GHz		_____	75	peak-to-peak
	f = 1.85 GHz		_____	75	peak-to-peak
	f = 2.6 GHz		_____	75	peak-to-peak
	f = 3.6 GHz		_____	5	peak-to-peak
	f = 5.1 GHz		_____	5	peak-to-peak
	f = 10.9 GHz		_____	5	peak-to-peak
	f = 11.1 GHz		_____	5	peak-to-peak
	f = 20.9 GHz		_____	5	peak-to-peak
	f = 21.1 GHz		_____	5	peak-to-peak
	f = 40 GHz		_____	5	peak-to-peak

	Video Crosstalk With R&S®SMF-K3 option				
	f = 500 MHz			150	peak-to-peak
	f = 990 MHz			150	peak-to-peak
	f = 1 GHz			150	peak-to-peak
	f = 1.85 GHz			150	peak-to-peak
	f = 2.6 GHz			150	peak-to-peak
	f = 3.6 GHz			10	peak-to-peak
	f = 5.1 GHz			10	peak-to-peak
	f = 10.9 GHz			10	peak-to-peak
	f = 11.1 GHz			10	peak-to-peak
	f = 20.9 GHz			10	peak-to-peak
	f = 21.1 GHz			10	peak-to-peak
	f = 40 GHz			10	peak-to-peak

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2 Adjustments

This chapter describes all necessary measurements to restore the performance of the R&S SMF100A after module replacement.

Preliminary Remark

Setting a defined **initial** state by pressing the **PRESET** key prior to adjustments is recommended. To ensure that the internal adjustments are valid at operating temperature, at least **30 minutes warm-up time** at this temperature must be observed.

Manual Adjustments

Maximum YIG Frequency

To adjust the maximum YIG oscillator frequency connect the RF-output of the R&S SMF100A with the RF input of a spectrum analyzer or frequency counter.

Settings R&S SMF100A:

Preset
Frequency: 10.99 GHz
Level: 0 dBm

Settings

Analyzer/Counter:

Frequency: 11 GHz
Reference Level: 5 dBm
Span: 500 MHz

Set the TMO-DAC 2% below maximum (64200 dec = FAC8 hex) via direct mode:

TEST:DIR 'FSYN',#H011A,#HFAC8

Read the Control register at address = 112 hex:

TEST:DIR?'FSYN',#H0112

Change the logical state of control bit 7 (counting starts with 0) to zero and write the modified value back:

TEST:DIR'FSYN',#H0122,#Hxxxx

xxxx is the modified value in hexadecimal format.

Tune the RF-Frequency by means of R34 to 11 GHz $\pm$ 50 MHz. Lower values of R34 do increase the frequency.

FM Deviation / Frequency Response

To adjust FM deviation and FM frequency response connect the RF output of the R&S SMF100A to the RF input of a modulation analyzer with a demodulation bandwidth of ≥ 10 MHz. Preferred instrument: R&S FSUP with option R&S FS-K7.

Settings R&S SMF100A:

Preset	
Frequency:	10 GHz
Level:	0 dBm
FM State:	On
FM Source:	LF Gen 1
FM Deviation:	500 kHz
LF Frequency:	200 kHz, 4 MHz

First step: LF Frequency = 200 kHz. Adjust the measured FM deviation by means of R30 to $500 \text{ kHz} \pm 3 \text{ kHz}$.

Second step: LF Frequency = 4 MHz. Adjust the measured FM deviation by means of R28 to $500 \text{ kHz} \pm 5 \text{ kHz}$.

CW Filter adjustment

For optimum frequency setting time and phase noise the CW filter must be adjusted (R29).

Settings R&S SMF100A:

Preset	
Frequency:	10.99 GHz
Level:	0 dBm

Measure the DC voltage at test point P1 (about 8.5 V).

Adjust (R29) the DC voltage at test point P3 to the previously measured value $\pm 100 \text{ mV}$.

Internal Adjustments

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

Adjustments of the Complete Unit

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

The external adjustments have to be performed, if the recommended calibration interval is exhausted.

External Adjustments Requiring Measurement Equipment

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

External Level Correction

The measuring program for external level correction measures output power over frequency and level and stores the correction values inside the R&S SMF100A to maintain level accuracy. Besides the level deviations of the step attenuator from its nominal values are measured and are stored inside the device, too.

Connect the devices as shown in Fig. 2-1 and Fig. 2-2. Install the software, execute the R&S SMF100A Level Correction program and follow the instructions on the screen.

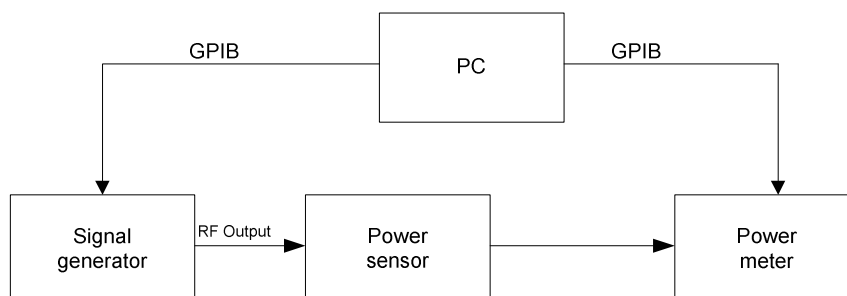


Fig. 2-1 External level correction with power sensor

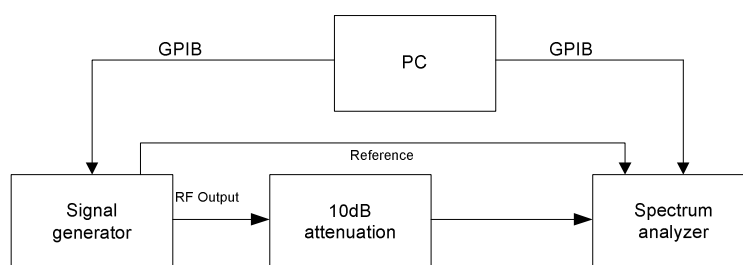


Fig. 2-2 External level correction with spectrum analyzer

External Loopgain Correction

The measuring program for external loopgain correction maximizes the internal level control bandwidth over frequency and level and stores the correction values inside the R&S SMF100A to achieve best AM accuracy and settling time. Connect the devices as shown in Figure 2-3. Install the software, execute the R&S SMF100A Loopgain Correction program and follow the instructions on the screen.

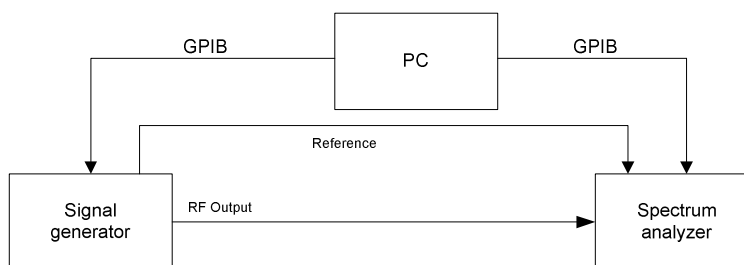


Fig. 2-3 External loopgain correction with spectrum analyzer

Measuring Equipment and Accessories

Table 2-1 Measuring equipment and accessories

Item	Type of equipment	Required Characteristics	Suitable Instrument	R&S Order No.
1	Signal generator	10 MHz to 40 GHz	R&S SMF100A	1167.0000.02
2	RF power sensor	10 MHz to 40 GHz	R&S NRP-Z55	1138.2008.02
3	RF power meter	GPIO	R&S NRP	1143.8500.02
4	Spectrum analyzer	10 MHz to 40 GHz	R&S FSU50	1166.1660.50
5	10 dB Attenuator	10 dB, 2.92 mm system, male, female, 2 W, VSWR <1.45@40 GHz	0 to 40 GHz	54A-10 (Weinschel)
6	Cable	2.92 mm system, male, male		
7	Software	For external level and loopgain correction	R&S SMF_LevCor program	
8	PC	GPIO		

Adjustment of internal Reference Frequency

The frequency accuracy of the synthesizer is determined (set to internal reference) by a highly stable 10 MHz quartz oscillator that is set to a calibrated frequency standard at the R&S factory. This oscillator is subject to ageing and can usually be recalibrated; please contact your R&S representative.

Note: The internal reference can be aligned by up to approx. $\pm 10^{-6}$ under the menu **Setup - Reference Oscillator - Adjustment**. This setting does not affect the factory adjustment and can be reset at any time by means of deactivation.

Adjustments after Module Replacement

Changed module	Required adjustment/correction	Calibration necessary (refer to chapter "Checking the rated characteristics")
Interface Board	None	None
Motherboard	None	None
BNC Board	None	None
MW Interface Board	None	None
Controller Board	See below, "Procedures after Replacing the Controller Board or the Lithium Battery"	None
Reference Oscillator	None	Reference Frequency
AM/FM/Scan Modulator	Setup/Internal Adjustments/Adjust Modulation	LF Generator, Amplitude Modulation, Frequency Modulation, Phase Modulation
Removable USB	None	None
Removable GPIB	None	None
Removable Compact Flash	Setup/Internal Adjustments/Adjust All	None
Frequency Synthesis	Setup/Internal Adjustments/Adjust Frequency Synthesis	Frequency, Spectral Purity
Down Converter	Setup/Internal Adjustments/Adjust All Level External level and loopgain correction (external measurement equipment and special measuring software required)	Spectral Purity, Level Data, Amplitude Modulation, Pulse Modulation
ALC/DDS Unit	Setup/Internal Adjustments/Adjust All Level External level and loopgain correction (external measurement equipment and special measuring software required)	Spectral Purity, Level Data, Amplitude Modulation, Pulse Generator
TMO Unit TMO Control Unit, TMO Adapter	Manual adjustments: max. YIG frequency, FM deviation, CW filter.	Spectral Purity, Frequency Modulation
DMA Module	Setup/Internal Adjustments/Adjust All External level and loopgain correction (external measurement equipment and special measuring software required)	Spectral Purity, Level Data, Amplitude Modulation, Pulse Modulation
Low Harmonics	Setup/Internal Adjustments/Adjust All External level and loopgain correction (external measurement equipment and special measuring software required)	Spectral Purity, Level Data
Directional Coupler	Setup/Internal Adjustments/Adjust All External level and loopgain correction (external measurement equipment and special measuring software required)	Level Data

Changed module	Required adjustment/correction	Calibration necessary (refer to chapter "Checking the rated characteristics")
Detector	Setup/Internal Adjustments/Adjust All External level and loopgain correction (external measurement equipment and special measuring software required)	Level Data
Step Attenuator	Setup/Internal Adjustments/Adjust All External level and loopgain correction (external measurement equipment and special measuring software required)	Level Data
Switch	Setup/Internal Adjustments/Adjust All External level and loopgain correction (external measurement equipment and special measuring software required)	Spectral Purity, Level Data
Power Supply Unit Front Panel Unit FFT Display A110 Display Adapter Board Inverter Rotary Pulse Generator A125 Pushbutton Board Set Flex. Switch Board A120 Front Panel Controller A130	None None	None None
Fan E1	None	None
Compact Flash Card	Setup/Internal Adjustments/Adjust All	None
Lithium Battery	See below, "Procedures after Replacing the Controller Board or the Lithium Battery"	None

Procedures after Replacing the Lithium Battery

1. Before switching on, connect an USB keyboard to the R&S SMF100A.
2. After switching on, the R&S logo does not disappear.



3. Wait about 10 seconds and afterwards press "F1".
4. The operating system (LINUX) and the R&S SMF100A firmware will start.
5. Set correct date and time at R&S SMF100A setup menu.

Procedures after Replacing the Controller Board

Required equipment

External USB CD or DVD ROM Drive

Required software:

BIOS_SMFxxxx.iso (order number 1400.3651.00)

A burn program that can burn ISO images onto CD/DVD. Recommended program: **Nero Burning**

Prepare CD Rom or DVD with full image of R&S SMF100A:

1. Start Nero on your PC.
2. From the program menu, select **File -> Burn CD image**.
3. Specify file type "all files" (*.*)
4. Select the ISO image file to be burned (BIOS_SMFxxxx.iso).
5. Confirm the checkbox indicating that Nero does not recognize the format of the image file.
6. When the dialog appears, set the parameters specified above.
7. Click "burn".

Install the new BIOS on the LPC processor

1. Switch off the instrument
2. Connect an external USB CD or DVD drive to the R&S SMF100A.
3. Insert the CD Rom or DVD with BIOS into the external drive.
4. Switch on the instrument.
The CD or DVD boots the instrument and executes the following steps (approx. 1 min).
The LED of the external USB Drive **is on**. The Flash Program and the BIN File are copied from the CD to the Ram drive. During transmission the USB drive is audible.
The LED on the external USB Drive **is off**. The BIOS is installed in the EPROM of the R&S SMF100A.
5. Wait until the USB drive gets quiet.
6. Remove the external CD ROM/DVD drive
7. Switch instrument off and on
The instrument reboots and the new BIOS is loaded on the instrument.

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3 Repair

Instrument Design and Function Description

Block diagram of the entire R&S SMF100A refer to figure Chapter 5 (1167.000.01 S, Sheet 1 to 3).

The R&S SMF100A base unit consists of modules as follows:

- A900 Power Supply Unit,
- A100 Front Module,
- A200 Interface Board,
- A250 Processor Unit,
- A300 Motherboard,
- A205 Microwave Interface,
- A400 Frequency Synthesis,
- A500 ALC/DDS Unit,
- A720 Coupler,
- A725 Detector,
- A780 Low Harmonics,
- A800 DMA Module,
- A820 TMO Unit,
- A450 Down Converter,
- A520 AM/FM/Scan Modulator,
- A575 Reference Oscillator,
- A740 Frequency Doubler,
- A600 Step Attenuator,
- A640 Switch,
- A170 GPIB Board,
- A180 USB Board,
- A190 Removable Flash Board

A900 Power Supply Unit

The **power supply unit (A900)** is providing the most important stabilized supply voltages for the modules which are derived from the input line voltage. It additionally provides a 13.5 V standby voltage for the supply of the reference oscillators for frequency synthesis. Within the modules additional module-specific voltages are directly derived from the incoming voltages out of the power supply unit.

A100 Front Module

The **front module unit (A100)** consists of **Display (A110)**, **Keyboard (A120)**, **Knob (A125)** and **Front Panel Controller (A130)**. It includes two USB and one Power Sensor connectors. The display is controlled by **Processor Unit (A250)** via a DVI-connection. User inputs via keyboard, roll key or mouse are directed to the **Processor Unit (A250)** via USB bus after having been pre-processed by the Front Panel Controller.

A200 Interface Board

The **Interface Board (A200)** is distributing the Power Supply voltages to the modules and is additionally the electrical link in between the **Processor Unit (A250)**, the modules and the external interfaces. It is also the mechanical stabilizer of the Processor Unit. Data transfer in between modules and Processor Unit is performed via PCI-Bus. Format transformation from the PCI-Bus-Data to the module specific data format is performed by means of a Field Programmable Gate Array (FPGA) called SMF_COM, which does provide functions as follows:

- PCI-Interface,
- Master Controller for serial bus,
- 8-bit-Parallel Bus,
- Interrupt Controller,
- ADC/DAC Interface,
- Configurations Interface (for FPGA configuration),
- Sweep Controller for analog ramp sweep,
- I/O Port,
- Fan Controller.

Output voltages from the Power Supply are protected by means of lead-fuses located on the Interface Board before directed to the specific modules. Noise critical lines are additionally filtered using low-pass circuits. The Interface Board additionally includes connectors for microwave modules, the diagnosis Analog-Digital-Converter (ADC), a double Digital-Analog-Converter (DAC) for the V/GHz-output and the X-output, a reset generator and the configuration EEPROM for the SMF_COM FPGA.

A250 Processor Unit

The **Processor Unit (A250)** is directly plugged onto the **Interface Board (A200)**. Its main function is the control of the modules and the communication to/from the input-output-interfaces. The Processor Unit includes a standard LAN-interface, four USB-interfaces and the Compact Flash card including the firmware. The Compact Flash card may be accessible from the rear panel as an option, which does need the **Removable Flash Board (A180)**.

A300 Motherboard

The **Motherboard (A300)** is designed for a maximum of four modules to be stacked within three 19" height units. The modules are the *Frequency Synthesis*, *ALC/DDS Unit* and *Down Converter*. The fourth slot is left free for the purpose of additional options to be fitted in.

ATTENTION



Fixed module positions

The module positions are fixed and cannot be freely selected !

The motherboard is directly linked to the Interface Board by means of two connectors. Data transmission to the modules plugged onto the motherboard is performed via a parallel bus with 8 bits in width. The same bus is used for the configuration of the FPGAs when powering on the instrument. The ID-EEPROMS on the modules are controlled via the serial bus.

A205 Microwave Interface

Microwave modules in the lower and middle position and the **Reference Oscillator (A575)**, i. e. the modules which are not directly connected with the Interface Board, are controlled via **Microwave Interface (A205)**. This module mainly provides functions as follows:

- Serial Bus Decoder (SerBus),
- Diagnose Multiplexer,
- Step Attenuators controller,
- Correction data EPROM

The Microwave Modules are serial controlled by the Interface Board by means of the SerBus-Decoder. The output voltages of the temperature sensors on the specific microwave modules can be selected by means of the diagnostic multiplexer. Instrument specific data, for instance level correction data, is stored within the EPROM on the **Microwave Interface**.

A400 Frequency Synthesis

The **Frequency Synthesis module (A400)** provides the main function within frequency synthesis. It includes all phase locked loops which are critical in terms of phase noise and spurious emissions and the RF-stages of frequency synthesis:

- 10 MHz VTCXO
- 100 MHz VCXO
- Reference Loop
- Step Frequency Multiplier
- Coarse Frequency Loop
- TMO Loop and TMO Control

The **10 MHz VTCXO** is the standard reference oscillator, which is small-bandwidth linked via the **Reference Loop** to a **100 MHz VCXO** of low phase noise at frequency offsets above 500 Hz. If a better close-carrier phase noise or higher frequency precision is needed, the 100 MHz-VCXO may be linked to an optional **10 MHz OCXO (A575)** or to an external reference with higher control bandwidth. The reference output (REF OUT) may be either connected to the external 10 MHz-reference or to the internal 10 MHz reference.

By means of a low noise **Step Frequency Multiplier** a fixed frequency range of 700 to 1500 MHz in 100 MHz steps is generated out of the 100 MHz reference frequency. This signal is used as intermediate frequency for the *Coarse Frequency Loop*. The 100 MHz-signal is additionally directed to the modules *Down Converter* and *ALC/DDS Unit*.

The **Coarse Frequency Loop** does generate an in terms of spectrum very clean interims frequency for down mixing of the divided TMO-frequency within the TMO Loop. The interims frequency covers the range of 733 to 1493 MHz with a minimum resolution of 2 MHz.

By means of the **TMO Loop** the divided and transformed TMO-frequency will be directed to the fine adjustable DDS-frequency (from ALC/DDS unit). **TMO Control** is also included in TMO Loop. It provides the needed control voltages for the module **TMO Unit (A820)**. The basic setting of the TMO is done by means of a 16 bit DAC. The main coil control current for the quasi analog ramp sweep is additionally controlled by means of a ramp integrator.

A500 ALC/DDS Unit

Following functions are provided by module **ALC/DDS-Unit (ADU)**:

- Direct Digital Synthesis (DDS),
- ALC and level reference signal,
- Interface to Modulation Board
- FPGA including DDS, pulse generator, modulation matrix, LF-generators, FM/φM-modulators

Fine adjustment of frequency settings is done by means of a DDS. The DDS signal is additively supplied to the TMO Loop. Additionally the frequency- and phase modulation is done by means of the DDS.

The digitally operating **Level Control Loop (Automatic Level Control = ALC)** is integrated within FPGA SMF_MOD. Analog voltages of level- and reference-detector are digitised by means of two ADCs, directed to the FPGA and herein digitally processed. The settings of the control loop may be reprogrammed after having been universally and optimized adapted to the specific operation mode because the entire function is integrated in the FPGA.

The FPGA provides a digital reference signal to the reference detector, which is converted into analog sine wave with a fixed carrier frequency of 12.5 MHz by means of a 16 bit DAC. The amplitude of the reference signal, representing the output level of R&S SMF100A, may be fine trimmed within the FPGA and is switched in big steps by means of a step attenuator. This signal is amplified up to 20 dBm by means of a power amplifier and is directed to the reference detectors.

The ALC/DDS-Unit includes the interface to the option Modulator Board (AM/FM/Scan Modulator, A520).

In addition to the DDS and the ALC the FPGA SMF_MOD includes a pulse generator, two LF generators and a modulation matrix. These units are enabled only along with the modulation board, i.e. the option Pulse Generator respectively.

A720 Coupler / A725 Detector

Directional coupler (**Coupler, A720**) and level detector (**Detector, A725**) are combined to a compact unit. Using the directional coupler the RF signal is partially coupled out and directed to the level detector and rectified. The detector module includes a second detector which is rectifying the reference signal which is directed from module ALC/DDS Unit (A500). Both rectified signals are amplified and directed to the ALC control loop. The ALC is comparing both signals and is setting the RF level in order that both detected signals have same levels (ALC on). For frequencies below 1 GHz, a similar structure is integrated in the down converter.

A780 Low Harmonics

The filter unit (**Low Harmonics, A780**) improves the suppression of unwanted harmonics and sub harmonics. It consists of a structure of some selectively switch able band passes in the range from 1 GHz to 22 GHz. The digital control signals and the power supply voltages are directed from the Interface Board.

A800 DMA Module

The **DMA Module (A800)** is the microwave core module. In addition to the RF output signal it is also providing the needed RF signal for frequency synthesis and down converter. The input signal is the output from YIG oscillator (3 to 11 GHz)

The DMA module includes functions as follows:

- Directional coupler for coupling the oscillator signal to the PLL,
- programmable divider and multiplier,
- Level-Preset,
- Level control unit for ALC and amplitude modulation,
- Pulse modulator,
- Power amplifier,

The RF output provides a frequency range from 1 to 22 GHz. Frequencies below 3 GHz are generated by the divider, frequencies above 11 GHz are generated by the multiplier. A second RF output included in the module is providing the input signal (11 to 22 GHz) for the multiplier module (**A740, Frequency Doubler**). The DMA module is controlled by the Interface Board (SerBus, digital control signals and analog control signals for level presets)

A820 TMO Unit

Tuneable Microwave Oscillator, TMO is the variable main oscillator which may be operated in the frequency range in between 3 and 11 GHz. The **TMO Unit (A820)** consists of a YIG-Oscillator (YTO) and the TMO Control Unit. The fast controllable YTO has very low phase noise. The TMO Control unit converts the control voltages (from frequency synthesis) to the control currents needed within the FM- and main coils and creates the frequency compensation for broadband FM. Supply voltages and control signals are directed from the module Frequency Synthesis (A400) to the TMO Unit. Both are connected via a cable less connection.

A450 Down Converter

The **Down Converter (A450)** is extending the lower frequency range of R&S SMF100A down to 10 MHz. The input signal in the range in between 375 kHz to 1.875 GHz is directed from DMA-Module. In order to get signals below 375 kHz the signal is mixed down by means of a 1.5 GHz LO signal. This is created by means of multiplying the 100 MHz reference signal from module A400 frequency synthesis. The down converter includes its special reference and level detector as well as a specific pulse modulator, which is electrically located on the signal behind the level detector.

A520 AM/FM/Scan Modulator

The **AM/FM/Scan Modulator (A520)** makes modulations like AM lin, AM exp, FM, PhiM and digital modulations like ASK, FSK, PSK, BPSK possible along with FPGA SMF_MOD, located on module ALC/DDS-Unit. In addition two LF generators with sinus, trapezoid, and noise signals are available along with an universal LF output. The modulation board is plugged on module ALC/DDS-Unit.

The modulation board includes two fast ADCs in order to convert external analog signals into digital ones, which are processed within FPGA SMF_MOD. The digital modulation matrix, modulation setting and control are integrated in the FPGA.

The input impedance of the analog inputs are switch able in between (50 Ω | 600 Ω | 100 k Ω). They may be coupled either by AC or DC.

A FM Feed Forward DAC is used for FM/PhiM. The FM Feed Forward DAC generates an appropriate modulation signal for the direct modulation of the TMO. Therefore frequency or phase modulation is possible also above the control bandwidth of the TMO-Loop. An additional DAC is providing a LF output for general purpose. This output may be, for instance, switched to the LF-generator or the analog modulation signals. The usable frequency range is in between 0 to 10 MHz. The signal amplitude may be set in fine steps within the FPGA and may be set in large steps by means of an external amplifier stage.

A575 Reference Oscillator

The **Reference Oscillator (A575)** is improving the close carrier phase noise and does provide a better long term stability. It mainly consists of an highly precise oven controlled 10 MHz oscillator. The oven is active as long the instrument is switched on and off using the front switch while the rear side located power switch is in the on-position. Power supply and control is done by the **Microwave Interface (A205)**. The reference oscillator includes an ID-EEPROM which is storing the module ID as well as correction data for frequency correction.

A740 Frequency Doubler

The module **Frequency Doubler (A740)** is doubling the frequency band 10.5 to 20 GHz up to 21 to 40 GHz. The input signal is directed from **DMA Module (A800)**. The module is consisting of a high bandwidth doubler followed by switch able band pass filters and a power amplifier in order to suppress unwanted spurious emissions.

A600 Step Attenuator

This **step attenuator (A600)** makes an additional precise output attenuation possible by additional 110 db in 10 db steps. The step attenuator is controlled by **Microwave Interface (A205)**.

A640 Switch

To extend the frequency range of R&S SMF100A by means of **Down Converter (A450)** and **Doubler Module (A740)** the **Switch (A640)** is needed. It is switching the RF signal either taken out of Down Converter, DMA-Module or doubler module via directional coupler and via the step attenuator to the RF output of R&S SMF100A.

A170 GPIB Board

By the **GPIB Board (A170)** the R&S SMF100A may be remote controlled via GPIB. This board includes a GPIB-to-PCI Controller. The GPIB Board is located in a slot at the rear side of the instrument and is directly plugged onto the **Interface Board (A200)**.

A180 USB Board

By the **USB Board (A180)** the R&S SMF100A may be remote controlled via USB 2.0. This board includes a USB-to-PCI Controller. The USB Board is located in a slot at the rear side of the instrument and is directly plugged onto the **Interface Board (A200)**.

A190 Removable Flash Board

The **Removable Flash Board (A190)** makes it possible to remove the compact flash memory card without the need to open the instrument. It is plugged into the second slot at the rear side of the instrument into the location of the **USB board (A180)**.

Module Replacement

This section describes in detail the replacement of modules. Chapter 5 provides information on how to order spare parts; it contains the list of mechanical parts with order numbers and the illustrations for module replacement.

DANGER**Danger of shock hazard**

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

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

ATTENTION**Danger of damage to components of the modules**

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.

Overview of the Modules

Overview – module replacement

Module	Adjustment see chapter 2	See page
Boards		
Interface Board		3.11
Motherboard		3.11
BNC board		3.12
MW interface Board	x	3.12
Controller board (Processor Unit)		3.13
Reference Oscillator		3.14
AM/FM scan modulator	x	3.14
Removable USB		3.15
Removable GPIB		3.15
Removable Compact flash	x	3.16
Frequency synthesis	x	3.17
Down converter	x	3.17
ALC/DDDS unit	x	3.18
Microwaves modules		
TMO unit: TMO Control Unit TMO Adapter	x	3.18
DMA module unit	x	3.19
Low harmonics	x	3.20
Directional coupler	x	3.20
Detector	x	3.20
High-Power Amplifier	x	3.21
Step attenuator	x	3.21
Frequency doubler	x	3.22
Switch	x	3.23
Parts / units		
Power supply unit: Switching Power Supply Fan E3		3.23
Front panel unit: TFT Display A110, Display Connect FMR 6-SHARP, Converter Rotary Pulse Generator (A125) Pushbutton Board Set (1167.0739.00), Flex. Switch Board (A120), Front Panel Controller (A130)		3.25
Fan E1		3.28
Compact flash card	x	3.14
Lithium battery	x	3.13

Note: The words "left" and "right" in the manual always refer to the front view of the instrument.

Safety Instructions, Dismounting the Case

DANGER**Danger of shock hazard**

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

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

ATTENTION**Danger of damage to components of the module**

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.

Replacing Fuses

DANGER**Danger of shock hazard**

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

To replace the fuses

1. Open the lid of the AC power connector.
 2. Lift the fuse holder out of its slot.
 3. Exchange the two fuses.
- Put the fuse holder back in its slot and close the lid.

Removing the Interface Board A200

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 and 1167.0416.01).

- The interface board is located behind the display at the top of the instrument.
- Dismount fan E1 after disconnecting the fan cable.
- Unscrew all screws (14 x 1148.3059) from interface board.
- Unscrew all screws (6 x 0041.1653) from rear panel.
- Remove all options mounted on interface board from the rear, or remove insertion cover plate (2 x 1167.0497) by unscrewing the screws (8 x 1148.3271).
- Remove RJ45 coupler jack X215 from rear panel.
- Remove the controller LPC A250.
- Exchanging the controller LPC is described on the following pages.
- Disconnect W780, W200, W160, W800, fan cable from E3.
- Disconnect W904 (see drawing 1167.0416.01) from power supply.
- Pull the interface board toward the fan while raising the front of the board about 5 mm to free the on-board plugs. Then pull the board toward the front of the instrument and lift it out.

Replacing the Interface Board A200

- To insert the new interface board, proceed in the reverse order. Connect all cables in the correct position and tighten all screws (drawing 1167.0000.01).
- Perform internal adjustments as described in chapter 2, "Adjustments".

ATTENTION



Risk of damage to the board

Be careful when installing the interface board in order not to cause damage to any components. Make sure to connect the cables as indicated by their labeling.

Removing the Motherboard A300

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 and 1167.0500.01).

- Remove the module hood by unscrewing the screws (3x 1148.3271).
- Remove the frequency synthesis if it is present – see [“Removing the Frequency Synthesis A400”](#).
- Remove the down converter if it is present – see [“Removing the Down Converter A450”](#).
- Remove the ALC/DDS unit if it is present – see [“Removing the ALC/DDS Unit A500”](#).
- Disconnect cables W310, W311, W313.
- Disconnect cables W312, W316 (included in 1167.0500.01).
- Unscrew the screws (10x 1148.3059).
- Remove the SMP Adaptors (10x 1093.6869) from the motherboard.

Replacing the Motherboard A300

- To insert the new motherboard, proceed in the reverse order. Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01 and 1167.0000.01 S).
- Reinstall the frequency synthesis, down converter, ALC/DDS unit in the correct position.
- Reinstall the module hood (see above).

Removing the BNC Board A160

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01).

- Unscrew the BNC nuts (10x).
- Disconnect cable W160.

Replacing the BNC Board A160

- To insert the new BNC board, proceed in the reverse order. Connect the cable in the correct position and tighten all screws (drawings 1167.0000.01 and 1167.0000.01 S).

Removing the MW Interface Board A205

(See chapter 5, spare parts list 1167.0039.01 and 1167.0416, parts list and drawings 1167.0000.01 and 1167.0416).

- Disconnect cable W125, W200, W725.
- Disconnect cable W903 (included in 1167.0500.01).
- Disconnect the step attenuator (1167.5553.01).
- Unscrew the screws (6x 1148.3059).

Replacing the MW Interface Board A205

- To insert the new MW interface board, proceed in the reverse order. Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01 and 1167.0000.01 S).
- After replacing the MW interface board, perform adjustments as described in chapter 2, "Adjustments".

Removing the Controller LPC A250

(See chapter 5, spare parts list 1167.0039.01 and 1167.0500.00, parts list and drawings 1167.0000.01 and 1167.0500.00).

- Switch off the instrument and pull the mains plug.
- The LPC is fitted on top of the interface board A200 and fastened with six screws (2084.8000.00). Be careful when disconnecting the PCB from the interface board.
- Disconnect cable W127 (to keyboard controller) and W215 (LAN cable) to rear panel.
- Disconnect front panel cable W110 (1167.0374.00) included in 1167.0500.00.
- Carefully pull the CF card or CF card adapter (R&S SMF-B80) out of the defective controller LPC and plug it into the new LPC.

Note: The controller LPC is tightly inserted on the interface board. Carefully pull off the board.

Removing the Lithium Battery

- The lithium battery is accommodated on the controller LPC board.

CAUTION



Danger of injury

- Lithium batteries must not be exposed to high temperatures or fire.
- Keep away from children.
- If the battery is replaced improperly, there is danger of explosion. Only replace the battery with an R&S type (see chapter 5, spare parts list 1167.0039.01).
- Lithium batteries are hazardous waste and must be disposed of in special containers.
- Do not short-circuit the battery!

- Carefully lift and pull out the battery.

Note: 3.4 V lithium battery ($\varnothing$ 20 mm * 3 mm, type CR2032), R&S Order No. 0858.2049.00.

- Insert new battery into holder below the spring.

Note: The positive pole (+) of the battery should point up.

- See chapter 2, "Procedures after Replacing the Lithium Battery".
- Carefully lift and pull out the battery.

Removing the CompactFlash™ Card A250

- The CompactFlash™ card is fitted into the controller LPC.
- Carefully pull the card out of the defective controller LPC and plug it into the new LPC.
- Perform internal adjustments as described in chapter 2, "Adjustments".

Replacing the Controller LPC A250

- Install the new controller LPC in the reverse order.
- Carefully plug the cable connectors to the controller LPC, taking care not to reverse the polarities.
- Connect cable W110 to the front panel.
- Connect cable W127 to the keyboard controller board, and connect W1215 (LAN cable) to rear panel).
- Carefully plug the new controller (A250) to the interface board (A200) and fasten it in place using the six screws.

Removing the Reference Oscillator A575 (R&S SMF-B1)

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.9159.01).

- Unscrew the screws (2x 1148.3059).
- Disconnect cable W405; W575.
- Pull the reference oscillator toward power supply unit.

Replacing the Reference Oscillator A575 (R&S SMF-B1)

- To insert the new reference oscillator A575, proceed in the reverse order.
- Lock in the hook of the oscillator to the TMO unit.
- Connect all cables in the correct position and tighten all screws (drawings 1167.9159.01 and 1167.0000.01 S).
- After replacing the reference oscillator A575, perform adjustments as described in chapter 2, "Adjustments".

Removing the AM/FM Scan Modulator A480 (R&S SMF-B20)

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01).

- Remove the module hood by unscrewing the screws (3x 1148.3271).
- Remove the ALC/DDS unit A500 – see ["Removing the ALC/DDS Unit A500"](#).
- Unscrew the screws (10x 1096.5205.00).
- Remove the RF cover from the board.
- Carefully disconnect the AM/FM scan modulator A480.

Replacing the AM/FM Scan Modulator A480 (R&S SMF-B20)

- To insert the new AM/FM scan modulator A480, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01 and 1167.0000.01 S).
- After replacing the AM/FM scan modulator A480, perform adjustments as described in chapter 2, "Adjustments".

ATTENTION**Risk of damage to the board**

Be careful when installing the unit in order not to cause damage to any components. Make sure to connect the cables as indicated by their labeling.

Removing the USB Board A180 (R&S SMF-B84)

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.6608.01).

- Unscrew the screws (4x 1148.3271).
- Carefully unlock the unit with a screwdriver.
- Remove the unit from the instrument.

Replacing the USB Board A180 (R&S SMF-B84)

- To insert the USB board A180, proceed in the reverse order.

ATTENTION**Risk of damage to the board**

Be careful when installing the unit in order not to cause damage to any components.

Removing the GPIB Board A170 (R&S SMF-B83)

(See chapter 5 spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.6608.01).

- Unscrew the screws (4x 1148.3271).
- Carefully unlock the unit with a screwdriver.
- Remove the unit from the instrument.

Replacing the GPIB Board A170 (R&S SMF-B83)

- To insert the GPIB board A170, proceed in the reverse order.

ATTENTION**Risk of damage to the board**

Be careful when installing the unit in order not to cause damage to any components.

Removing the Compact Flash A190 (R&S SMF-B85)

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.6808.01).

- First remove the controller LPC – see [“Removing the Controller LPC A250”](#).
- Remove the CF adapter (1405.2102.02) from the LPC. To do this, lift up the spring panel from the CF board.
- Unscrew the screws (4x 1148.3271) from the rear panel.
- Pull the unit toward the rear about 100 mm – but not more!
- Disconnect cable W190.
- Remove cable W190 toward the inside of the instrument.

Replacing the Compact Flash A190 (R&S SMF-B85)

- To insert the compact flash A190, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.6808.01 and 1167.0000.01 S).
- After replacing the compact flash A190, perform adjustments as described in chapter 2, *“Adjustments”*.

ATTENTION**Risk of damage to the board**

Be careful when installing the unit in order not to cause damage to any components.

Removing the Frequency Synthesis A400

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01 and 1167.4005.01).

- Remove the module hood by unscrewing the screws (3x 1148.3271).
- Disconnect cables W406, W409, W410.
- Remove the frequency synthesis A400 from the instrument.
- Carefully use the hand gears to unplug the unit.

Replacing the Frequency Synthesis A400

- To insert the new frequency synthesis A400, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01, 1167.4005.01 and 1167.0000.01 S).
- After replacing the frequency synthesis A400, perform adjustments as described in chapter 2, "Adjustments".

Removing the Down Converter A450 (R&S SMF-B2)

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01 and 1167.4005.01).

- Remove the module hood by unscrewing the screws (3x 1148.3271).
- Disconnect cables W409, W454, W455.
- Remove the down converter A450 from the instrument.
- Carefully use the hand gears to unplug the unit.

Replacing the Down Converter A450 (R&S SMF-B2)

- To insert the new down converter A450, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01, 1167.4005.01 and 1167.0000.01 S).
- After replacing the down converter A450, perform adjustments as described in chapter 2, "Adjustments".

Removing the ALC/DDS Unit A500

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01 and 1167.4005.01).

- Remove the module hood by unscrewing the screws (3x 1148.3271).
- Disconnect cables W412, W511, W512, W513, W524; W525, W526.
- Disconnect cable W410.
- Remove the ALC/DDS unit A500 from the instrument.
- Carefully use the hand gears to unplug the unit.

Replacing the ALC/DDS Unit A500

- To insert the new ALC/DDS unit A500, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01, 1167.4005.01 and 1167.0000.01 S).
- After replacing the ALC/DDS unit A500, perform adjustments as described in chapter 2, "Adjustments".

Removing the TMO Unit A820

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01 and 1167.1987.00).

- Remove the Reference Oscillator A575 – see [Removing the Reference Oscillator A575](#).
- Unscrew the screws (4x 0041.1653).
- Disconnect cable W821.
- Pull the TMO unit toward the power supply unit.

Replacing the TMO Unit A820

- To insert the new TMO unit A820, proceed in the reverse order.
- Connect all cables and options in the correct position and tighten all screws (drawings 1167.0000.01, 1167.1987.00 and 1167.0000.01 S).
- After replacing the TMO unit A820, perform adjustments as described in chapter 2, "Adjustments".

Removing TMO CONTROL Unit A821

- First remove TMO Unit A820 - see [Removing the TMO Unit A820](#).
- Disconnect cable W821
- Unscrew the screws (4x 1148.3059.00) on the board.
- Unscrew the screw (0041.1653.00) on transistor holding panel.

Replacing TMO Control Unit A821

- To insert the new TMO Control unit A820, proceed in the reverse order.
- After replacing the TMO Control unit A820, perform adjustments as described in chapter 2, "Adjustments".

Removing TMO with Adapter A822

- First remove TMO Unit A820 – see [Removing the TMO Unit A820](#).
- Disconnect cable W821
- Unscrew the screws (4x 1148.2630.00).

Replacing TMO with Adapter A822

- To insert the new TMO with Adapter A822, proceed in the reverse order.
- After replacing the TMO Control unit A820, perform adjustments as described in chapter 2, "Adjustments".

Removing the DMA Module Unit A800

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01).

- Disconnect cables W406, W454, W800, W802, W803, W821.
- Unscrew the screws (4x 0455.5966).

Replacing the DMA Module Unit A800

- To insert the new DMA module unit A800, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01 and 1167.0000.01 S).
- After replacing the DMA module unit A800, perform adjustments as described in chapter 2, "Adjustments".

Removing the Low Harmonics A780

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01).

- Disconnect cables W780, W783, W802.
- Disconnect cables W740 and W742 from Frequency Doubler.
- Remove the doubler metal sheet – unscrew the screws (4x 2084.8000).
- Unscrew the screws (4x 1148.3059).

Replacing the Low Harmonics A780

- To insert the new low harmonics A780, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01 and 1167.0000.01 S).
- After replacing the low harmonics A780, perform adjustments as described in chapter 2, "Adjustments".

Removing the Directional Coupler A720

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01).

- Disconnect cables W644, W720.
- Remove the front panel unit – see ["Removing the Front Panel Unit A100"](#).
- Unscrew the screws (2x 0275.5830).
- Remove the detector A725 – see ["Removing the Detector A725"](#).
- Unscrew the coupler from the detector.

Replacing the Directional Coupler A720

- To insert the new directional coupler A720, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01 and 1167.0000.01 S).
- After replacing the directional coupler A720, perform adjustments as described in chapter 2, "Adjustments".

Removing the Detector A725

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01).

- Disconnect all connected cables depending on mounted options. Disconnect cables W310, W311, W507, W725.
- Unscrew the screws (4x 0048.8218).
- Disconnect the detector from the coupler.

Replacing the Detector A725

- To insert the new detector, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01 and 1167.0000.01 S).
- After replacing the detector, perform adjustments as described in chapter 2, "Adjustments".

Removing the High-Power Amplifier A760 (R&S SMF-B31)

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01S, 1167.0000.01 and 1167.7404.01).

- Disconnect all connected cables depending on mounted options. Disconnect cables W784, W760, W762 or W763.
- Unscrew the screws (4x 1096.5205).

Replacing the High-Power Amplifier A760 (R&S SMF-B31)

- To insert the new high-power amplifier A760, proceed in the reverse order.
- Connect all cables and options in the correct position and tighten all screws (drawings 1167.0000.01, 1167.7404.01 and 1167.0000.01S).
- After replacing the high-power amplifier A760, perform adjustments as described in chapter 2, "Adjustments and Calibration".

ATTENTION *Risk of damage to the board*



Be careful when installing the unit in order not to cause damage to any components. Connector X760 is mounted facing the front.

Removing the Step Attenuator 22 GHz A600 (R&S SMF-B26)

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01 and 1167.5553.01).

- Disconnect cables W720, W100, W600.
- Unscrew the screws (2x 0041.1653).

Replacing the Step Attenuator A600 22 GHz (R&S SMF-B26)

- To insert the new step attenuator A600, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01, 1167.5553.01 and 1167.0000.01 S).
- After replacing the step attenuator A600, perform adjustments as described in chapter 2, "Adjustments".

Removing the Step Attenuator 43.5 GHz A610 (R&S SMF-B27)

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01S, 1167.0000.01 and 1167.5553.01).

- Disconnect cables W720, W100, W600.
- Unscrew the screws (2x 0041.1653).

Replacing the Step Attenuator 43.5 GHz A610 (R&S SMF-B27)

- To insert the new step attenuator 43.5 GHz A610, proceed in the reverse order.
- Connect all cables and options in the correct position and tighten all screws (drawings 1167.0000.01, 1167.5553.01 and 1167.0000.01S).
- After replacing the step attenuator A610, perform adjustments as described in chapter 2, "Adjustments and Calibration".

Removing the Frequency Doubler A704 (R&S SMF-B144)

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01).

- Remove the low harmonics A780 – see ["Removing the Low Harmonics A780"](#).
- Disconnect the cables W740, W742, W803.
- Unscrew the screws (7x).

Replacing the Frequency Doubler A704 (R&S SMF-B144)

- To insert the new frequency doubler A704, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01 and 1167.0000.01 S).
- After replacing the frequency doubler A704, perform adjustments as described in chapter 2, "Adjustments".

Removing the Switch A640 (R&S SMF-B2)

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01).

- Disconnect all connected cables depending on mounted options. Disconnect cables W455, W742, W 783, W644, W640.
- Unscrew the screws (4x 0041.1653) from bottom of the instrument.

Replacing the Switch A640 (R&S SMF-B2)

- To insert the new switch A640, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01 and 1167.0000.01 S).
- After replacing the switch A640, perform adjustments as described in chapter 2, "Adjustments".

Removing the Power Supply Unit A900

The Power Supply Unit A900 consist of this spare parts:

- Switching Power Supply A910
- Fan E3

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01 and 1167.0416.01).

- Disconnect the cable W904 – pull very strongly on the connector body.
- Disconnect the cable W903.
- Disconnect the cables from power input connectors W910, W911, W913.
- Disconnect the fan cable from the interface board A200.
- Unscrew the screws (6x 1148.2646).
- Unscrew the screw (1x 1148.3271).
- Move the power supply unit toward the middle of the instrument and lift it out.

Replacing the Power Supply Unit A900

- To insert the new power Supply unit A900, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01, 1167.0416.01 and 1167.0000.01 S).
- After replacing the power supply unit A900, perform adjustments as described in chapter 2, "Adjustments".

Removing the Switching Power Supply A910

- First removing the Power Supply Unit A900 - see ["Removing the Power Supply Unit A900"](#).
- Pull out the Switching Power Supply, on the open side from screening case.

Replacing the Switching Power Supply A910

- To insert the new Switching Power Supply A910, proceed in the reverse order.

Removing the Fan E3

(See chapter 5, spare parts list 1167.0039.01 and 1167.0416.0, parts list and drawings 1167.0000.01 and 1167.0416.01)

- Remove the power supply A900 – see ["Removing the Power Supply Unit A900"](#).
- Unlock the rubber pins.
- Now you can change the fan E3, but do not forget to unplug the fan cable.

Installing the new Fan E3

- Mount the new fan E3.
- Connect the fan cable at the interface board A200 (X203).

ATTENTION Danger of damage to the instrument



Please note the direction of the airflow printed on the fan. The arrow on the fan must point to the inside of the instrument! The fan must blow the cool air in the instrument in order to cool the components and prevent overheating.

Make sure to route the cable so that it cannot get into the fan.

- Replace the power supply – see ["Replacing the Power Supply Unit A900"](#).
- Reinstall the tube and the rear panel feet.

Removing the Front Panel Unit A100

The Front Panel Unit A100 consist of following this spare parts:

- TFT Display A110
- Display Connect
- Converter
- Rotary Pulse Generator
- Push button Board Set
- Flex Switch Board
- Front Panel Controller

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01).

- Unscrew the handle screws (4x 1096.4896).
- Dismount the handles (2x 1096.1474).
- Remove the front cover (1167.0700).
- Unscrew the screws (6x 1148.3288).
- Disconnect cable W100.
- Disconnect cables W110, W125, W127, W312, W316, W512, W524, W525, W526.
- Remove the controller LPC – see [“Removing the Controller LPC A250”](#).
- Disconnect the display connection cable (1167.0374).

Replacing the Front Panel Unit A100

- To insert the new front panel unit A100, proceed in the reverse order.
- Connect all cables in the correct position and tighten all screws (drawings 1167.0000.01 and 1167.0000.01 S).
- After replacing the front panel unit A100, perform adjustments as described in chapter 2, *“Adjustments”*.

Removing the TFT Display A110, Display Connect FMR 6-SHARP, Converter

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01 S, 1167.0000.01 and **1167.0500.01**, 1167.0500.01 S).

Remove the front panel unit A100 – see [“Removing the Front Panel Unit A100”](#).

Removing the TFT Display A110

- Unscrew the screw (1x 1300.4457).
- Unscrew the screws (2x 1148.3059).
- Remove the holding bracket (1167.0568.00).
- Unscrew the screws (4x 1300.4457).
- Disconnect the display cables.

Removing Converter

- Disconnect the display cable.
- Unscrew the screw (2 x 1148.2923.00).

Removing Display Connect FMR 6-SHARP

- First Remove Converter
- Disconnect the display cable.
- Unscrew the screw (2 x 1148.2923.00).
- Pull off the Display Connect FMR 6-SHARP from TFT Display.
- Disconnect the cable from Controller LPC - see [“Removing the Controller LPC A250”](#).

Replacing the Display Connect FMR 6-SHARP, Converter

- To insert the new Display Connect FMR 6-SHARP or Converter, proceed in the reverse order.
- Connect all cables and options in the correct position and tighten all screws (drawings 1167.0000.01, 1167.0500.01 and 1167.0000.01 S).

Replacing the TFT Display A110

- To insert the new display A110, proceed in the reverse order.
- Connect all cables and options in the correct position and tighten all screws (drawings 1167.0000.01, 1167.0500.01 and 1167.0000.01 S).
- After replacing the display A110, perform adjustments as described in chapter 2, "Adjustments".

ATTENTION Risk of damage to the display

Make sure to mount the display dust-free.

Replacing Rotary Pulse Generator (A125) the Pushbutton Board Set (1167.0739.00), Flex. Switch Board (A120), and Front Panel Controller (A130)

(See chapter 5, spare parts list 1167.0039.01, parts list and drawing 1167.0500.01).

The rotary pulse generator, pushbutton board set, flex. switch board and Front Panel Controller are located behind the front panel unit and the keyboard frame

Removing Rotary Pulse Generator (A125)

- Remove front Panel Unit A100 – see [“Removing the Front Panel Unit A100”](#).
- Pull off the knob (0852.1086.00) of the rotary pulse generator. The rotary pulse generator can be replaced after undoing the hexagon nut.

Removing the Pushbutton Board Set, Flex. Switch Board and Front Panel Controller

- Remove front Panel Unit A100 – see [“Removing the Front Panel Unit A100”](#).
- Unscrew the screw (1x 1300.4457)
- Unscrew the screws (2x 1148.3059)
- Disconnect Display Cables
- Remove holding bracket (1167.0568.00)
- Place the front panel unit onto a clean surface with the keys pointing upwards.
- Remove cable to the front panel controller.
- Unscrew the two screws (1148.3313.00) and remove the front panel controller.
- Unscrew the screws (6x 1148.2752.00)
- Remove Key holding Plate1
- Unscrew the screws (2x 1148.2752.00)
- Remove Key holding Plate2
- The pushbutton board set (1400.0717.00), the flex. switch board (A355), as well as the front panel controller can now be replace.

Removing the Fan E1

(See chapter 5, spare parts list 1167.0039.01, parts list and drawings 1167.0000.01)

- Disconnect the fan cable at the interface board connector E1.
- Unlock the rubber pins.
- Now you can change the fan E1, but do not forget to unplug the fan cable.

Installing the New Fan E1

- Mount the new fan.
- Connect the fan cable to the interface board (X202).

ATTENTION



Danger of damage to the instrument

Please note the direction of the airflow printed on the fan. The arrow on the fan must point to the inside of the instrument! The fan must blow the cool air in the instrument in order to cool the components and prevent overheating.

Make sure to route the cable so that it cannot get into the fan.

- Reinstall the tube and the rear panel feet.

Troubleshooting

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

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

DANGER



Danger of shock hazard

Disconnect boards from the AC supply before you plug or unplug them!

Be careful not to cause short-circuits when measuring voltages!

The following utilities are provided in the signal generator for easy diagnosis:

- Internal diagnosis test points
- Internal adjustments
- Info line with error messages and history of messages
- Internal keyboard test

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

Measuring Equipment and Accessories

Item	Type of equipment	Specifications recommended	Equipment recommended	R&S order No.
1	DC meter		R&S URE2	0350.5315.02
2	Spectrum analyzer	Frequency range 0 to 40 GHz	R&S FSP40	1164.4391.40
3	Microwave adapter cable	1 m long K-male to-K-male connection		
4	Microwave adapter cable	1 m long QMA-male to-K-male connection		
5	RF Adapter cable	BNC-male-to-BNC-male-connection		
6	Oscilloscope	100 MHz	TDS 220	

Switch-On Problems

When the instrument is switched on, the following modules are involved:

- Power supply
- Interface board (IFBO)
- CPU (LPC6/1L+)
- Front module with keyboard controller board and switching pad
- Microwave Interface board

To analyze switch-on and switch-off problems that occur with the R&S SMF100A, the interplay of the individual modules is summarized in the following.

Switch-on

In standby mode the ON/OFF button on the front panel is monitored by the front panel controller (FPC; A130). As soon as the ON/OFF button on the front panel is pressed, the output of the FPC (signal PWR_OFF) switches from HIGH Z to LOW and the power supply then starts up its output voltages.

When the +5 V output passes the 4.75 V threshold, the PWRGOOD signal (IFBO X251.A23) from the power supply is set and the CPU on the processor unit (A250) is now started up. Within four seconds after switch-on, the CPU must pull the PWR_OFF line (IFBO X251.B9) to LOW -level, since the output of the FPC is subsequently switched to HIGH Z mode again.

If the green LED on the front panel lights up for only a short time (approx. four seconds) and then the orange standby LED lights up again, this means that the CPU is not booting properly. This may be caused by a defective or overheated power supply, processor or interface board (check fuse F7).

Switch-off

The instrument can be switched off in three different ways:

The CPU's PWR_BUTTON input signal (IFBO X251.A21) is routed via a pull-up resistor directly to the ON/OFF button on the front panel. Briefly pressing this button generates a low pulse, which tells the BIOS or operating system to shut down. Prior to shutdown, all instrument settings (frequency, level, modulation, etc) are saved on the CompactFlash™ card. When the operating system has been completely shut down, the CPU's PWR_OFF signal (IFBO X251.B9) is switched to tristate (HIGH Z), which turns off the power supply.

Pressing and holding the button on the front panel for longer than four seconds leads directly to a hard reset of the CPU and sets the PWR_OFF signal to HIGH Z, which also switches off the power supply. If the CPU is switched off in this way, this status is saved in the CPU and expects a low signal on the PWR_BUTTON line when the instrument is switched on again. It is therefore necessary to set this signal to low for at least one second the next time the instrument is switched on.

The instrument can also be switched off by means of the temperature monitoring circuits in the power supply. If the sensors detect an over temperature (e.g. in the event that a fan fails), the power supply switches off by itself. The instrument can only be restarted by switching off and on the power switch at the instruments rear panel after the power supply has cooled down.

- Error: Instrument cannot be switched on.

Error discretion	Possible error causes and further steps
Yellow standby-LED is dark.	➤ Check power-on switch on the rear: ➤ Switch on power supply. ➤ Check fuses on the rear.
Yellow standby-LED remains dark.	➤ Measure standby voltage of power supply at X903.4 on the microwave interface board. Rated value: $13.5\text{ V} \pm 0.4\text{ V}$ - No voltage: First check cable W903 from power supply to microwave interface, then the power supply unit itself. ➤ Measure standby voltage at fuse F1 (between F1 and R5/R6) on the microwave interface board. Rated value: $+13.5\text{ V} \pm 0.5\text{ V}$ - No voltage: Check and replace fuse F1. The standby voltage as well is routed to the modules Frequency Synthesis (A400) and Ref. Oscillator (A575). Check these modules, if there is a short on the 13.5V-standby line. Replace the defective module. ➤ Measure regulated standby voltage at C2. Rated value: $+5\text{ V} \pm 0.25\text{ V}$ - Faulty voltage: The +5 V-standby voltage is routed to the processor unit (A250) and the Front Panel Controller (A130). Check these modules, if there is a short on the +5V-standby line. Replace the defective Module. - Voltage ok: Check cabling (W125) from Microwave Interface board to Front Panel Controller (A130)
Green LED lights up for approx. 4 seconds.	Power supply overheated: check fan E3. Fuse F7 on the interface board is blown: replace fuse F7. Processor unit defective: Replace processor unit.

• **Error: Signal generator starts up but display remains black**

Error description	Possible error causes and further steps
CPU does not boot correctly	➤ Check DVI signals on IF board X342 Pins 23 to 26: $3.3\text{ V} \pm 0.1\text{ V}$ Pins 29 to 34: $5.0\text{ V} \pm 0.2\text{ V}$ Pin 15: DVI clock signal 25.2 MHz $U_{PP} = 0.7\text{ V} \pm 0.1\text{ V}$ Faulty DVI signals: Change CPU
CPU does boot, but display remains black	➤ Check cabling between Processor Unit (A250), Display Adapter board (A110) and display inverter No backlight: Backlight inverter or fluorescent tube defective. Replace the defective parts. Backlight ok: Check the Display Adapter board and TFT display. Replace the defective parts

After power-up the fans should blow during the boot process. It is a normal behavior, that the left side fan stops after the boot sequence has finished, if the ambient temperature is rather low or the R&S SMF100A has not warmed up.

• **Error: Fan does not work**

Error description	Possible error causes and further steps
Left front fan (E1) does not work	➤ Disconnect the fan and check the voltage on Interface Board (A200) X202 between pin 1 and pin 2 : Rated voltage: $11.7\text{ V} \pm 0.5\text{ V}$ Voltage ok: Check the fan. If the fan works, replace the Interface board (A200), otherwise replace the defective fan. Faulty/no voltage: Check +12 V voltage at fuse F10 on the Interface board (A200). Replace the fuse if necessary and check, whether there is a short on the +12 V-line.
Power supply fan (E3) does not work	➤ Disconnect the fan and check the voltage on Interface Board (A200) X203 between pin 1 and pin 2 : Rated voltage: $11.7\text{ V} \pm 0.5\text{ V}$ Voltage ok: Check the fan. If the fan works, replace the Interface board (A200), otherwise replace the defective fan. Faulty/no voltage: Check +12 V voltage at fuse F10 on the Interface board (A200). Replace the fuse if necessary and check, whether there is a short on the +12V-line.

Problems with Booting

- **Error: Unit does not start the application**

After switch-on, the signal generator first boots the computer BIOS. After successful initialization of the computer, the LINUX operating system starts up. During this boot sequence, an R&S logo is displayed. Subsequently, the application is loaded as a start-up program. Simultaneously, several FPGAs are loaded on the modules and self-tests are performed at various locations.

Normal action	Error, possible causes and corrective action
➤ Start signal generator	R&S logo does not disappear The operating system (LINUX) can't be started • Connection of CompactFlash™ card became looser → Make sure the CompactFlash™ card or the CompactFlash adapter (option R&S SMA-B80) is properly connected on the CPU board. (LPC6/1L+). To do this, you have to remove the CPU board from the IF board. • CMOS failure of BIOS (after battery change) → Connect a USB keyboard and press F1 to resume → If the signal generator starts up correctly now, you have to update date and time in the R&S SMA setup menu.

Keyboard and Rotary Knob Test

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

Normal action	Error, possible causes and corrective action
Test called with SETUP - Check Front Panel...	
An image of the front panel appears with gray keys. When a key is pressed once or the knob is moved, the field changes to green. If the key is pressed more than once, the field changes to red.	Note: <i>Be careful with the rotary knob! Turn only slightly in the specified direction, otherwise the field will change to red.</i>
When all operating elements including the rotary knob have been actuated once, all fields are green. If operating elements have been actuated twice, the fields are red.	If the color changes to red at the first actuation, a malfunction has occurred (bouncing). If the color of the corresponding field remains the same after actuation, the function is defective. In either case: Change the switching pad and/or rotary knob.
A message is output when all keys have been pressed: "All Front Panel Keys were accessed correctly"	Note: <i>No error message is output even if a number of keys are red. The user must decide whether a malfunction has occurred.</i>

Troubleshooting with Internal Test Points

A diagnostic A/D converter on the Interface board allows you to measure voltages at internal test points, which are located on all important modules of the instrument.

Diagnostic test points are located on following modules:

- Interface board (IFBO)
- Microwave Interface board (MWIFC)
- Frequency Synthesis (FSYN)
- ALC DDS Unit (ADU)
- Modulation board (MOD)
- Down converter (DCON)
- DMA module (DMA)
- Reference Oscillator (OCXO)

All modules (Step Attenuator excluded) have temperature sensors for temperature monitoring purposes. Additionally the rotation speed of both fans can be monitored.

Normal action	Error, possible causes and corrective action
Internal diagnosis switched on with: SETUP - Test Points... Select the desired test point under Select Test Point. To operate, set State ON	
The measured voltage is displayed under Voltage. "99.9999 V" means that the test point does not exist. This value is also returned for queries concerning the IEC/IEEE bus if a non-existent test point is queried. The diagnostic system operates with multiplexers on each board to switch the desired test point to the common line named DIAG on the motherboard. Each test point is switched to the line only for the time of a measurement and switched off after it. The A/D converter is located on the IF board. It is advisable to begin by checking the test points on the IF board, since the diagnostic converter is located on this module.	➤ For troubleshooting refer to the following chapters. ➤ Compare the displayed values with the values specified in the respective sections concerning troubleshooting on the module. Major deviations from the named values indicate a defect: Change the module. If all test points are out of tolerance, maybe only one of the modules is defective and disturbs the diagnostic system. To determine which module is defective, remove all modules that include test points one after another, except the Interface board. If values are still out of tolerance, replace the Interface board. Note: <i>Temperatures are not always output directly in °C. The measured value often has to be multiplied by 100.</i>

Troubleshooting with Internal Adjustments

Various internal adjustments are necessary for correct operation of the instrument. The failure of a certain adjustment can shorten troubleshooting considerably. The affected modules are the Frequency Synthesis module (FSYN), the ALC DDS unit (ADU) and the AM/FM/Scan Modulator board (MOD).

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

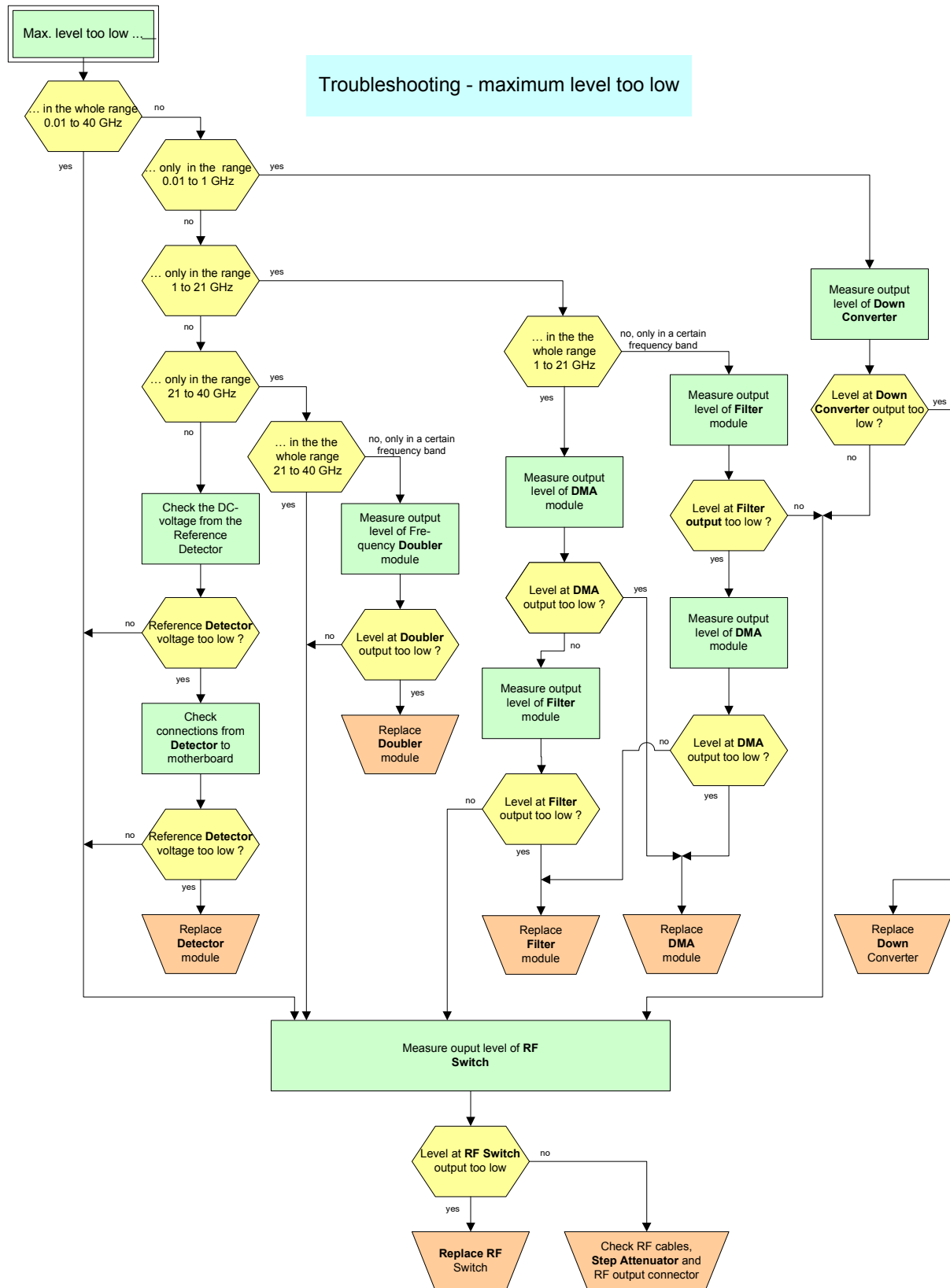
Normal action	Error, possible causes and corrective action
Internal adjustments called: SETUP - Internal Adjustments...	Note: When Adjust All is called, all internal calibration operations are performed. When troubleshooting, however, it is advisable to start the calibration operations individually and also to monitor their progress.
Adjust Frequency Synthesis Internal adjustment of synthesis module FSYN is executed.	Abort during adjustment: See section " Troubleshooting – Frequency Synthesis (FSYN, A400) ".
Adjust Level Internal adjustment of ALC DDS Board is executed.	Abort during adjustment: See " Troubleshooting – Interface Board (IFBO, A200) ".
Adjust Modulation/ LF Generator Internal adjustment of modulation/LF generator is executed.	Abort during adjustment: See " Troubleshooting – AM/FM/Scan Modulator (MOD, A520) ".

Faulty RF Output Signal

- **Error:** Signal generator supplies faulty signal or none at all at the RF output.

Error	Actions to perform
No RF signal or a signal with insufficient level at the RF output.	Run internal adjustments (see "Troubleshooting with Internal Adjustments"). After internal adjustment, follow the Flow Chart and check all probably defective modules. Change any defective module: ➤ Check attenuator (see "Troubleshooting – Step attenuator (A600)"). ➤ Check RF Switch (see "Troubleshooting – RF Switch (A640)"). ➤ Check Filter Bank (see "Troubleshooting – Filter (A780)"). ➤ Check Down Converter (see "Troubleshooting – Down Converter (DCON, A450)"). ➤ Check DMA Module (see "Troubleshooting – DMA module (A800)"). ➤ Check YIG Oscillator.
The frequency at the RF output is not correct.	➤ Run internal adjustments (see "Troubleshooting with Internal Adjustments"). ➤ After internal adjustment, check FSYN (see "Troubleshooting – Frequency Synthesis (FSYN, A400)").

Flow Chart



Faulty LF Output Signal

Faulty Pulse Output Signal

The signals of LF-Generator and pulse generator are generated in the FPGA on the ALC DDS Unit (A500). For proper working of the FPGA a correct reference clock is needed at the ALC DDS Unit. (X505).

Error	Actions
Faulty LF Output Signal	➤ Run internal adjustment: Adjust Modulation/LF Generator. If internal adjustment fails see "Troubleshooting – Interface Board (IFBO, A200)".
Faulty Pulse Output Signal	➤ See "Troubleshooting – Interface Board (IFBO, A200)"

Faulty AM

The amplitude modulation AM is generated by using the level control loop (ALC). The level control loop consists of the DMA module, the level detector and mainly the ALC DDS Unit.

The internal modulation generator is implemented on the AM/FM/Scan Modulation board (A520).

Error	Actions
AM is faulty	➤ Run internal adjustment: Adjust Level. Run loop gain calibration program ➤ Check ALC DDS Unit, detector, DMA module
Only external AM is faulty	➤ Activate external AM and feed in a modulation signal (1 kHz, 1 V_{peak}) at EXT1 or EXT2 BNC connector of the signal generator. Check cable from BNC connector to motherboard. ➤ Run internal adjustments: Adjust Modulation/LF Generator. ➤ Check AM/FM/Scan Modulation board (A520).

Faulty FM/PM

The FM/PM modulation is generated at the ALC DDS Unit (A500)
The internal modulation generator is implemented on the AM/FM/Scan Modulation board (A520).

Error	Corrective action
FM is faulty (with modulation frequency < 100 kHz)	➤ Run internal adjustment: Adjust Frequency Synthesis. ➤ Activate internal FM with 1 kHz modulation frequency and check the modulated RF signal. If the modulated signal is bad, check Frequency Synthesis module and TMO unit. ➤ Replace the defective module.
FM is faulty (with modulation frequency > 100 kHz)	➤ Run internal adjustment: Adjust Frequency Synthesis. ➤ Activate internal FM with 1 MHz and 4 MHz modulation frequency and check the modulated RF signal. ➤ First by shure the FM frequency response and FM deviation is adjusted at the TMO unit. ➤ If these adjustments are not successfully, check Modulation board, Frequency Synthesis and TMO Unit.
Only external FM/PhiM is faulty	➤ Activate external FM and feed in a modulation signal (1 kHz, 1 V_{peak}) at EXT1 or EXT2 BNC connector of the signal generator. Check cable from BNC connector to motherboard. ➤ Run internal adjustments: Adjust Modulation/LF Generator. ➤ Check AM/FM/Scan Modulation board (A520).

Faulty Pulse Modulation

The signal for internal pulse modulation is generated by the pulse generator FPGA on the ALC DDS Unit (ADU). The external pulse modulation signal is also feed into the pulse generator FPGA.
The output signal of this FPGA is feed to the pulse modulators of DMA Module and Down converter.

Error	Corrective action
Internal pulse modulation is faulty in the whole RF frequency range.	➤ Activate internal pulse modulation with 1 ms pulse period and 500 μs pulse width and check for correct output signal at the PULSE OUTPUT (square 1 kHz, 3.3 V_{peak}). If the signal is bad, troubleshoot ALC DDS Unit first.
Internal pulse modulation is faulty (RF < 1 GHz)	➤ Replace Down Converter (A450).
Internal pulse modulation is faulty (RF ≥ 1 GHz)	➤ Replace the DMA Module (A800)..
Only external pulse modulation is faulty	➤ Activate external pulse modulation and feed in a modulation signal (square 1 kHz, TTL level) at PULSE IN BNC connector of the signal generator. Check cable W316 from BNC connector to motherboard (X316). ➤ If the signal at X316 is ok, replace the ALC DDS Unit (A500).

Troubleshooting – Interface Board (IFBO, A200)

Supply Voltages

Before troubleshooting on the Interface board, measure the supply voltages on its connector (X904) and compare them to the values specified in the table. If one or more voltages are not of the required level, first check for a fault of the power supply.

Check the fuses listed in the table below:

Supply Voltage	Pin at connector X904	Fuse	
+ 5.2 V	1, 2, 3	F2 F7	ALC DDS Unit, Frequency Synthesis, Down Converter Processor Unit
+ 12 V	5	F9 F10 F1	ALC DDS Unit, Frequency Synthesis, Down Converter Interface Board, Microwave Modules Step Up Converter 15 V, 24 V, 40 V on Interface Board
- 12 V	9	F11 F12	Interface Board, Microwave Modules ALC DDS Unit, Frequency Synthesis, Down Converter
+ 6.5 V	13	F14	Interface Board, ALC DDS Unit, Frequency Synthesis, Down Converter
- 6.5 V	14	F15	Interface Board, ALC DDS Unit, Frequency Synthesis, Down Converter
+ 3.4 V	17, 18, 19	F17 F18	Interface Board, Microwave Modules Interface Board, ALC DDS Unit, Frequency Synthesis, Down
+ 8 V	21, 22, 23	F19 F20 F21	Interface Board, Microwave Modules Down Converter DMA Module

Test Points

The following test points are accessible via **SETUP** - Test Points.... .

Test Point		MIN [V]	MAX [V]	Fuse
000	Reference ground	-0.01	+0.01	
001	Temperature sensor	-0.10	+0.70	
002	+4 V reference voltage	+3.95	+4.15	
003	+1.2 V core Voltage (FPGA)	+1.15	+1.25	
004	-5 V supply voltage	-5.20	-4.80	
005	+15 V-step up converter	+14.5	+15.5	F5
006	+24 V-step up converter	+23.5	+25.5	F3
007	+40 V-step up converter	+38	+42	F4
008	V/GHz-output	0	22	
009	X-Axis-output	0	10	
010	Z-Axis-output	-10	+5.5	
011	+2.5 V-V_AUX-voltage (FPGA)	+2.40	+2.60	
013	Diagnosis DMA-Module	-10	+10	
014	Temperature sensor Filter Bank	-0.10	+0.70	

Check all DC voltages. The measured values of the temperature sensors have to be multiplied by 100 to get the temperature in °C.

Errors

Error	Action to perform
15 V voltage at test point 005 fails	➤ Check/replace fuse F5 on interface board. Check TMO Unit, Frequency Synthesis and Motherboard for short on the 15V line.
24 V voltage at test point 006 fails	➤ Check/replace fuse F3 on interface board. Check TMO Unit, Frequency Synthesis, Motherboard, Step attenuator, Microwave interface for short on the 24V-line
40 V voltage at test point 007 fails	➤ Check/replace fuse F4 on interface board. Check TMO Unit, Frequency Synthesis and Motherboard for short on the 12V/40V-line
Failure at test point 002, 003, 011	➤ Replace Interface board.

Troubleshooting – Frequency Synthesis (FSYN, A400)

The tests listed below ensure that an assumed error on the Frequency Synthesis module (FSYN) is not caused by a defective or incorrectly connected cable, incorrect adjustment or another module

Before troubleshooting on the Frequency Synthesis, measure the supply voltages on its connectors (X400, X401) and compare them to the values specified in the table. If one or more voltages are not of the required level, first check for a fault of the power supply or Interface board.

Supply Voltages

Pin	Min. Voltage/V	Max. Voltage/V
X401 A to D5	+23.9	+24.1
X400.A to D22	+11.4	+12.6
X400.A to D20	+6.3	+6.7
X400.A to D24	+5.0	+ 5.4
X400.A to D1	+3.3	+3.5
X400.A to D18	-6.7	-6.3
X400.A to B16	-12.6	-11.4

Input and Output Signals

Connector, system	Signal name	Frequency	Level	Signal flow
X409, QMA	REF100B	100 MHz	+4 ± 2 dBm	To Down Converter
X410, QMA	REF100A	100 MHz	+4 ± 2 dBm	To ALC/DDS Unit
X406, QMA	FPLL	750 to 1500 MHz	+3 ± 2 dBm	From DMA Module

Test Points

The following test points are accessible via **SETUP** - Test Points.... .

Test Point		MIN [V]	MAX [V]	
100	Reference ground	-0.05	+0.05	
101	Temperature sensor	-0.10	+0.70	
102	+2.5 V-supply voltage	+2.45	+2.55	
103	+5 V_A supply voltage	+4.95	+5.05	
104	+5 V_B-supply voltage	+4.95	+5.05	
105	+5 V_C-supply voltage	+4.35	+4.65	
106	+6 V_A-supply voltage	+5.93	+6.07	
107	+10 V_A-supply voltage	+9.92	+10.08	
108	-5 V-supply voltage	-5.10	-4.90	
109	(reserved)			
110	Reference voltage +8 V	+7.92	+8.08	
111	Reference voltage -8 V	-8.08	-7.92	
112	Tuning voltage to TCXO/OCXO	0	+8	

Check all DC voltages from test point 102 to 111. Replace the module if one or more voltages fail.
The measured values of the temperature sensor has to be multiplied by 100 to get the temperature in °C.

Error Messages

"Synthesis OCXO 10 MHz oven cold"	➤ If this message does not disappear after 10 minutes, OCXO is defective. Change the module.
"Synchronization error on external reference"	➤ Check for correct External Reference Frequency setting and corresponding input signal.
"Synthesis Reference PLL unlocked"	➤ If the input signal and frequency settings are correct and the error message is still displayed, change the module.

Internal Adjustment "Adjust Synthesis"

A comprehensive test of the module is to run the internal adjustment (**SETUP** - **Internal Adjustment Adjust Frequency Synthesis**). VCO bank, step frequency multiplier filters and TMO loop are adjusted in sequence.

Error during internal adjustment

Error	Action to perform
Internal adjustment "Adjust Synthesis" aborts at FSYN_CFL_VCO Adjustment .	➤ Replace the Frequency Synthesis module.
Internal adjustment "Adjust Synthesis" aborts at FSYN_SFM_FILTER Adjustment .	➤ Replace the Frequency Synthesis module.
Internal adjustment "Adjust Synthesis" aborts at FSYN_YTO Adjustment .	➤ Check adjustment of TMO Unit ➤ Check RF output of YIG oscillator (cable W821). If no signal is preset (3 to 11 GHz, > 10 dBm) change YIG-oscillator ➤ Check RF output of DMA module (cable W406) If no signal is preset (750 to 1500 MHz, > 0 dBm) change DMA module ➤ Replace the Frequency Synthesis module.

Troubleshooting – Reference Oscillator (OCXO, A575)

Before a Go/NoGo decision on the OCXO, measure the supply voltage at connector X575. If the voltage is out of tolerance, first look for bad cables and connections and check the 13.5 V-standby voltage of the power supply.

Supply Voltage

Pin	Min. voltage/V	Max. voltage/V
X575.1 X575.2	+13.2	+13.8

Input and Output Signals

Connector, system	Signal name	Frequency	Level	Signal flow
X576, SMP	REF10	10 MHz	+0 ± 2 dBm	To Frequency Synthesis

Test Points

The following test point is accessible via **SETUP** - Test Points.... .

Test Point		MIN [V]	MAX [V]	
019	+12 V supply voltage	+11.4	+12.6	

Measure the supply voltage at test point 019.

Errors

Error	Error correction
Internal reference frequency: Frequency error > $2 \cdot 10^{-6}$	➤ The frequency accuracy of the synthesizer is determined (set to internal reference) by a highly stable 10 MHz quartz oscillator that is set to a calibrated frequency standard at the R&S factory. This oscillator is subject to ageing and can usually be recalibrated; please contact your R&S representative. Note: The internal reference can be aligned by up to approx. $\pm 10^{-6}$ under the menu Setup - Reference Oscillator - Adjustment. This setting does not affect the factory adjustment and can be reset at any time by means of deactivation.
"Synthesis OCXO 10 MHz oven cold"	➤ If this message does not disappear after 10 minutes, OCXO is defective. Change the module.

Troubleshooting – ALC DDS Unit (ADU, A500)

The tests listed below ensure that an assumed error on the ALC DDS unit (ADU) is not caused by a defective or incorrectly connected cable, incorrect adjustment or another module

Before troubleshooting on the ADU, measure the supply voltages at connector X500 and compare them to the values specified in the table. If one or more voltages are not of the required level, first check for a fault of the power supply or Interface board.

Supply Voltages

Pin	Min. voltage/V	Max. voltage/V
X500.A to D22	+11.4	+12.6
X500.A to D20	+6.3	+6.7
X500.A to D24	+5	+5.4
X500.A to D1	+3.3	+3.5
X500.A to D18	-6.7	-6.3
X500.A to B16	-12.6	-11.4

Input and Output Signals

Connector, system	Signal name	Frequency	Level	Signal flow
X505, QMA	REF100A	100 MHz	+4 ± 2 dBm	From Frequency Synthesis

Test Points

The following test points are accessible via **SETUP** - Test Points.... .

Test Point		MIN [V]	MAX [V]	
200	Reference ground	-0.05	+0.05	
201	Temperature sensor	-0.10	+0.70	
202	+7.5 V reference voltage	+7.47	+7.52	
203	-5 V supply voltage	-5.10	-4.90	
204	-7.5 V reference voltage	-7.57	-7.43	
205	+2.4 V reference voltage	+1.92	+2.88	
206	+2.4 V reference voltage	+1.92	+2.88	
207	+1.5 V FPGA supply voltage	+1.45	+1.55	
208	+5 V_A supply voltage	+4.95	+5.05	
209	-5 V_A supply voltage	-5.05	-4.95	
229	+3.5 V supply voltage	+3.10	+3.60	
232	+11 V filtered supply voltage	+10.89	+11.11	
233	-11 V filtered supply voltage	-11.11	-10.89	
234	+5 V DDS supply voltage	+4.95	+5.05	
235	+5 V DDS supply voltage	-5.05	-4.95	
210	Clock signal ADC DAC	0.35	2.00	
222	Clock signal FPGA	0.04	1.00	

Check all DC voltages. Replace the module if one or more voltages fail.

The measured values of the temperature sensor has to be multiplied by 100 to get the temperature in °C.

Check the clock signals at test point 210 and 222.

Error Messages

Error message	Action to perform
Calibration data missing; Missing ...	➤ If this message appears, the internal adjustment (SETUP - Internal Adjustment - Adjust Level) must be executed.
Calibration failed; Level Offset (Dcon) ...failed	➤ Check Down Converter and ADU.
Calibration failed; Level Offset (DMA) ...failed Calibration failed; Level Offset (Doubler) ...	➤ Check Detector module and ADU.
Calibration failed; Level gain preamplifier adjustment failed	➤ Check connectors ADU to Motherboard and DCON to Motherboard. Check DCON, detector and ADU.
Calibration failed; Level preset adjustment failed	➤ Check DMA module, Filter module, Down converter, Detector, ADU
Calibration failed; Linearization data measurement failed	➤ Check DMA module, Frequency Doubler, and ADU
Output unleveled: Gain control on upper limit	➤ If this message appears, the level control (ALC) cannot set the desired output level. Check whether the error appears in the entire frequency range or only in certain bands. ➤ If the desired output level is below the specified maximum output level, look at the Flow Chart for further troubleshooting. ➤ If the error only appears in certain frequency bands below 1GHz, the Down Converter module is defective and must be replaced.

Troubleshooting – AM/FM/Scan Modulator (MOD, A520)

The tests listed below ensure that an assumed error on the AM/FM/Scan Modulator (MOD) is not caused by a defective or incorrectly connected cable, incorrect adjustment or another module.

Before troubleshooting on the MOD, measure the supply voltages at connector X500 of the ALC/DDS unit and compare them to the values specified in the table. If one or more voltages are not of the required level, first check for a fault of the power supply or Interface board.

Supply Voltages

Pin	Min. voltage/V	Max. voltage/V
X500.A to D22	+11.4	+12.6
X500.A to D20	+6.3	+6.7
X500.A to D24	+5.0	+5.4
X500.A to D1	+3.3	+3.5
X500.A to D18	-6.7	-6.3
X500.A to B16	-12.6	-11.4

Test Points

The following test points are accessible via **SETUP** - Test Points.....

Test Point		MIN [V]	MAX [V]	
250	Reference ground	-0.05	+0.05	
251	Temperature sensor	-0.10	+0.70	
252	-5 V supply voltage	-5.10	-4.90	
259	-2.4 V reference voltage EXT1-ADC	-2.88	-1.92	
260	-2.4 V reference voltage EXT2 ADC	-2.88	-1.92	

Check all DC voltages. Replace the module if one or more voltages fail.

The measured values of the temperature sensor has to be multiplied by 100 to get the temperature in °C.

Internal Adjustment "Adjust Modulation/LF Generator"

Errors in the internal LF generators are indicated by the internal adjustment procedure.

Important: During internal adjustment the LF output has to be left open!

Error message	Error correction
Missing LfGen adjustment data	➤ Execute internal adjustment "Adjust Modulation/LF Generator"
LfGen adjustment failed (disconnect load to calibrate)	➤ Be sure , that the LF output is left open. Execute internal adjustment "Adjust Modulation/LF Generator"
LfGen adjustment failed (internal hardware problems) LfGen adjustment failed (no convergence) ExtAna calibration failed	➤ Replace the module.

Troubleshooting – Down Converter (DCON, A450)

The tests listed below ensure that a supposed fault on the Down converter is not caused by a defective or incorrectly connected cable, incorrect adjustment or another module.

Before further troubleshooting on the Down Converter unit ensure that internal adjustments (**SETUP** - Internal Adjustment - Adjust Frequency Synthesis) work correctly.

Before a Go/NoGo decision on the DCON, measure the supply voltages at connector X450 and compare them to the values specified in the table. If one or more voltages are not of the required level, first check for a fault on the power supply or Interface board.

Supply Voltages

Pin	Min. voltage/V	Max. voltage/V
X450.A to D22	+11.4	+12.6
X450.A to D14	+7.76	+8.24
X450.A to D20	+6.3	+6.7
X450.A to D24	+5.0	+5.4
X450.A to D1	+3.3	+3.5
X450.A to D18	-6.7	-6.3
X450.A to B16	-12.6	-11.4

Input and Output Signals

Connector, system	Signal name	Frequency	Level	Signal flow
X453, QMA	REF100B	100 MHz	+4 ± 2 dBm	From Frequency Synthesis
X454, QMA	DCON_IN	375 MHz to 1875 MHz	+8 ± 2 dBm	From DMA Module
X455, QMA	DCON_OUT	10 MHz to 1000 MHz	19 to 25 dBm	To RF Switch (typ. maximum level).

Test Points

The following test points are accessible via **SETUP** - Test Points.... .

Test Point		MIN [V]	MAX [V]	
300	Reference ground	-0.05	+0.05	
301	Temperature sensor	-0.10	+0.75	
302	+11V supply voltage	+9.50	+11.00	
303	Supply voltage for Pulse modulator switch	-2.70	-2.30	
305	Driver stage	+7.20	+7.70	
307	Power amplifier	+10.3	+11.0	
317	-11V supply voltage	-11.3	-10.5	
322	Supply voltage for Pulse modulator switch	4.40	4.80	
323	Supply voltage for Pulse modulator switch	3.90	4.30	
309	500 MHz Reference	0.05	1.00	f < 375MHz

Check all DC voltages. Replace the module if one or more voltages fail. The measured values of the temperature sensor has to be multiplied by 100 to get the temperature in °C.

Error Messages

Error message	Action to perform
Output unlevelled: ALC	➤ If the error only appears in certain frequency bands below 1GHz, the Down Converter module is defective and must be replaced. ➤ Before removing the Down Converter module, you can also try new external level correction. If this does not work, the Down Converter module is definitely defective.
No RF level at frequencies below 375 MHz	➤ Check voltage at test point 309. Voltage too low: Check REF100B signal at X453.

Troubleshooting – DMA module (A800)

The tests listed below ensure that a supposed error in the DMA Module is not due to a defective or incorrectly connected cable, an incorrect adjustment, or another module.

The error causes described below relate exclusively to error symptoms occurring at frequencies above or equal 1 GHz. If errors occur at frequencies less than 1 GHz, follow the troubleshooting steps described under Troubleshooting – Down Converter.

Before proceeding with additional troubleshooting on the DMA module, ensure that the internal adjustments (**SETUP** – Internal Adjustment - Adjust Frequency Synthesis) can be completed without any errors. Measure the supply voltages at connector X800 and compare them to the values specified in the table. If one or more voltages are not of the required level, check first for a fault on the power supply or Interface board.

Supply Voltages

Pin	Min. voltage/V	Max. voltage/V
X800.1 X800.2	+11.4	+12.6
X800.3 to 6	+7.76	+8.24
X800.9 X800.10	-12.6	-11.4
X800.19	+3.3	+3.5
X800.16 to 18	+6.3	+6.7
X800.15	-6.7	-6.3

Input and Output Signals

Connector, system	Signal name	Frequency	Level	Signal flow
X801, SMA	FTMO	3 to 11 GHz	11 to 17	From YIG Oscillator
X802, K	ODMA_1	1 to 21 GHz	23 to 30 dBm	To Filter Bank (typ. maximum level).
X803, K	ODMA_2	10.5 to 20 GHz	17 to 21 dbm	To Doubler module (typ. maximum level).
X804, SMA	FPLL	750 to 1500 GHz	> 3 dBm	To Frequency Synthesis
X805, SMA	FDCON	375 to 1875 GHz	> 6 dBm	To Down Converter

Test Points

The following test points are accessible via **SETUP** - Test Points.... .

Test Point		MIN [V]	MAX [V]	
800	Reference ground	-0.05	+0.05	
801	Temperature sensor	-0.10	+0.75	
802	+5 V_A supply voltage	+4.80	+5.20	
803	-5 V_A supply voltage	-5.20	-4.80	
804	+11 V_ supply voltage	+10.0	+11.5	
805	-11 V_ supply voltage	-11.5	-10.0	
806	+5 V_ supply voltage	+4.80	+5.20	
807	+7.5 V supply voltage	+7.30	+7.70	
808	+9.6 V supply voltage	+9.40	+9.80	
809	Drain voltage #1	+6.50	+6.90	
810	Gate voltage #1	-1.20	-0.40	
811	Drain voltage #2	+6.90	+7.30	
812	Gate voltage #2	-1.20	-0.40	
813	Drain voltage #3	+7.10	+7.50	
814	Gate voltage #3	-1.20	-0.50	
815	Drain voltage #4	+7.40	+7.80	
817	Drain voltage PA	+8.90	+9.30	
818	Gate voltage PA	-4.10	-1.37	
819	Drain voltage PA	+4.30	+4.70	
820	Gate voltage PA	-1.50	-1.30	

Check all DC supply voltages, drain and gate voltages. Replace the module if one or more voltages fail. The measured values of the temperature sensor has to be multiplied by 100 to get the temperature in °C.

Troubleshooting – Filter (A780)

The tests listed below ensure that a supposed error in the Filter module is not due to a defective or incorrectly connected cable, an incorrect adjustment, or another module.

The error causes described below relate exclusively to error symptoms occurring in the frequency range 1 to 21 GHz. If errors occur at frequencies less than 1 GHz, follow the troubleshooting steps described under *Troubleshooting – Down Converter*. If errors occur at frequencies more than 21 GHz, follow the troubleshooting steps described under *Troubleshooting – Frequency Doubler*.

Before proceeding with additional troubleshooting on the Filter module, ensure that the internal adjustments (**SETUP** – **Internal Adjustment - Adjust Frequency Synthesis**) can be completed without any errors. Measure the supply voltages at connector X780 on the Interface board and compare them to the values specified in the table. If one or more voltages are not of the required level, check first for a fault on the power supply or Interface board.

Supply Voltages

Pin	Min. voltage/V	Max. voltage/V
X780.2 to 4	+11.4	+12.6
X780.5 to 8	+7.76	+8.24
X780.11,12	-12.6	-11.4
X780.21	+3.3	+3.5

Input and Output Signals

Connector, system	Signal name	Frequency	Level	Signal flow
X781, SMA	IFILT	1 to 21 GHz	22 to 30 dbm	From DMA Module (typ. maximum level).
X782, SMA	OFILT	1 to 21 GHz	18 to 25 dbm	To RF Switch (typ. maximum level).

Test Point

The following test point is accessible via **SETUP** - **Test Points....** .

Test Point		MIN [V]	MAX [V]
014	Temperature sensor	-0.10	+0.75

The measured value of the temperature sensor has to be multiplied by 100 to get the temperature in °C.

Bandswitch frequencies

Band #	Control Signals @ X780				Frequency Range
	Pin 20	Pin 19	Pin 18	Pin17	
1	L	L	L	H	1 to 1.5 GHz
2	L	L	H	L	1.5 to 2.2 GHz
3	L	L	H	H	2.2 to 3.0 GHz
4	L	H	L	L	3.0 to 4.2 GHz
5	L	H	L	H	4.2 to 6.0 GHz
6	L	H	H	L	6.0 to 8.4 GHz
7	L	H	H	H	8.4 to 12 GHz
8	H	L	L	L	12 to 16 GHz
9	H	L	L	H	16 to 21 GHz

Errors

Error	Action to perform
Maximum output level is too low in one or more of the frequency ranges listed in the table above.	• Measure the corresponding control signals at connector X780 on the interface board. • If the signals are correct, check cable W780. • If the cable is ok, change the Filter module.
Maximum output level is too low in the complete frequency range 1 to 21 GHz.	• Check modules in the following sequence: DMA module → Filter module → RF Switch.

Troubleshooting – Frequency Doubler (A740)

The tests listed below ensure that a supposed error in the Doubler module is not due to a defective or incorrectly connected cable, an incorrect adjustment, or another module.

The error causes described below relate exclusively to error symptoms occurring at frequencies above or equal 21 GHz. If errors occur at frequencies less than 21 GHz, follow the troubleshooting steps described under Troubleshooting – Down Converter and Troubleshooting – DMA Module.

Before proceeding with additional troubleshooting on the Frequency Doubler module, ensure that the internal adjustments (**SETUP** – Internal Adjustment - Adjust Frequency Synthesis) can be completed without any errors.

Supply Voltages

Measure the supply voltages at connector X740 on the Microwave Interface board:

Pin	Min. voltage/V	Max. voltage/V
X740.2 to 4	+11.4	+12.6
X740.5 to 8	+7.76	+8.24
X740.11,12	-12.6	-11.4
X740.21	+3.3	+3.5

Input and Output Signals

Connector, system	Signal name	Frequency	Level	Signal flow
X741, K	IDOUB	10.5 to 20 GHz	16 to 21 dbm	From DMA Module (typ. maximum level).
X742, K	ODOUB	21 to 40 GHz	18 to 23 dbm	To RF Switch (typ. maximum level).

Test Point

The following test point is accessible via **SETUP** - Test Points.... .

Test Point		MIN [V]	MAX [V]
017	Temperature sensor	-0.10	+0.75

The measured value of the temperature sensor has to be multiplied by 100 to get the temperature in °C.

Bandswitch frequencies

Band #	Control Signals @ connector X740		Frequency Range
	Pin 18	Pin 17	
1	L	L	21.0 to 27.2 GHz
2	L	H	27.2 to 36.8 GHz
3	H	L	36.8 to 40.0 GHz

Errors

Error	Corrective action
Maximum output level is too low in one or more of the frequency ranges listed in the table above.	• Measure the corresponding control signals at connector X740 on the interface board. • If the signals are correct, check cable W740. • If the cable is ok, change the Frequency Doubler module.
Maximum output level is too low in the complete frequency range 21 to 40 GHz.	• Check modules in the following sequence: DMA module → Frequency Doubler module → RF Switch.

Troubleshooting – RF Switch (A640)

The tests listed below ensure that a supposed error in the RF Switch Module is not due to a defective or incorrectly connected cable, an incorrect adjustment, or another module.

Before proceeding with additional troubleshooting on the DMA module, ensure that the internal adjustments (**SETUP** – **Internal Adjustment - Adjust Frequency Synthesis**) can be completed without any errors.

Supply Voltages

Measure the supply voltages at connector X640 on the Microwave Interface board:

Pin	Min. voltage/V	Max. voltage/V
X640.1	+11.4	+12.6
X640.4	-12.6	-11.4

Input and Output Signals

Connector, system	Signal name	Frequency	Level	Signal flow
X641, K	ISW_1	1 to 21 GHz	17 to 25 dbm	From Filter module (typ. maximum level).
X642, K	ISW_2	21 to 40 GHz	17 to 23 dbm	From Doubler module (typ. maximum level).
X643, K	ISW_3	10 MHz to 1 GHz	18 to 25 dbm	From Down Converter (typ. maximum level).
X644, K	OSW	10 MHz to 40 GHz	10 to 22 dbm	To Coupler/Detector (typ. maximum level).

Test Point

The following test point is accessible via **SETUP** - Test Points.... .

Test Point		MIN [V]	MAX [V]	
023	Temperature sensor	-0.10	+0.75	

The measured value of the temperature sensor has to be multiplied by 100 to get the temperature in °C.

Bandswitch frequencies

Band #	Control signals @ connector X640		Frequency Range
	Pin 6	Pin 2	
1	L	L	10 MHz to 1 GHz
2	H	L	1 GHz to 8.4 GHz
3	L	H	8.4 GHz to 21 GHz
4	H	H	21 GHz to 40 GHz

Errors

Error	Action to perform
Maximum output level is too low in one or only few of the frequency ranges listed in the table above.	- Measure the corresponding control signals at connector X640 on the Microwave Interface board A205. - If the signals are correct, check cable W640. - If the cable is ok, change the RF Switch module.
Maximum output level is too low in the complete frequency range 10 MHz to 40 GHz.	Check modules in the following sequence: Step Attenuator → RF Switch → DMA module.

Troubleshooting – Coupler/Detector (A720/A725)

The tests listed below ensure that a supposed error in the RF Switch Module is not due to a defective or incorrectly connected cable, an incorrect adjustment, or another module.

Before proceeding with additional troubleshooting on the DMA module, ensure that the internal adjustments (**SETUP** – Internal Adjustment - Adjust Frequency Synthesis) can be completed without any errors.

Supply Voltages

Measure the supply voltages at connector X725 on the Microwave Interface board:

Pin	Min. voltage/V	Max. voltage/V
X725.1	+11.4	+12.6
X725.2	+3.3	+3.5
X720.4	-12.6	-11.4

Input and Output Signals

Connector, system	Signal name	Frequency	Level	Signal flow
X721, K	ICPL	10 MHz to 40 GHz	10 to 22 dBm	From RF Switch (typ. maximum level).
X720, K	OCPL	10 MHz to 40 GHz	9 to 22 dBm	To Step Attenuator (typ. maximum level).
X727, K	RF_DET	10 MHz to 40 GHz	-11 to 11 dBm	From Coupler (typ. maximum level).
X728, SMA	REF_LVL2	15 MHz	> 20 dBm	From ALC/DDS Unit
X729, SMP	DET2_REF			To ALC/DDS Unit
X730, SMP	DET2			To ALC/DDS Unit

Test Point

The following test point is accessible via **SETUP** - Test Points.... .

Test Point		MIN [V]	MAX [V]	
018	Temperature sensor	-0.10	+0.75	

The measured value of the temperature sensor has to be multiplied by 100 to get the temperature in °C.

Troubleshooting – Step attenuator (A600)

Supply Voltages

Measure the supply voltage at connector X601 on the Microwave Interface board:

Pin	Min. voltage/V	Max. voltage/V
X601.6	+23.5	+25.5

Error	Error correction
Step attenuator does not switch	➤ Check the +24V supply voltage and the connection at connector X600/X601 on the Microwave Interface board. Supply voltage faulty: Check fuse F3 on the Interface board.
Some attenuator steps do not work	➤ Check the control signals at connector X600/X601 on the microwave interface board. Control signals ok: Replace the step attenuator. Control signals faulty: Replace the Microwave Interface board.
Attenuation out of tolerance	➤ Replace the step attenuator

Input and Output Signals

Connector, system	Signal name	Frequency	Level	Signal flow
X600	Logic signals	static	TTL	Control interface and power supply from Microwave Interface board
X601, K	RF_IN	10 MHz to 40 GHz	<30 dBm	RF Input (from directional coupler)
X602, K	RF_OUT	10 MHz to 40 GHz	<30 dBm	RF output (to N output connector of the R&S SMF100A)

Contents - Chapter 4 "Software Update/Installing Options"

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4 Software Update / Installing Options

This chapter contains information on firmware update, Linux operating system update and installing options to the R&S SMF100A. Additional manuals obtained together with a firmware update or with subsequently acquired options can be filed here.

The firmware/software update always consists of one file with a filename extension of “.trs”. The version numbers in the filename vary with each update. Since there are two possibilities for updating, the names of the files are significant. You will either update only the instrument’s firmware or you will update both the firmware and the operating system. Filenames starting with SMF_..... contain images for the instrument’s firmware only, while filenames starting with RESCUE_..... contain images for updating the firmware and the operating system.

CAUTION



Drivers and programs used in the instrument under Linux have been adapted to the signal generator. Existing software must only be modified with update software released by Rohde & Schwarz. Likewise, only programs authorized by Rohde & Schwarz for use on the instrument must be executed

Installation of New R&S SMF Firmware

Your R&S SMF100A is delivered with the latest firmware version available. Firmware updates as well as the Release Notes describing the improvements and modifications are provided on the Internet at the download site of the R&S SMF homepage (<http://www.rohde-schwarz.com>). This homepage always offers the latest information on your signal generator, e.g. also on **changes of the firmware update procedure**.

Firmware updates always are delivered in one single file with a filename starting with “SMF_” and ending in “.trs”. The version numbers in the filename vary with each update.

Note:

In addition, a file with ending “.iso” is provided. It contains a full image of the instrument firmware and operating system. It can be used e.g. to create a spare CompactFlash™ card (see following section).

Firmware update: SMF_x.xx.xx.trs

The installation of a new firmware version is performed via the USB interface. A deinstallation of the old firmware is not necessary.

The update file has to be downloaded from the Internet to a PC. From there the file should be transferred to a memory stick which will later be plugged into the USB interface of the instrument. The firmware update is performed during instrument’s boot sequence. The new firmware will be loaded right after the update process; a reboot of the instrument is not necessary.

If the instrument “sees” a memory stick at its USB interface during boot sequence, it offers all versions stored on the memory stick (*.trs files) for selection. Thus, an upgrade or downgrade of the firmware is possible at any time.

Installing the firmware

Note: *The update process can be cancelled at any time during the update process before step 5 (below).*

1. Switch off the instrument.
2. Plug in the memory stick which contains the update file(s) (previously downloaded from the Internet) to the USB interface of the instrument.
3. Switch on the instrument.
4. Wait until the selection menu for the available firmware version(s) appears.
5. Select the firmware version to be installed with the cursor up/down keys and press ENTER to activate your selection. A 'Yes/No' question will appear. When you selected 'Yes' the selected version will be installed.
6. At the first start of the new firmware check if an update of the PCI-FPGA is required. This is reported during the boot process. A PCI-FPGA update is started in the **Setup-System-Update** menu by pressing the **PCI-FPGA** button.

ATTENTION

To avoid impairment of instrument functions, the update of the PCI-FPGA must not be cancelled and the instrument must not be switched off during this update.

7. When the new/updated firmware is up and running, execute internal adjustments after a warm-up time of approx. 10 minutes.
 - Press the **SETUP** key on the instrument front panel, select **Internal Adjustments** and execute **Adjust All**.
This process updates internal instrument adjustments and can take several minutes. Adjustments requiring external measurement equipment are not affected by the firmware update and need not to be performed.

Using an Image for the Installation of New Linux Operating System and R&S SMF Firmware

A full image of the current firmware and operating system is provided on the Internet at the download site of the Rohde & Schwarz SMF homepage.

The image is delivered in one single file with a file ending ".iso". The version numbers in the filename vary with each update.

Required equipment

External USB CD ROM or DVD Drive.

Required software:

A Burn program that can burn ISO images onto CD/DVD. Examples: **Nero Burning, Win on CD**

Prepare CD Rom or DVD with full image of R&S SMF100A:

1. Download the image file from the Internet to a PC
2. Start Nero on your PC.
3. From the program menu, select **File -> Burn CD image**.
4. Specify file type "all files" (*.*)
5. Select the ISO image file to be burned (*.iso).
6. Confirm the checkbox indicating that Nero does not recognize the format of the image file.
7. When the dialog appears, set the parameters specified above.
8. Click "burn".

Install the new firmware on the CompactFlash™ card

1. Switch off the instrument
2. Connect an external USB CD or DVD drive to the R&S SMF100A.
3. Insert the CD Rom or DVD with full image into the external drive.
4. Switch on the instrument
The CD or DVD boots the instrument and automatically executes the installation steps (approx. 5 min). The program informs about the installation progress.
5. Wait until the installation is finished.
6. Remove external CD ROM/DVD drive.
7. Reboot the Instrument.
The new firmware is now loaded on the instrument.
8. Execute internal adjustments after a warm-up time of approx. 10 minutes.
 - Press the **SETUP** key on the instrument front panel, select **Internal Adjustments** and execute **Adjust All**.
This process updates internal instrument adjustments and will take several minutes. Adjustments requiring external measurement equipment are not affected by the firmware update and need not to be performed.

Installing the Options

A list of all available R&S SMF100A options is provided in the data sheet and on the internet (<http://www.rohde-schwarz.com>).

Hardware Options

Installation and replacement of hardware options is described in chapter 3 of this service manual. Please also note the mounting instructions enclosed with the options. These mounting instructions can be filed at this place in the service manual and are thus easily available whenever they are required.

CAUTION



Danger of shock hazard

Disconnect the instrument from the mains before opening the casing. Also note the safety instructions at the beginning of this manual.

ATTENTION



Risk of damage to the instrument

The components used in the instrument are sensitive to electrostatic discharges which is why they are to be dealt with according to the ESD regulations.

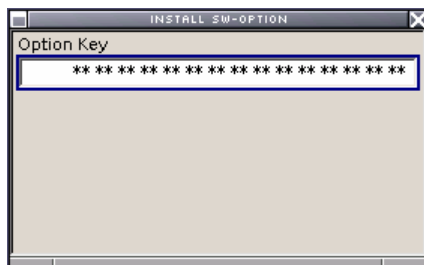
The **[SETUP] Installed Options** menu provides information on the already installed options.

Software Options

All available software options are already included in the latest firmware. They are ready to operate after they are enabled by means of a key code supplied with the option.

Only if the R&S SMF100A is equipped with an older firmware version, a firmware update prior to enabling the software option may be required. The information on the valid firmware versions for the purchased software option is provided together with the option.

The key code is to be entered into the **[SETUP] Install SW Option** menu.



The **[SETUP] Installed Options** menu provides information on the already installed options

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5 Documents

This chapter provides information on the ordering of spare parts and contains the spare part list and the documents for the complete R&S SMF100A unit.

Spare Parts

The stock numbers necessary for ordering replacement parts and modules can be found in the component lists further down.

DANGER**Danger of shock hazard**

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

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

ATTENTION**Risk of damage to the module**

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

Available Power Cables

Table 5-1 List of power cables available

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)



Spare Parts List

Mechanical Drawings

Pos.-Nr. ItemNo	Menge Quantity	ME Unit	El.Kennz Ref.Des.	Benennung / Bezeichnung Designation	Z	Sachnummer Stock No.	Ersatzteil Subst.part	BA	VH
10	0	S		ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG *EXPLANATION OF MODELS VAR02=GRUNDVARIANTE MOD02=BASIC MODEL PB BEMERKUNG NOTE Die Montage der Optionen SMF -B1, SMF-B2, SMF-B26, SMF-B31, SMF-B81, SMF-B83, SMF-B84, SMF-B85 und SMF- B122 ist in der jew. zugeh. Optionszeichnung dargestellt. The mounting instruction of the options SMF-B1, SMF-B2, SMF-B26, SMF-B31, SMF-B81, SMF-B83, SMF-B84, SMF-B85 and SMF-B122 has show on the respective option drawings		0999.9610.00		B	O
20	0	S		PB ERSATZTEILLISTE VORHANDEN SPARE PARTS LIST AVAILABLE ZS ERSATZTEILLISTE VORHANDEN SPARE PARTS LIST AVAILABLE Sachnr./Part No. 1167.0039.01		0999.9684.00		M	O
200	1	S		ZM CHASSIS CHASSIS	Z	1167.0174.02		M	O
250	1	S	A100	ZM FRONTEINHEIT SMF FRONT PANEL UNIT SMF	Z	1167.0500.02		M	
260	6	S		VS 965/ISR-M2.5X6-A4-PA 965/ISR-M2.5X6-A4-PA		1148.3288.00		B	T
300	1	S	A900	ZE POWER SUPPLY UNIT POWER SUPPLY UNIT	Z	1167.0416.02		M	
310	6	S		VS 7985/ISR-M4X6-A4-PA SCREW		1148.2646.00		B	T
315	1	S		DZ FLBDK.HALTER 14/13 DZ FLAT CABLE HOLDER		0254.2055.00		B	O
320	1	S		MZ STUEZWINKEL HOLDER	Z	1167.1887.00		M	
330	2	S		VS 7985/ISR-M2.5X6-A4-PA SCREW		1143.5630.00		B	T
340	1	S		KR RUECKWANDBLENDE (BEDR.) REAR PLATE	Z	1167.0380.00		M	
350	2	S		VS 6900/ISR-M2.5X8-A2 COMBINATION SCREWS		0041.1653.00		B	T
400	1	S	A400	EE FREQUENCY SYNTHESIS FREQUENCY SYNTHESIS	Z	1167.0800.02	X	M	
500	1	S	A500	EE ALC/DDS UNIT ALC/DDS UNIT	Z	1167.1006.02		M	
600	1	S	A200	ED INTERFACE BOARD INTERFACE BOARD	Z	1167.1206.02	X	M	
610	14	S		VS 6900/ISR-M2.5X6-A2 COMBINATION SCREWS		1148.3059.00		B	T
611	6	S		VS 6900/ISR-M2.5X8-A2 COMBINATION SCREWS		0041.1653.00		B	T
615	1	S	E1	EV 119X119X25 47L/S 12V FAN 119X119X25		3584.1607.00	X	B	O



ROHDE & SCHWARZ

Benennung/Designation

SMF100A SIGNALGENERATOR
SMF100A SIGNAL GENERATOR

Sprach./Lang
de en

Ä.I. / C.I
12.00

Blatt/Sheet
1 of 5

Dokument Nr. / Document No.

1167.0000.01 ST

SMF

Datum/
Date

2007-07-09

Abt. /
Dept.

1GPK

Name /
Name

DR

Pos.-Nr. ItemNo	Menge Quantity	ME Unit	El.Kennz Ref.Des.	Benennung / Bezeichnung Designation	Z	Sachnummer Stock No.	Ersatzteil Subst.part	BA	VH
616	4	S		EV GUMMISTIFT F. LUE.BEF. RUBBER PIN		1146.2161.00		B	T
620	2	S		MZ EINSCHUBBLENDE INSERTION COVER PLATE	Z	1167.0497.00		M	
630	8	S		VS 965/ISR-M2.5X4-A4-PA 965/ISR-M2.5X4-A4-PA		1148.3271.00		B	T
650	1	S	A205	ED MW-INTERFACE MW-INTERFACE	Z	1167.1135.02	X	M	
655	1	S	W200	DY KABEL W200 CABLE W200	Z	1167.3021.00		M	
660	6	S		VS 6900/ISR-M2.5X6-A2 COMBINATION SCREWS		1148.3059.00		B	T
700	1	S	A300	EE MOTHERBOARD MOTHERBOARD	Z	1167.1606.02	X	M	
701	10	S		VS 6900/ISR-M2.5X6-A2 COMBINATION SCREWS		1148.3059.00		B	T
705	10	S		FJ BU/BU SMP FUER 10MM ADAPTOR		1093.6869.00		B	T
730	1	S	A250	GR LPC6/1L+ CONTROLLER LPC6/1L+		1091.3127.00	X	B	A
735	6	S		VS 7985/ISR-M2.5X25-A4-PA 7985/ISR-M2.5X25-A4-PA		2084.8000.00		B	T
736	6	S		VS DIN125-A2.7-A4 WASHER DIN125		0082.4663.00		B	V
740	1	S	A251	GP COMPACTFLASH 256MB TOSHIBA 256MB COMPACT FLASH CARD		2095.8788.00	X	B	V
800	1	S	A160	ED BNC BOARD BNC BOARD	Z	1167.1270.02	X	M	
810	1	S		KR RUECKWANDSTECKERBLECH (BEDR.) REAR PLATE	Z	1167.1964.00		M	
820	8	S		VS 6900/ISR-M2.5X8-A2 COMBINATION SCREWS		0041.1653.00		B	T
830	6	S		MP ABDECKK. RD11.1/9.9 COVER		0009.9217.00		B	T
840	2	S		MP ABDECKKAPPE RD6.4 COVER		0009.9181.00		B	T
1000	1	S	W215	DG PATCHKABEL KAT6. 0.5M PATCHCABLE CAT.6. 0.5M		0041.9283.00		B	T
1005	1	S	X215	FT EINBAUADAPTER 8P.GER 2XRJ45 COUPLER JACK STRAIGHT		1093.9122.00		B	O
1006	2	S		MZ SILIKONSCHNUR RD4X8MM SILICONE CORD RD4X8MM		1130.0164.00		M	
1070	1	S	W127	DF KABEL 4X2 U.SCHIRM 630 CABLE 4X2 W. SHIELD 630MM		1145.5115.00		B	O
1080	1	S	W125	DY KABEL W125 CABLE W125	Z	1167.2931.00		M	
1100	1	S	W725	DY KABEL W725 CABLE W725	Z	1167.3650.00		M	
1110	1	S	W800	DY KABEL W800 CABLE W800	Z	1167.3767.00		M	



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1120	1	S	W410	DV KABEL W410 CABLE W410	Z	1167.3209.00		M	
1130	1	S	W411	DV KABEL W411 CABLE W411	Z	1167.3180.00		M	O
1150	1	S	W310	DV KABEL W310 CABLE W310	Z	1167.3044.00		M	O
1160	1	S	W311	DV KABEL W311 CABLE W311	Z	1167.3050.00		M	O
1170	1	S	W507	DV KABEL W507 CABLE W507	Z	1167.3273.00		M	O
1210	1	S	W406	DV KABEL W406 CABLE W406	Z	1167.3138.00		M	
1230	1	S	W313	DV KABEL W313 CABLE W313	Z	1167.3109.00		M	O
1240	1	S	W407	DV KABEL W407 CABLE W407	Z	1167.3144.00		M	O
1250	1	S	W408	DV KABEL W408 CABLE W408	Z	1167.3150.00		M	O
1255	1	S	W513	DV KABEL W513 CABLE W513	Z	1167.3315.00		M	
1260	1	S	W511	DV KABEL W511 CABLE W511	Z	1167.3321.00		M	
1265	1	S	W821	DV KABEL W821 CABLE W821	Z	1167.3838.00		M	
1270	1	S	W456	DV KABEL W456 CABLE W456	Z	1167.3309.00		M	
1275	1	S	W508	DV KABEL W508 CABLE W508	Z	1167.3280.00		M	O
1280	1	S	W405	DV KABEL W405 CABLE W405	Z	1167.3121.00		M	O
1285	1	S	W412	DV KABEL W412 CABLE W412	Z	1167.3196.00		M	O
1290	1	S		MZ ADAPTERHALTEWINKEL HOLDER	Z	1167.1170.00		M	
1291	1	S		FJ HF-D.FLANSCH 28X28X0.8		1104.1644.00		B	O
1295	7	S		VS 965/ISR-M2.5X5-A4-PA SCREW		1148.2752.00		B	T
1300	1	S	S900	FN GERAETESTECKER MODUL POWER ENTRY MODUL		1160.2988.00		B	O
1305	1	S		FN SCHUBLADE EXTRA SAFE FUSE DRAWER EXTRA SAFE		1160.2994.00		B	O
1310	2	S	F1 F2	SS SCHMELZS.T4H IEC60127-2/V TIME LAG FUSE T4H		0020.7600.00		B	O
1330	1	S	W912	DX KABEL W912 GN/GE CABLE W912	Z	1167.3915.00		M	
1340	1	S	W913	DX KABEL W913 GN/GE CABLE W913	Z	1167.3921.00		M	
1350	1	S	W910	DX KABEL W910 BL CABLE W910	Z	1167.3896.00		M	
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Pos.-Nr. Item No.	Menge Quantity	ME Unit	El.Kennz Ref.Des.	Benennung / Bezeichnung Designation	Z	Sachnummer Stock No.	Ersatzteil Subst.part	BA	VH
1360	1	S	W911	DX KABEL W911 SW CABLE W911	Z	1167.3909.00		M	
1700	1	S	A780	ZE SWITCHED FILTER 22 SWITCHED FILTER 22	Z	1301.6001.02		M	
1701	4	S		VS 7985/ISR-M2.5X25-A4-PA 7985/ISR-M2.5X25-A4-PA		2084.8000.00		B	T
1702	1	S		MZ DOUBLER BLECH DOUBLER METAL SHEET	Z	1167.1941.00		M	
1703	4	S		VS 6900/ISR-M2.5X6-A2 COMBINATION SCREWS		1148.3059.00		B	T
1705	1	S	W780	DY KABEL W780 CABLE W780	Z	1167.3715.00		M	
1706	1	S		MZ STUEZWINKEL FÜR FESTMANTELKABEL CABLE CARRIER	Z	1167.1812.00		M	
1710	1	S	W802	DW HF Kabel W802 RF Cable W802	Z	1167.3750.00		M	
1720	1	S	A820	ZM TMO UNIT TMO UNIT	Z	1167.1987.02		M	
1730	4	S		VS 6900/ISR-M2.5X8-A2 COMBINATION SCREWS		0041.1653.00		B	T
1810	1	S	A725	ZE DETECTOR 44 GHZ DETECTOR 44 GHZ	Z	1167.0339.02		M	
1820	4	S		VS HVC/ISR-M2.5X16-A2 COMBINATION SCREWS		0048.8218.00		B	O
1850	1	S	A800	ZE DMA MODUL UNIT DMA MODUL UNIT	Z	1167.2502.02	X	M	
1860	4	S		VS DIN7985-M2.5X30-A4 SCREW		0455.5966.00		B	V
1980	1	S		MZ BGR DECKEL MODULE HOOD	Z	1167.0274.00		M	O
1990	3	S		VS 965/ISR-M2.5X4-A4-PA 965/ISR-M2.5X4-A4-PA		1148.3271.00		B	T
2000	1	S		KR FRONTHAUBE SMF BEDR FRONT COVER SMF	Z	1167.0700.00		M	O
2010	1	S		KR BW2-TUBUS 3E1/1T550 SMF -	Z	1167.0100.00		M	
2020	2	S		KR BW2-FRONTGRIFF 3E FRONT HANDLE		1096.1474.00		B	O
2030	4	S		VS SCHR. M4X14-ISR-PA SCREW M4X14-ISR-PA		1096.4896.00		B	T
2040	4	S		KR BW2-GERAETEFUSS FOOT		1096.2506.00		B	O
2050	2	S		KR BW2-AUFSTELLFUSS FOOT		1096.2529.00		B	O
2060	1	S		KR BW2-TRAGEGR.SEITL.T550 HANDLE	Z	1096.2687.00		M	T
2070	2	S		OS EGB-SCHILD 12X28 WARNING LABEL FOR ESDS		0061.1520.00		M	O
2100	4	S		KR BW2-RUECKKWANDFUSS REAR WALL FOOT		1096.2487.00		B	O



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				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG *EXPLANATION OF MODELS VAR02=GRUNDVARIANTE MOD02=BASIC MODEL						
20	1	S		MZ HALTEBLECH HOLDER	Z	1167.0216.00		M	O	
30	1	S	W823	DY KABEL W823 CABEL W823	Z	1167.2025.00		M	O	
40	1	S	A821	ED TMO CONTROL UNIT TMO CONTROL UNIT	Z	1167.1993.02		M	M	
45	5	S		VS 6900/ISR-M2.5X6-A2 COMBINATION SCREWS		1148.3059.00		B	T	
46	1	S		VS 6900/ISR-M2.5X8-A2 COMBINATION SCREWS		0041.1653.00		B	T	
60	4	S		VS ZYL6-32UNCX 1/4ZOLL A2 SCREW		0531.6605.00		B	V	
100	.3	S	A822	ED TMO ADAPTER TMO ADAPTER	Z	1167.2054.02		M		
110	.7	S	A822	ZE YIG OSZI. 3-11 GHZ YIG OSZI. 3-11 GHZ ab 2Q/2008 bevorzugt verwenden, wenn Funktion zuverlaessig.	Z	1306.6000.02		M		
 ROHDE&SCHWARZ			Benennung/Designation TMO UNIT TMO UNIT			Sprach./Lang de en		Ä.I. / C.I 06.00	Blatt/Sheet 1 of 1	
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				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG *EXPLANATION OF MODELS VAR02=GRUNDVARIANTE MOD02=BASIC MODEL					
20	1	S		MZ NETZTEILBLECH POWER SUPPLY PANEL	Z	1167.0222.00		M	
30	1	S		MZ NETZTEIL SCHIRM. OBEN SCREENING OFF TOP	Z	1167.0439.00		M	O
40	1	S		MZ NETZTEIL SCHIRM. UNTEN SCREENING OFF BOTTOM	Z	1167.0422.00		M	O
50	1	S	E2	DX LUEFTER 80X80X25 MIT KABEL BLOWER 80X80X25 WITH CABLE	Z	1167.0922.00	X	M	
60	4	S		EV GUMMISTIFT F. LUE.BEF. RUBBER PIN		1146.2161.00		B	T
70	1	S	A910	ZE NETZTEIL + KABEL POWER SUPPLY + CABLE	Z	1167.2031.00	X	M	
80	1	S	W903	DY DY KABEL W903 DY CABLE W903	Z	1167.3873.00		M	
90	4	S		VS 7985/ISR-M4X6-A4-PA SCREW		1148.2646.00		B	T
 ROHDE & SCHWARZ			Benennung/Designation POWER SUPPLY UNIT POWER SUPPLY UNIT			Sprach./Lang de en	Ä.I. / C.I 07.00	Blatt/Sheet 1 of 1	
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				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLÄRUNG *EXPLANATION OF MODELS VAR02=GRUNDVARIANTE MOD02=BASIC MODEL																			
20	1	S	A575	ED OCXO REF. OSCILLATOR OCXO REF. OSCILLATOR	Z	1167.9188.02		M															
40	1	S		MZ HALTEWINKEL FUER OCXO HOLDER	Z	1167.0445.00		M	O														
50	4	S		EV GUMMISTIFT F. LUE.BEF. RUBBER PIN		1146.2161.00		B	T														
60	2	S		VS 6900/ISR-M2.5X6- A2 COMBINATION SCREWS		1148.3059.00		B	T														
70	1	S	W575	DY KABEL W575 CABLE W575	Z	1167.3450.00		M															
<table> <tr> <td colspan="3" rowspan="2">  ROHDE&SCHWARZ </td><td colspan="3" rowspan="2"> Benennung / <i>Designation</i> SMF-B1 REFERENZOSZILLATOR SMF-B1 REFERENCE OSCILLATOR </td><td colspan="2"> Sprach. / <i>Lang</i> de en </td><td> Ä.I. / <i>C. /</i> 03.00 </td><td> Blatt / <i>Sheet</i> 1 of 1 </td></tr> <tr> <td colspan="4"> Dokument Nr. / <i>Document No.</i> 1167.9159.01 ST </td></tr> </table>										 ROHDE&SCHWARZ			Benennung / <i>Designation</i> SMF-B1 REFERENZOSZILLATOR SMF-B1 REFERENCE OSCILLATOR			Sprach. / <i>Lang</i> de en		Ä.I. / <i>C. /</i> 03.00	Blatt / <i>Sheet</i> 1 of 1	Dokument Nr. / <i>Document No.</i> 1167.9159.01 ST			
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Pos.-Nr. ItemNo	Menge Quantity	ME Unit	El.Kennz Ref.Des.	Benennung / Bezeichnung Designation	Z	Sachnummer Stock No.	Ersatzteil Subst.part	BA	VH
				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG *EXPLANATION OF MODELS VAR02=GRUNDVARIANTE MOD02=BASIC MODEL					
20	1	S	A450	EE DOWN CONVERTER DOWN CONVERTER	Z	1167.4105.02		M	M
100	1	S	W454	DV KABEL W454 CABLE W454	Z	1167.3215.00		M	
110	1	S	W409	DV KABEL W409 CABLE W409	Z	1167.3167.00		M	
120	1	S	W455	DV KABEL W455 CABLE W455	Z	1167.3221.00		M	
130	1	S	A640	ZE SCHALTER DC-44 SWITCH DC-44	Z	1301.7008.02		M	
140	1	S		OS EINLEGESCHILD 100KHZ...22GHZ	Z	1167.1787.00		M	
150	1	S		OS EINLEGESCHILD 100KHZ...44GHZ	Z	1167.1793.00		M	
160	1	S	W783	DW HF HF-KABEL W783 RF CABLE W783	Z	1167.3744.00		M	
170	1	S	W644	DW HF-KABEL W644 RF CABLE W644	Z	1167.3521.00		M	
180	1	S		DY KABEL W640 CABLE W640	Z	1167.3496.00		M	



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Pos.-Nr. ItemNo	Menge Quantity	ME Unit	El.Kennz Ref.Des.	Benennung / Bezeichnung Designation	Z	Sachnummer Stock No.	Ersatzteil Subst.part	BA	VH
				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG *EXPLANATION OF MODELS VAR02=GRUNDVARIANTE MOD02=BASIC MODEL					
100	1	S	W720	DW HF Kabel W720 44 GHZ RF Cable W720 44 GHZ	Z	1167.5847.00		M	
110	1	S	W100	DW HF Kabel W100 44GHZ RF Cable W100 44GHZ	Z	1167.2960.00		M	
120	1	S		MZ BODENPLATTE EICHLEIT. ATTENUATOR PANEL	Z	1167.4657.00		M	O
130	1	S		ZE EICHLEITUNG SMF 110DB ATTENUATOR SMF 110DB	Z	1046.5101.04		M	
140	2	S		VS 7985/ISR-M3X6-A4-PA SCREW		1148.2630.00		B	O

Pos.-Nr. ItemNo	Menge Quantity	ME Unit	El.Kennz Ref.Des.	Benennung / Bezeichnung Designation	Z	Sachnummer Stock No.	Ersatzteil Subst.part	BA	VH
				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG *EXPLANATION OF MODELS VAR02=GRUNDVARIANTE MOD02=BASIC MODEL					
20	1	S	A760	ZM HIGH POWER AMP. 22 HIGH POWER AMP. 22	Z	1301.4009.02		M	
40	4	S		VS HVC/ISR-M2.5X12-A2 COMBINATION SCREWS		1096.5205.00		B	O
100	1	S	W760	DY KABEL W760 CABLE W760	Z	1167.3673.00		M	
110	1	S	W784	DW HF KABEL W784 RF CABLE W784	Z	1167.3967.00		M	
120	1	S	W762	DW HF-KABEL W762 RF CABLE W762	Z	1167.3696.00		M	
130	1	S	W763	DW HF KABEL W763 RF CABLE W763 Only SMF-B2 or SMF-B144 fitted	Z	1167.3709.00		M	
140	4	S		VS 6900/ISR-M2.5X8-A2 COMBINATION SCREWS		0041.1653.00		B	T





Pos.-Nr. <i>ItemNo</i>	Menge <i>Quantity</i>	ME <i>Unit</i>	El.Kennz <i>Ref.Des.</i>	Benennung / Bezeichnung <i>Designation</i>	Z	Sachnummer <i>Stock No.</i>	Ersatzteil <i>Subst.part</i>	BA	VH
10	0	S	A170	ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLÄRUNG *EXPLANATION OF MODELS VAR02=GRUNDVARIANTE MOD02=BASIC MODEL PB BEMERKUNG NOTE Pos. 50 entfällt bei werkseitigem Einbau Item 50 missing because already assembled in factory		0999.9610.00		B	O
20	1	S		ED IEC-BUS IEC-BUS	Z	1167.6437.02		M	
40	1	S		VS 965/ISR-M2.5X4-A4-PA 965/ISR-M2.5X4-A4-PA		1148.3271.00		B	T
50	1	S		PD MONTAGEANWEISUNG SMF-B83 MOUNTING INSTRUCTION SMF-B83		1167.6420.00		M	
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Pos.-Nr. ItemNo	Menge Quantity	ME Unit	El.Kennz Ref.Des.	Benennung / Bezeichnung Designation	Z	Sachnummer Stock No.	Ersatzteil Subst.part	BA	VH	
10	0	S	A190	ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG *EXPLANATION OF MODELS VAR02=GRUNDVARIANTE MOD02=BASIC MODEL PB BEMERKUNG NOTE Pos 160 entfällt bei werkseitigem Einbau Item 160 missing because already assembled in factory		0999.9610.00		B	O	
20	1	S		EE FLASH CARD BOARD FLASH CARD BOARD	Z	1167.6843.02		M	M	
30	1	S		MZ BLENDEHALTER CF HOLDER CF	Z	1167.6872.00		M		
40	2	S		VS 7985/ISR-M2.5X8-A4-PA 7985/ISR-M2.5X8-A4-PA		1148.2730.00		B	T	
50	1	S		KB BLENDE CF BEDRUCKT PANEL CF PRINTED	Z	1167.6920.00		M		
60	2	S		VS 965/ISR-M2.5X4-A4-PA 965/ISR-M2.5X4-A4-PA		1148.3271.00		B	T	
70	1	S		MZ Klappe CF + SCHRAUBE LID CF + SCREW	Z	1167.6914.00		M		
100	1	S		EE CF ADAPTER AN LPC CF ADAPTER TO LPC	Z	1405.2101.02		M	O	
110	1	S		KM LP-FUEHRUNG GUIDE RAIL F_CIRC BOAR	Z	1405.2176.00		B	O	
120	2	S		VS 6900/ISR-M2.5X5-A2 COMBINATION SCREWS		0041.1630.00		B	T	
130	1	S	W190	ZN SICHERUNGSBUEGEL F. CF-BOARD PANEL FOR CF BOARD	Z	1405.2318.00		M		
140	1	S		DY CABLE FLASH-CARD CABLE FLASH-CARD	Z	1167.2919.00		M		
150	.06	M		WT KTSCH.PROF PE NATUR KTSCH.PROF PE NATUR		0001.9447.00		B	O	
160	1	S		PB MONTAGEANWEISUNG SMF-B85 MOUNTING INSTRUCTION SMF-B85		1167.6814.00		M		
ROHDE&SCHWARZ			Benennung/Designation SMF-B85 REMOVABLE-FLASH-CARD SMF-B85 REMOVABLE FLASH CARD			Sprach./Lang de en		Ä.I. / C.I 06.00	Blatt/Sheet 1 of 1	
SMF-B85			Datum/ Date	2007-05-23	Abt. / Dept.	1GPK	Name / Name	MS	Dokument Nr. / Document No. 1167.6808.01 ST	

Pos.-Nr. ItemNo	Menge Quantity	ME Unit	El.Kennz Ref.Des.	Benennung / Bezeichnung Designation	Z	Sachnummer Stock No.	Ersatzteil Subst.part	BA	VH
				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG *EXPLANATION OF MODELS VAR02=GRUNDVARIANTE MOD02=BASIC MODEL					
30	1	S	A720	ER RICHTKOPPLER 1-22GHZ DIRECTIONAL COUPLER		1167.8869.00		B	O
35	2	S		VS DIN137-A3-A2 WAVE SPRING WASHER DIN 137-A3		0005.0296.00		B	V
40	2	S		VS ZYL4-40UNCX 1/4ZOLL A1 SCREW		0275.5830.00		B	B
100	1	S	X1A	FJ TESTPORT GEH.ADAPTER ADAPTOR		1021.0493.00		B	O
110	1	S	X1B	FJ TESTPORT-ADAPT.F.PC3.5 ADAPTER RPC-3.5 FEMALE		1021.0512.00		B	O
120	1	S		OS EINLEGESCHILD 1 GHZ...22GHZ LABEL 1 GHZ...22GHZ	Z	1167.1764.00		M	
130	1	S	W101	DW HF KABEL W101 RF CABLE W101	Z	1167.2977.00		M	
140	1	S	W782	DW HF Kabel W782 RF Cable W782	Z	1167.3738.00		M	


ROHM

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Pos.-Nr. <i>ItemNo</i>	Menge <i>Quantity</i>	ME <i>Unit</i>	El.Kennz <i>Ref.Des.</i>	Benennung / Bezeichnung <i>Designation</i>	Z	Sachnummer <i>Stock No.</i>	Ersatzteil <i>Subst.part</i>	BA	VH
330	1	S		ZB ZUBEHOER SMF-B144 ACCESSORY SMF-B144	Z	1167.7227.00		M	
 ROHDE&SCHWARZ				Benennung/ <i>Designation</i> SMF-B144 1 GHZ BIS 43.5 GHZ SMF-B144 1 GHZ TO 43.5 GHZ		Sprach./ <i>Lang</i> de en	Ä.I. / <i>C./</i> 09.00	Blatt/ <i>Sheet</i> 2 of 2	
SMF-B144		Datum/ <i>Date</i>	2007-10-12	Abt. / <i>Dept.</i>	1GPK	Name / <i>Name</i>	DR	Dokument Nr. / <i>Document No.</i> 1167.7204.01 ST	

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Projektions-
methode
Projection
Method

Montage Reihenfolge:
mounting order:

1. Pos. 600 Interface Board
2. Pos. 700 Mother Board
3. Pos. 300 Power Supply Unit
4. Pos. 800 BNC Board
5. Pos. 615 Lüfter / FAN
6. Pos. 1810 Detector und *) Richtkoppler zusammenschrauben vor dem Einbau
Detector and directional coupler screw together before mounting
7. Pos. 320 Stuetzwinkel /holder
8. Pos. 1290 Adapterwinkel /holder
9. beliebig /in any order

Die Nummern der Teile entsprechen der jeweiligen
Position in der Stueckliste 1167.0000.01

The parts/items mentioned in this drawing are included
in the corresponding parts list 1167.0000.01

ARIANTENERKLAERUNG
EXPLANATION OF MODELS

VAR02 = GRUNDVARIANTE
MOD02 = BASIC MODEL

Modell Type	Seiten- Zahl Designation	Werkstoff Material	Sprache / Lang. Lang. / C.I.	Blatt / 26
ROHDE&SCHWARZ	SMF100A SIGNAL GENERATOR		de en	04.00 1
SMF	2006-06-24	16PK	ms/sr	1167.0000.01 D

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Projektions-
methode
Projection
Method

Die Nummern der Teile entsprechen der jeweiligen
Position in der Stückliste 1167.0000.01

The parts / items mentioned in this drawing are included
in the corresponding parts list 1167.6608.01

*) enthalten in
SMF-B122
1167.7004.02

included in
SMF-B122
1167.7004.02

*) enthalten in
SMF-B122
1167.7004.02

included in
SMF-B122
1167.7004.02

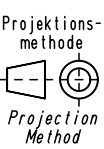
Modell Type	Bezeichnung Designation	Werkstoff Material	Sprache / Lang. Lang. / C.I.	Blatt / Stk. Sheet / Pcs.
ROHDE&SCHWARZ	SMF100A SIGNAL GENERATOR		de en	04.00 2
SMF	2006-06-24	16PK	ms/sr	1167.0000.01 D

VARIANTENERKLÄRUNG
EXPLANATION OF MODELS

VAR02 = GRUNDVARIANTE
MOD02 = BASIC MODEL

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Die Nummern der Teile entsprechen der jeweiligen
Position in der Stückliste 1167.0000.01

The parts / items in this drawing are included
in the corresponding parts list 1167.0000.01

VARIANTENERKLÄRUNG
EXPLANATION OF MODELS
VAR02 = GRUNDVARIANTE
MOD02 = BASIC MODEL

Modell Scale	Zeichn. Part	Werkstoff Material	Sprache / Lang. Lang. / C.I.	Blatt / 26
ROHDE&SCHWARZ	SMF100A SIGNAL GENERATOR		de en 05.00	3
SMF	2006-08-05	16PK	1167.0000.01	D

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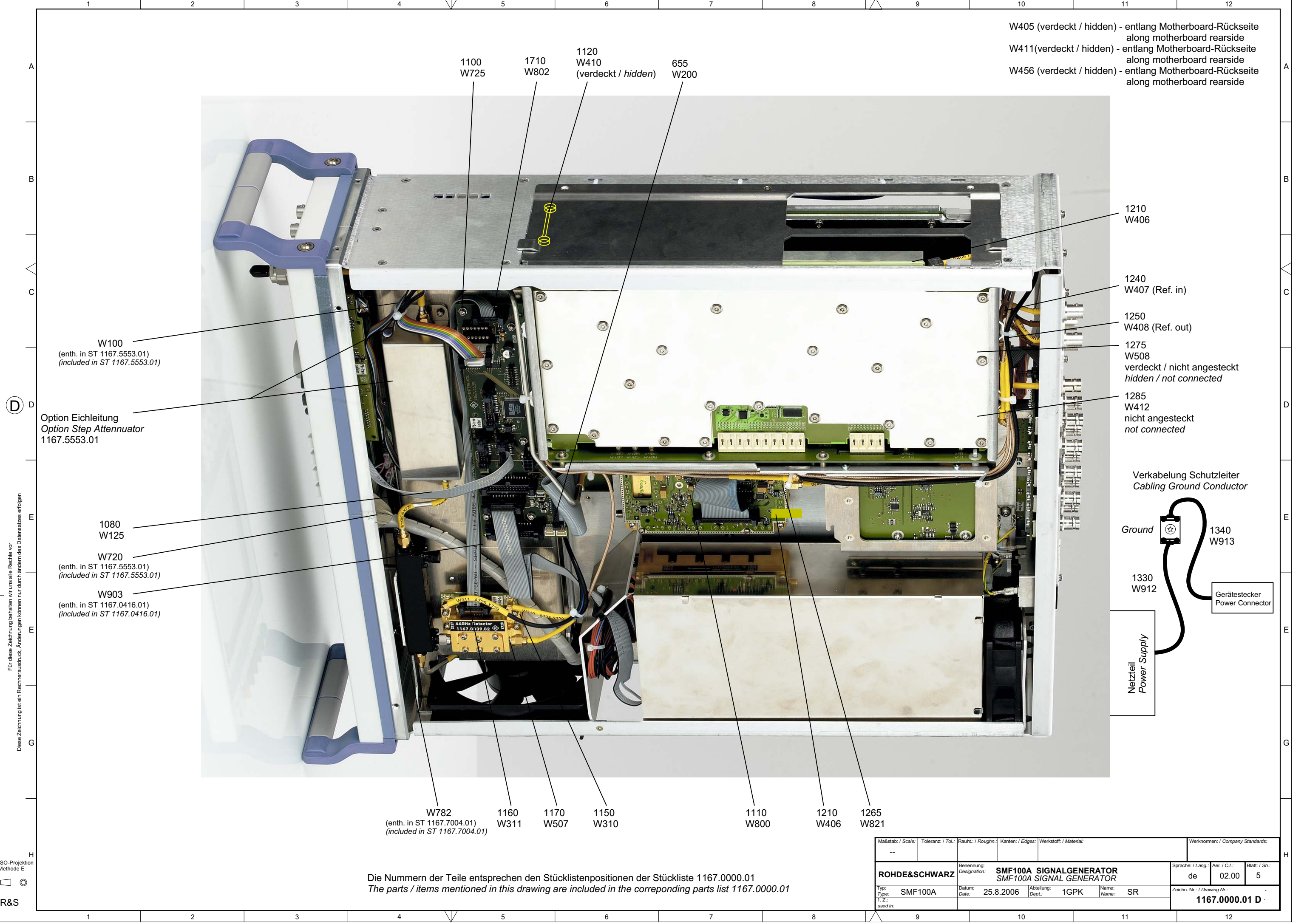
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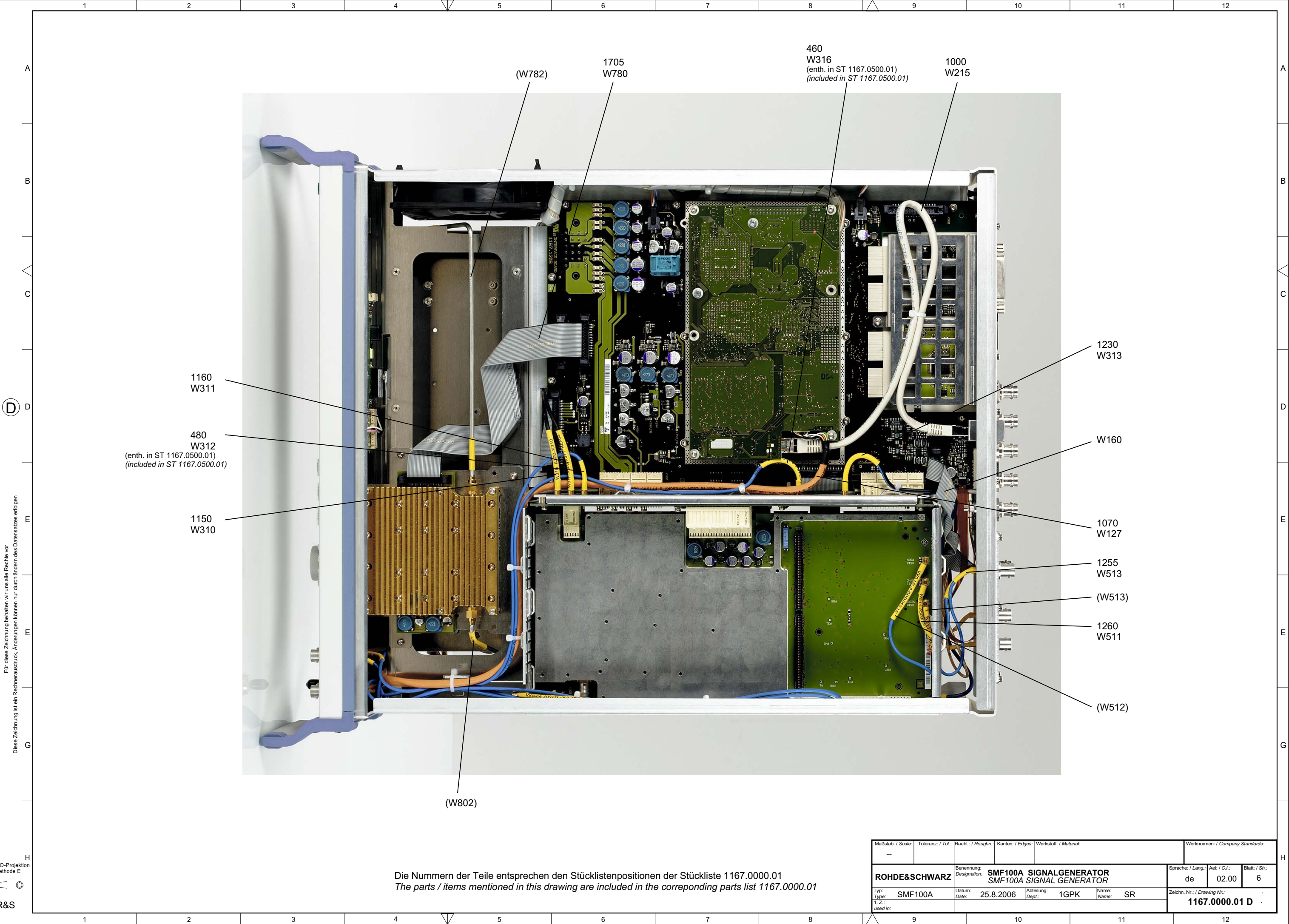
Projektions-
methode
Projection
Method

Die Nummern der Teile entsprechen der jeweiligen
Position in der Stueckliste 1167.0000.01
The parts / items in this drawing are included
in the corresponding parts list 1167.0000.01

Variantenerklärung
EXPLANATION OF MODELS
VAR02 = Grundvariante
MOD02 = Basic Model

Position Code	Teil Bezeichnung / Designation	Werkstoff Material	Sprache / Lang. Lang. / C.I.	Blatt / Stk. Sheet / Pcs.
ROHDE&SCHWARZ	SMF100A SIGNAL GENERATOR		de en	03.00 4
SMF	2006-06-24	16PK	ms/sr	1167.0000.01 D

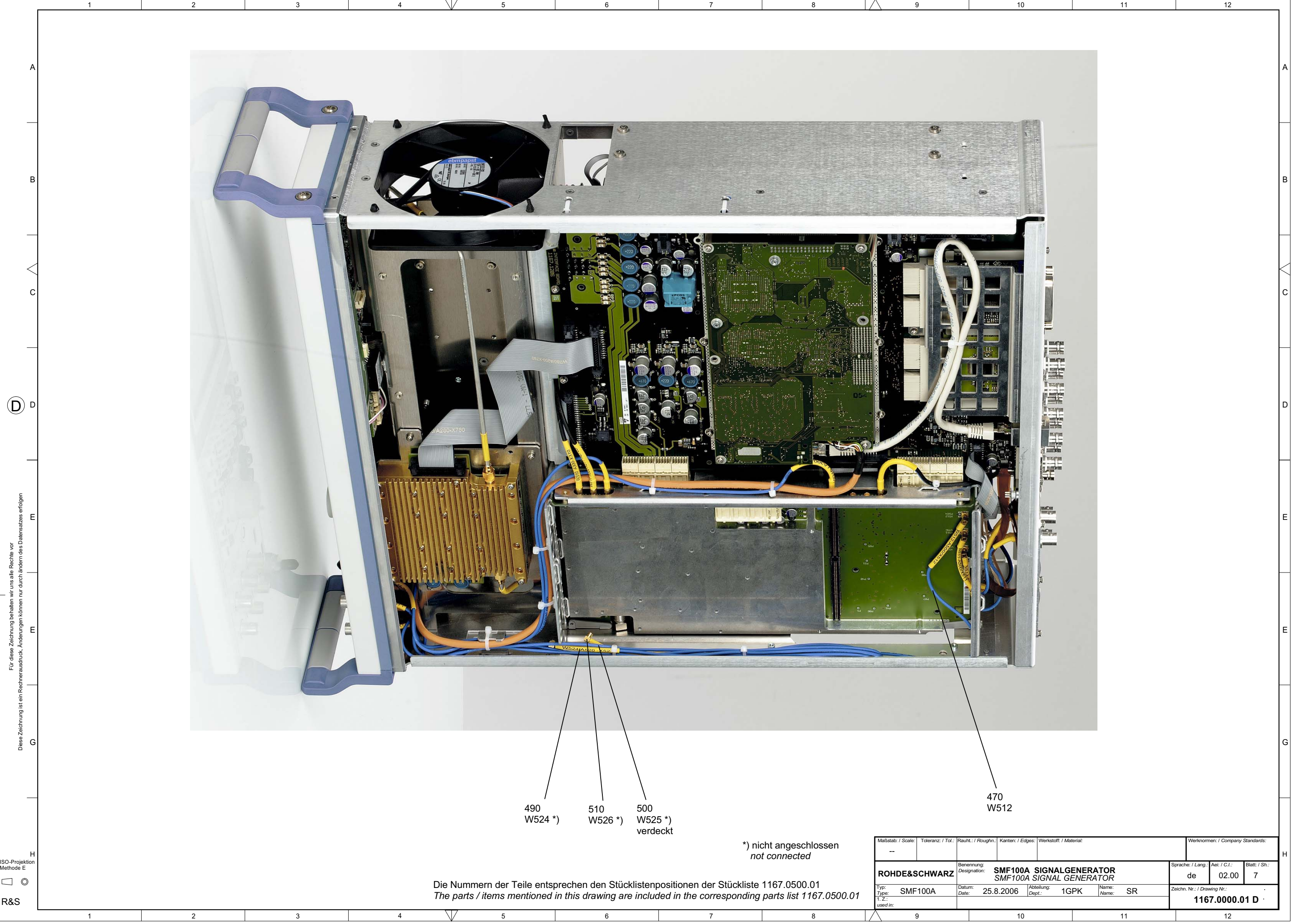




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Die Nummern der Teile entsprechen den Stücklistenpositionen der Stückliste 1167.0000.01
The parts / items mentioned in this drawing are included in the corresponding parts list 1167.0000.01

Maßstab: / Scale:	Toleranz: / Tol.:	Rauht.: / Roughn.:	Kanten: / Edges:	Werkstoff: / Material:	Werknormen: / Company Standards:		
--							
Benennung: SMF100A SIGNALGENERATOR					Sprache: / Lang.:	Akt: / C.I.:	Blatt: / Sh.:
Designation: SMF100A SIGNAL GENERATOR					de	02.00	6
Type: SMF100A	Date: 25.8.2006	Abteilung: 1GPK	Name: SR	Zeichn. Nr.: / Drawing Nr.: 1167.0000.01 D			
1. Z.: used in:							



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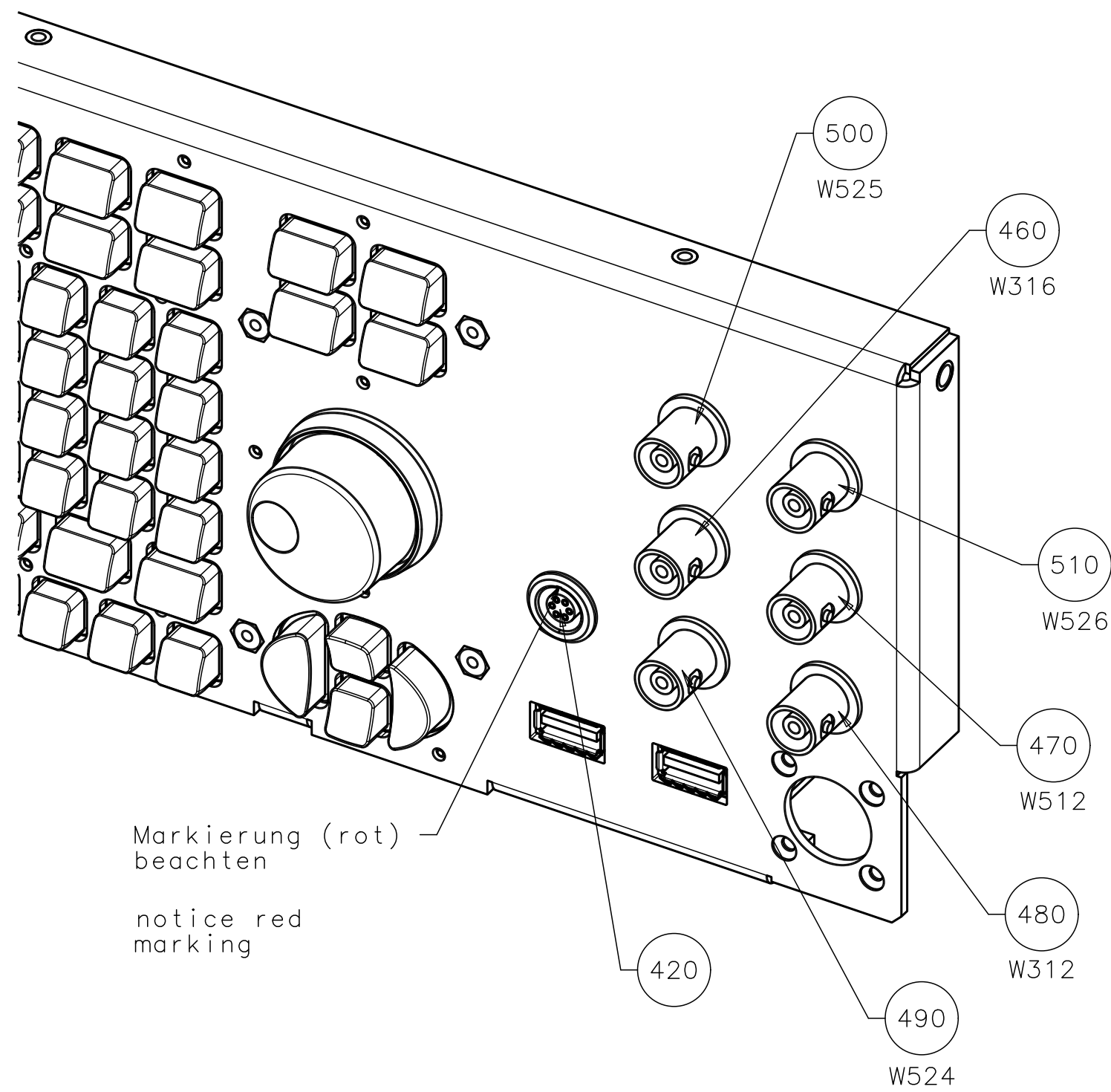
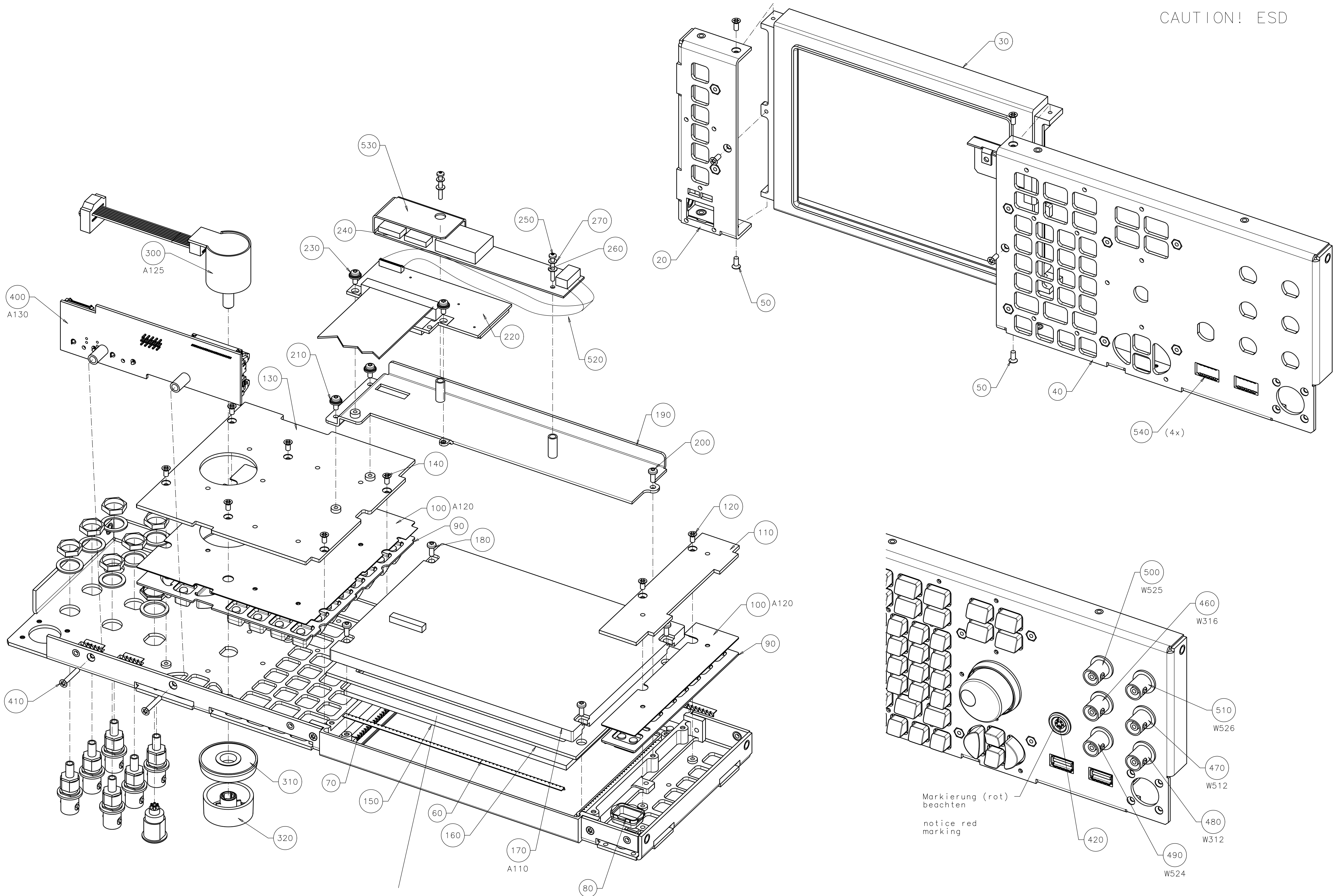
ISO-Projektion
Methode F
R&S

Die Nummern der Teile entsprechen den Stücklistenpositionen der Stückliste 1167.0500.01
The parts / items mentioned in this drawing are included in the corresponding parts list 1167.0500.01

*) nicht angeschlossen
not connected

Maßstab: / Scale:	Toleranz: / Tol.:	Rauht.: / Roughn.:	Kanten: / Edges:	Werkstoff: / Material:	Werknormen: / Company Standards:		
--							
Benennung: / Designation:		Benennung: / Designation:			Sprache: / Lang.:	Akt: / C.I.:	Blatt: / Sh.:
ROHDE&SCHWARZ		SMF100A SIGNALGENERATOR			de	02.00	7
Type:	SMF100A	Date:	25.8.2006	Abteilung: / Dept.:	1GPK	Name:	SR
1. Z.:		used in:					
					Zeichn. Nr.: / Drawing Nr.:		
					1167.0000.01 D		

CAUTION! ESD



Markierung (rot)
beachten
notice red
marking

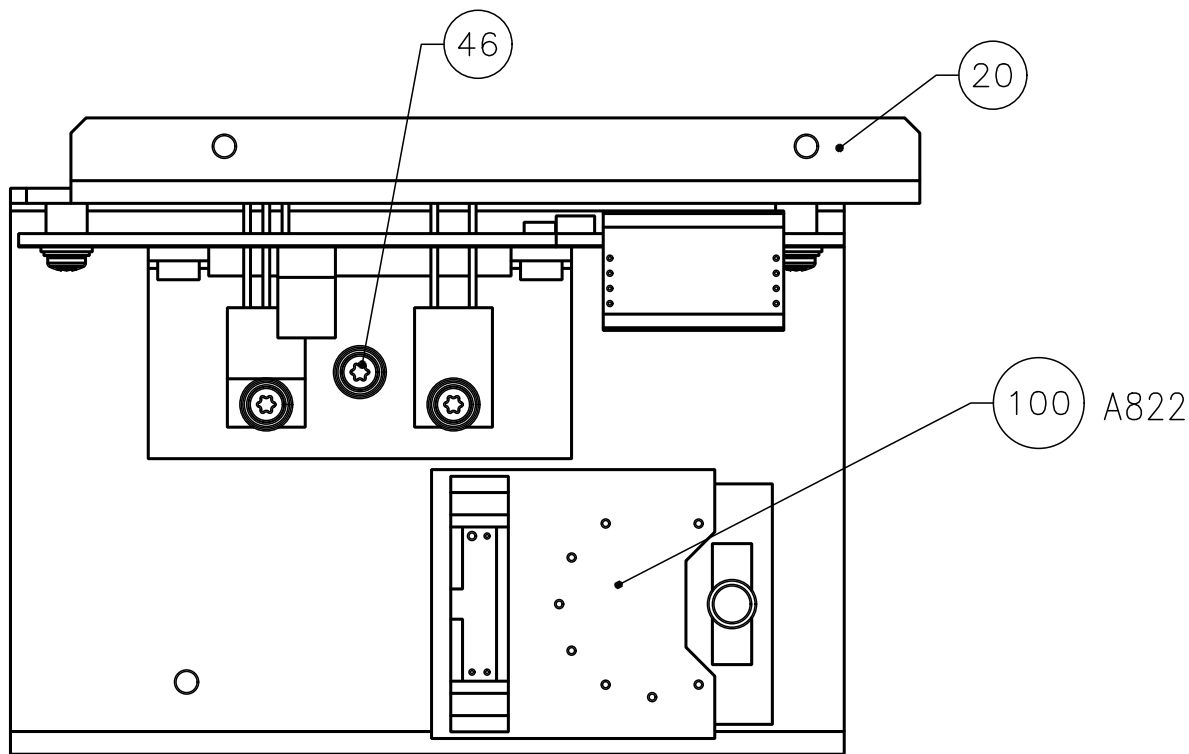
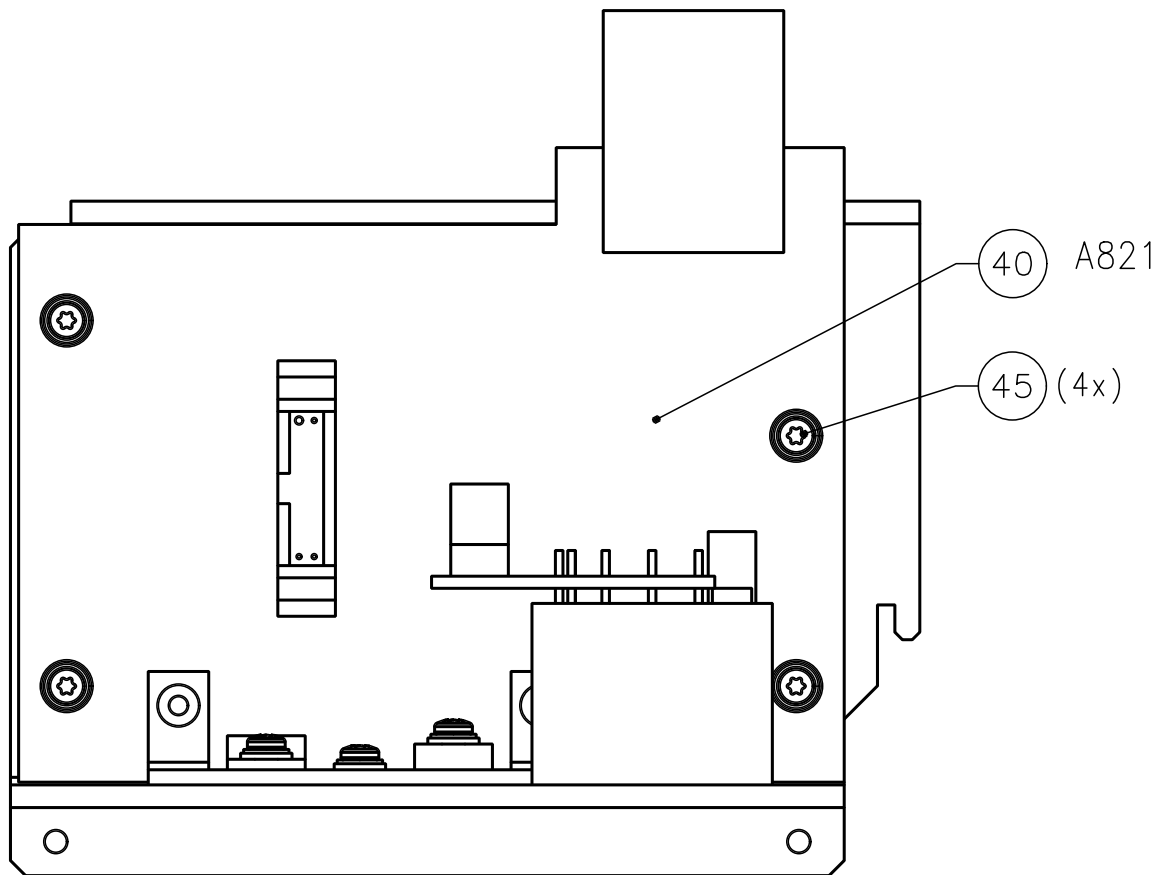
Der Luftraum zwischen Display (170) und Scheibe (150)
mit Dichtung (160) staubfrei montieren
The air space between Display (170) and Filter Glass (150)
is mounted dust-free with seal (160)

Die Nummern der Teile entsprechen der jew. Position in der
Stueckliste 1167.0500.01 ST
The parts / items mentioned in this drawing are included
in the corresponding parts list 1167.0500.01 ST

Modell Scale	Seitenzahl Page	Bezeichnung / Designation	Werkstoff Material	Sprache / Lang. Language	Blatt / Nr. Sheet / No.
ROHDE&SCHWARZ	SMF	FRONTEINHEIT SMF FRONT PANEL UNIT SMF	1ZKS	de en	04.00 1
SMF	2006-02-14	2006-02-14	1ZKS	kp	1167.0500.01 D

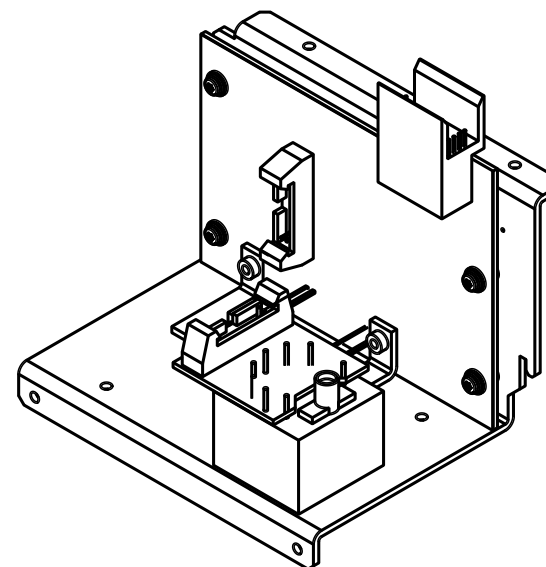
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Projektions-
methode
Projection
Method



Die Nummern der Teile entsprechen der jeweiligen
Position in der Stueckliste 1167.1987.01

The parts / items mentioned in this drawing are included
in the corresponding parts list 1167.1987.01



VARIANTENERKLAERUNG
EXPLANATION OF MODELS

VAR02 = GRUNDVARIANTE
MOD02 = BASIC MODEL

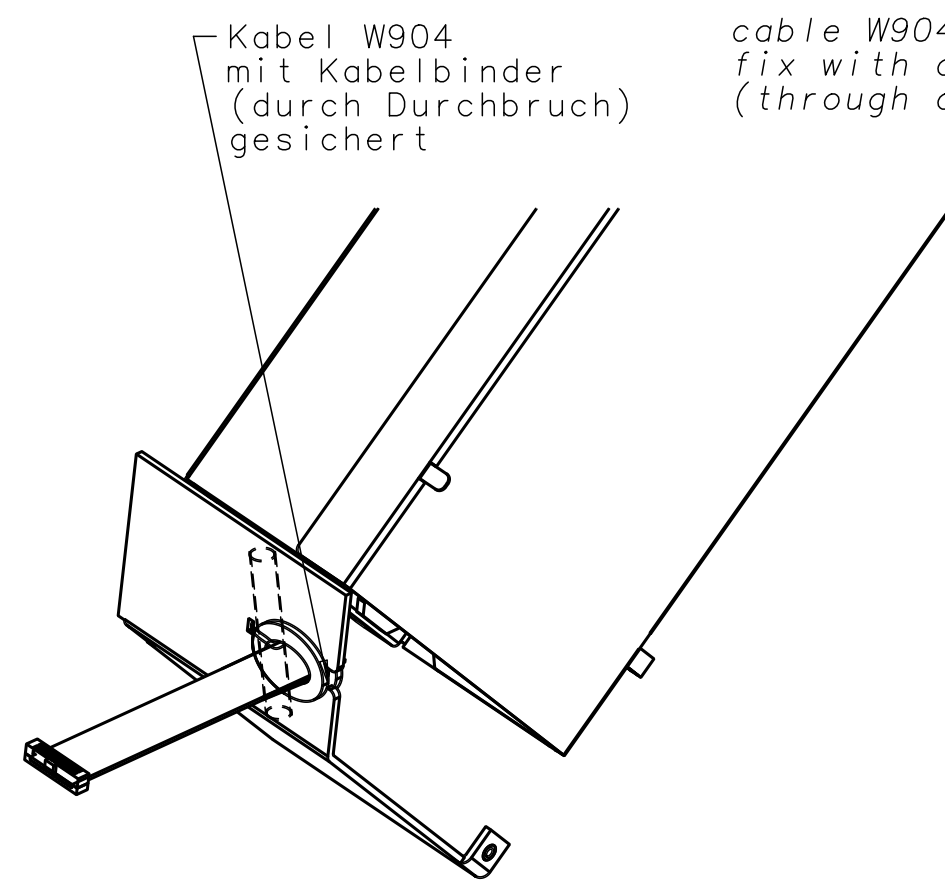
Maßstab Scale	1:1 (1:2)	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Aei. / C.I.	Blatt / Sh.
Benennung / Designation	TMO UNIT TMO UNIT			de en	02.00	1
Datum Date	2006-08-14	Abteilung Dept.	1GPK	Name Name	sr	1167.1987.01
SMF100A						D

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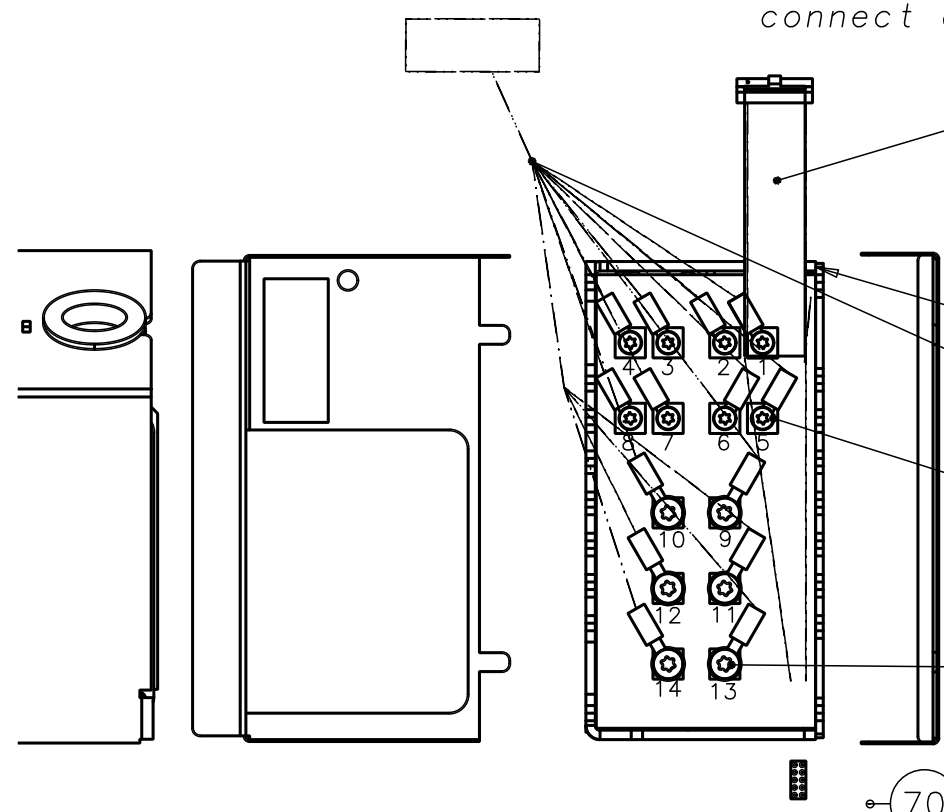
Projektions-
methode
Projection
Method

H



Kabel W904
mit Kabelbinder
(durch Durchbruch)
gesichert

*cab le W904
fix with cab letie
(through opening)*



W904
angeschlossen nach 1167.3938

W904
connect according to 1167.3938.00

(80) W903

(20)

(30)

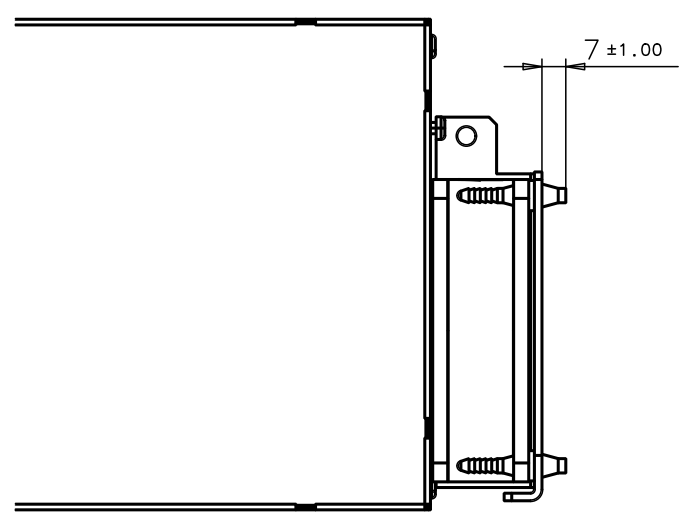
(40) (8x)

(50) (6x)

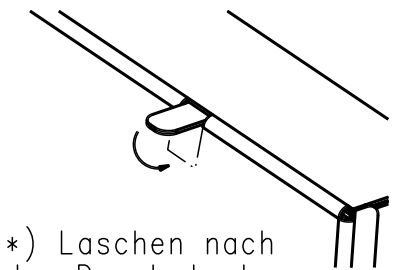
(70) Die Nummern der Teile entsprechen der jeweiligen
Position in der Stueckliste 1167.2031.00

The parts / items mentioned in this drawing are included
in the corresponding parts list 1167.2031.00

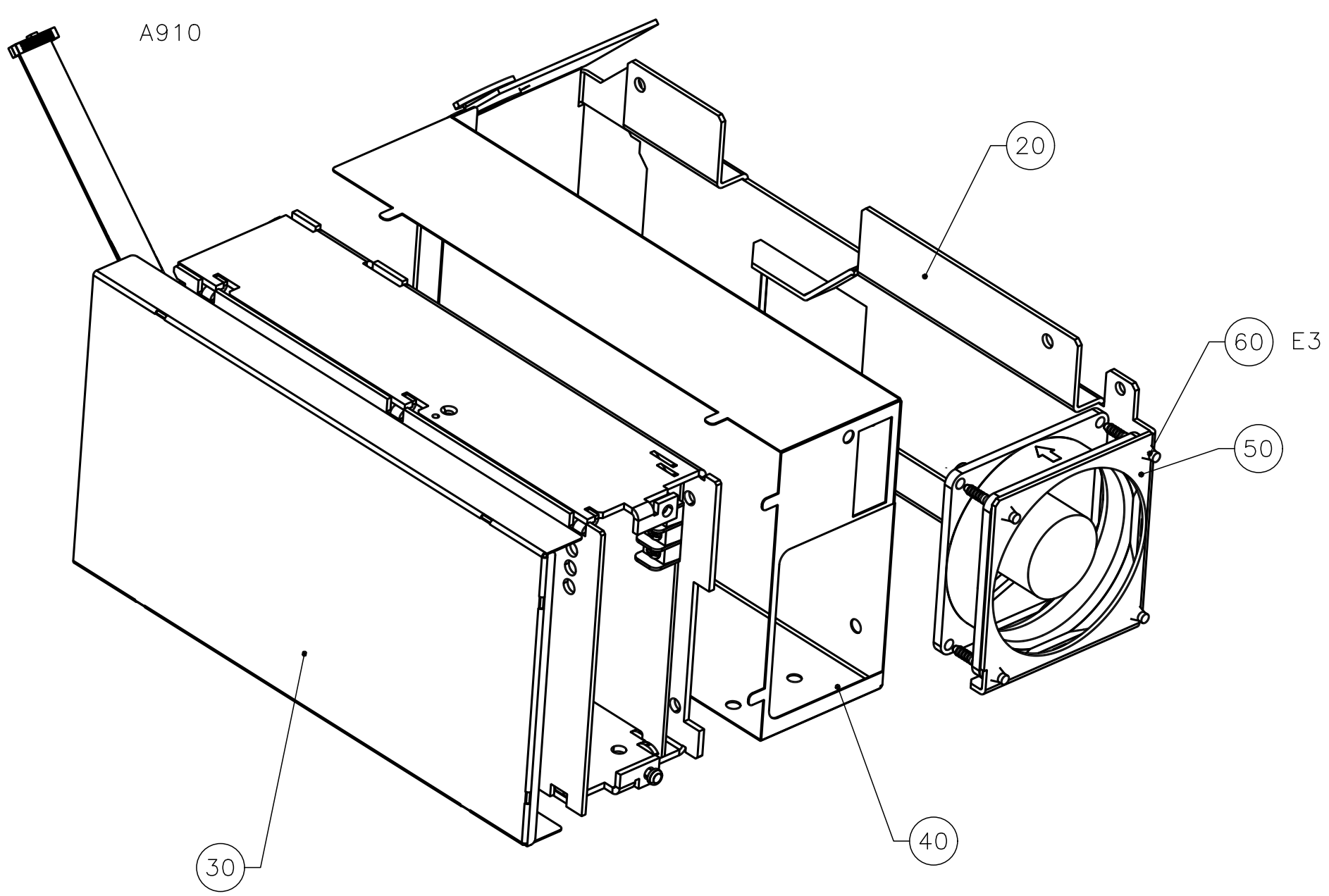
Gummistifte (60) nach Montage kuerzen (4x)
rubber pin shorten after mounting



7 ±1.00



*) Laschen nach
dem Durchstecken
umbiegen (4x)
bend the panel after
put through



A910

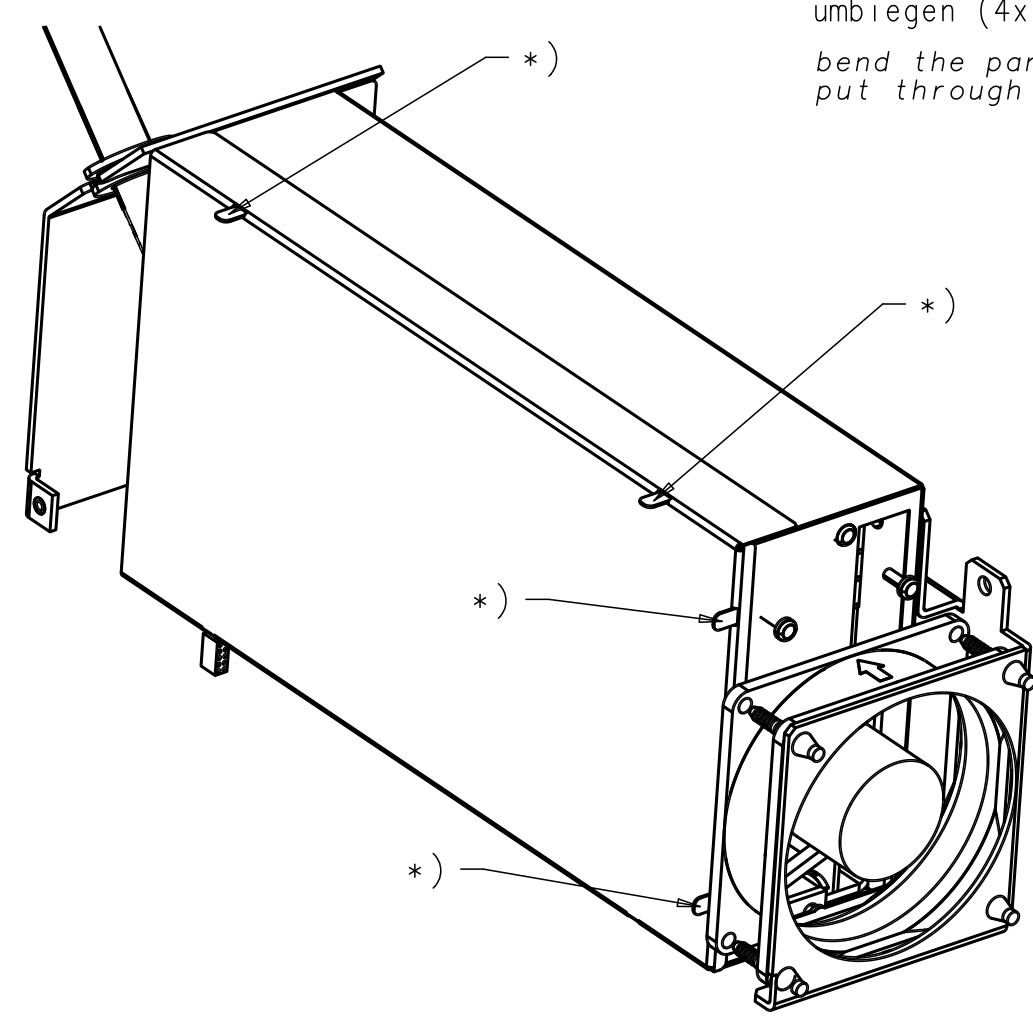
(20)

(60) E3

(50)

(30)

(40)



Die Nummern der Teile entsprechen der jeweiligen
Position in der Stueckliste 1167.0416.00

*The parts / items mentioned in this drawing are included
in the corresponding parts list 1167.0416.00*

VARIANTENERKLAERUNG
EXPLANATION OF MODELS

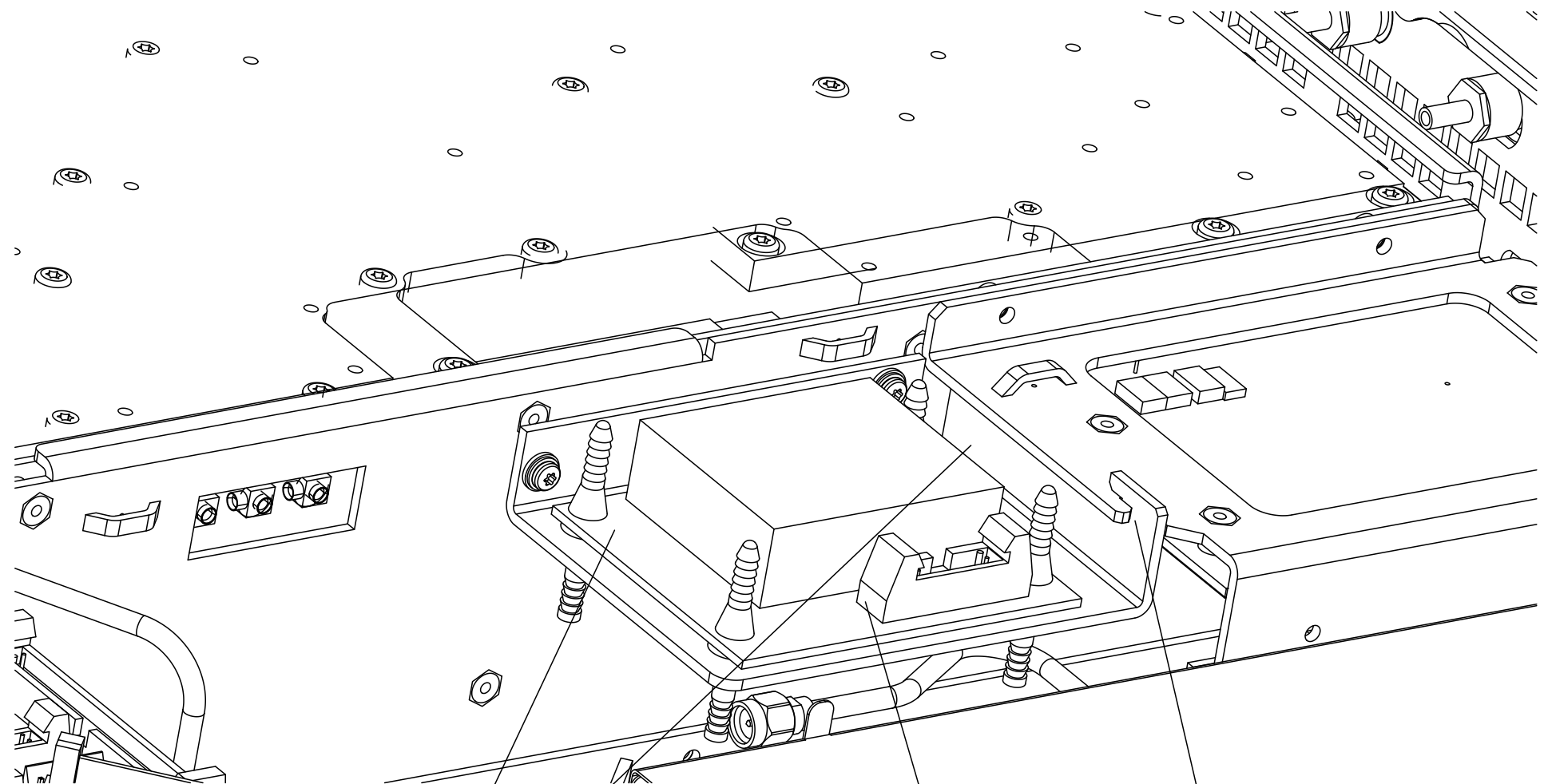
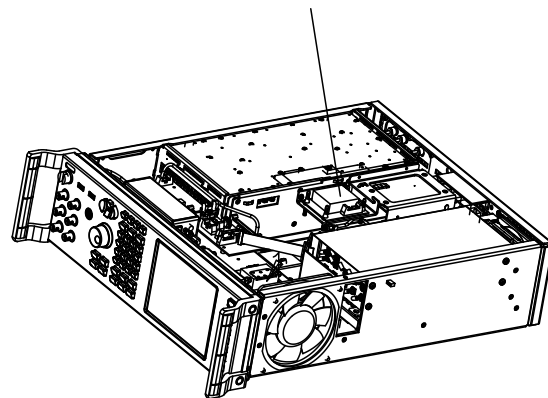
VAR02 = GRUNDVARIANTE
MOD02 = BASIC MODEL

Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang. de en	Blatt / Sh. 1
ROHDE&SCHWARZ	Benennung / Designation POWER SUPPLY UNIT POWER SUPPLY UNIT	Datum 2006-05-26	Abteilung 1GPK	Name ms/sr
Zeichn.Nr. / Drawing No. 1167.0416.01			D	

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Projektions-
methode
Projection
Method

Lage der OPTION SMF-B1
Position of OPTION SMF-B1



2) 2x anschrauben mit
M2.5x8 D6900/ISR
2x screw on with
M2.5x8 D6900/ISR

1) OPTION SMF-B1
hier einhaken
lock in here

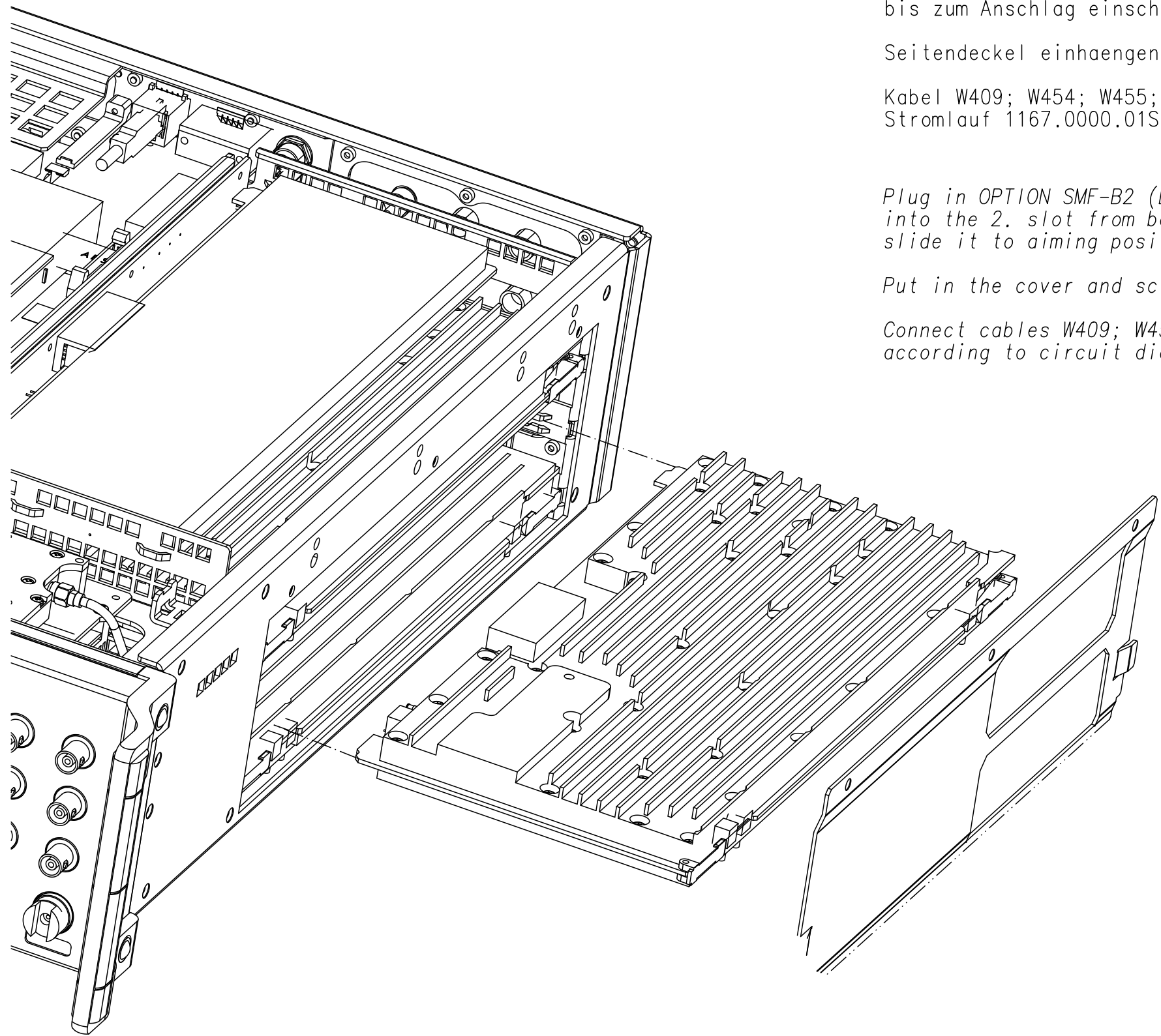
OPTION SMF-B1

Kabel W405; W575 gesteckt nach
Stromlauf 1167.0000.01S
Connect cable W405; W575 according to
circuit diagram 1167.0000.01S

Die Nummern der Teile entsprechen der jeweiligen
Position in der Stueckliste 1167.9159.01

The parts / items mentioned in this drawing are included
in the corresponding parts list 1167.9159.01

Maßstab Scale		Toleranz Tol.		Werkstoff Material					
ROHDE&SCHWARZ		Benennung / Designation SMF-B1 REFERENZOSZILLATOR SMF-B1 REFERENCE OSCILLATOR				Sprache / Lang.		Aei. / C.I.	Blatt / Sh.
						de en		02.00	1
SMF-B1		Datum Date	2006-08-19	Abteilung Dept.	1GPK	Name Name	sr		
						Zeichn.Nr. / Drawing No.		1167.9159.01 D	



OPTION SMF-B2 (DOWN CONVERTER) in den
2. Steckplatz von unten einfuehren und
bis zum Anschlag einschieben.

Seitendeckel einhaengen und anschrauben

Kabel W409; W454; W455; W456 nach
Stromlauf 1167.0000.01S gesteckt

*Plug in OPTION SMF-B2 (DOWN CONVERTER)
into the 2. slot from bottom side and
slide it to aiming position.*

Put in the cover and screw it on.

*Connect cables W409; W454; W455; W456
according to circuit diagram 1167.0000.01S*

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Projektions-
methode
Projection
Method

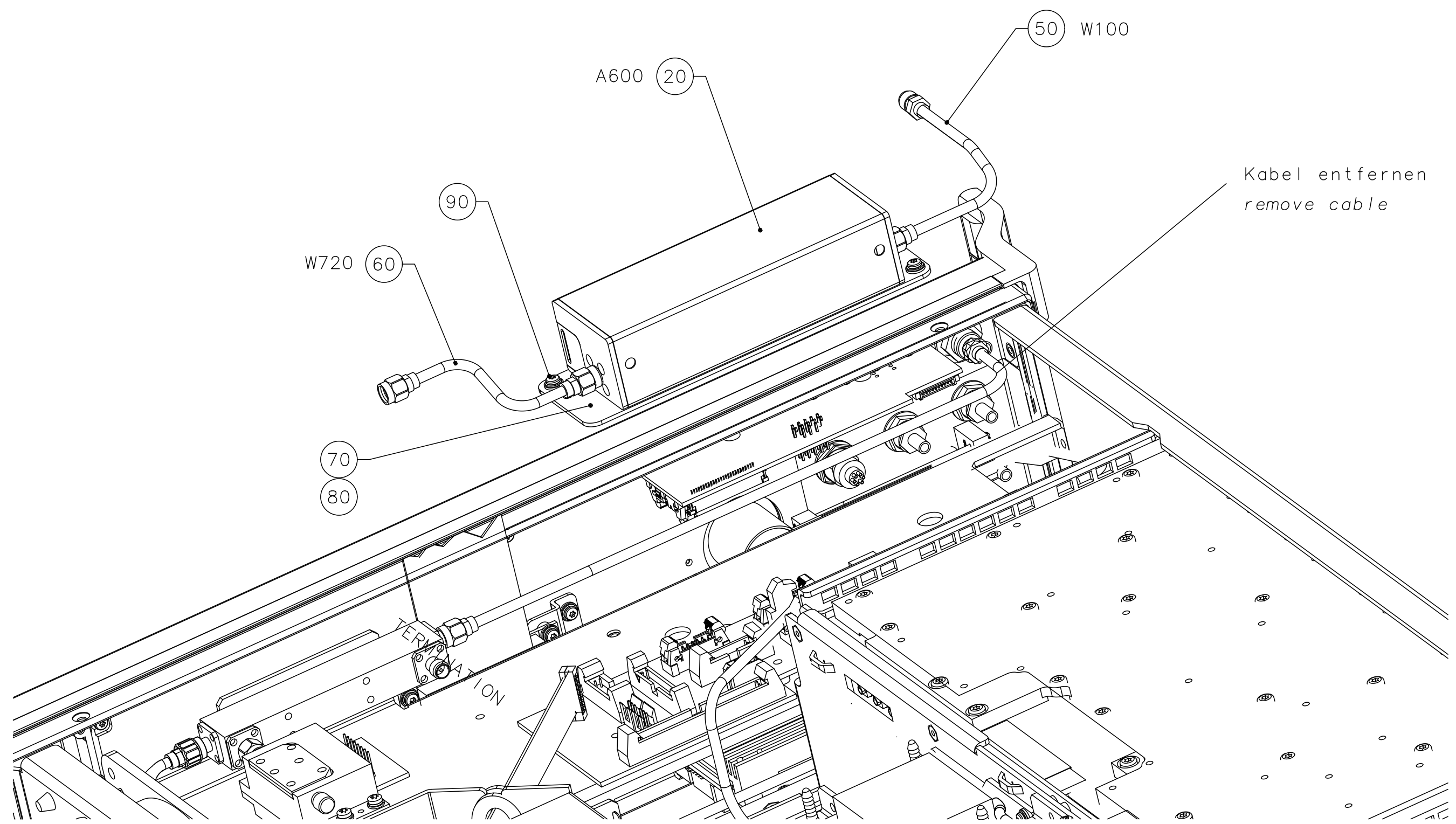
Die Nummern der Teile entsprechen der jeweiligen
Position in der Stueckliste 1167.4005.01

The parts / items mentioned in this drawing are included
in the corresponding parts list 1167.4005.01

Maßstab Scale	Toleranz Tol.		Werkstoff Material				
ROHDE&SCHWARZ	Benennung / Designation			Sprache / Lang.		Aei. / C.I.	Blatt / Sh.
	SMF-B2 100 KHZ BIS 1 GHZ SMF-B2 100 KHZ TO 1 GHZ			de en		02.00	1
				Zeichn.Nr. / Drawing No.			
SMF-B2	Datum Date	2006-08-19	Abteilung Dept.	1GPK	Name Name	sr	1167.4005.01 D

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Projektions-
methode
Projection
Method



Die Nummern der Teile entsprechen der jeweiligen
Position in der Stueckliste 1167.5553.01

The parts / items in this drawing are included
in the corresponding parts list 1167.5553.01

Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang. Aei. / C.I.			Blatt / Sh.
ROHDE&SCHWARZ	Benennung / Designation		de	en	02.00	1
	SMF-B26 EICHLEITUNG 22 GHZ SMF-B26 STEP ATTENUATOR 22 GHZ		Zeichn.Nr. / Drawing No.			D
SMF-B26	Datum Date	2006-09-27	Abteilung Dept.	1GPK	Name Name	sr
			1167.5553.01			

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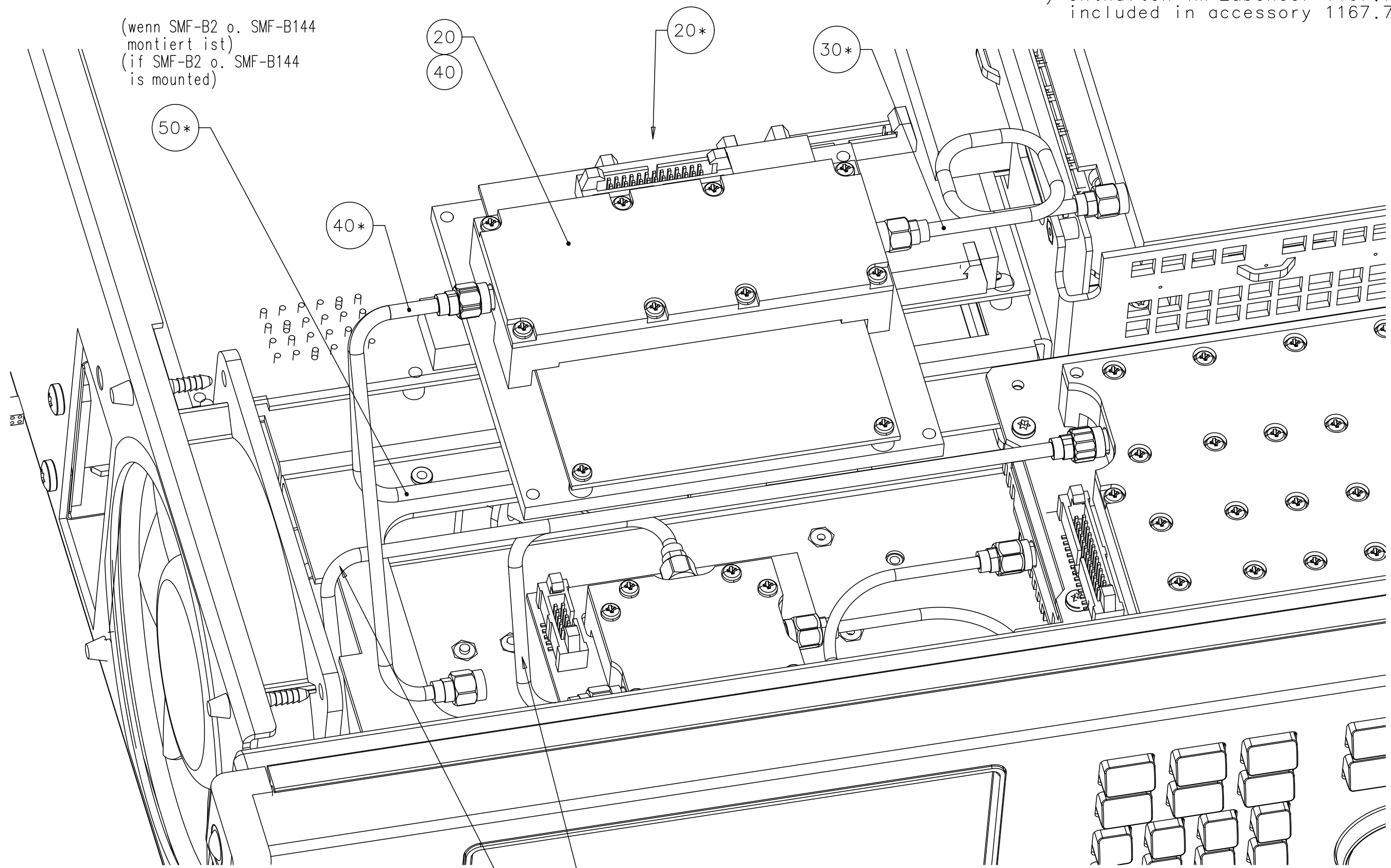
Projektions-
methode
Projection
Method

I

F

(wenn SMF-B2 o. SMF-B144
montiert ist)
(if SMF-B2 o. SMF-B144
is mounted)

*) enthalten im Zubehoer 1167.7427
included in accessory 1167.7427



Kabel entfernen / remove cable
(wenn SMF-B2 o. SMF-B144 montiert ist)
(if SMF-B2 o. SMF-B144 is mounted)

Kabel entfernen
remove cable

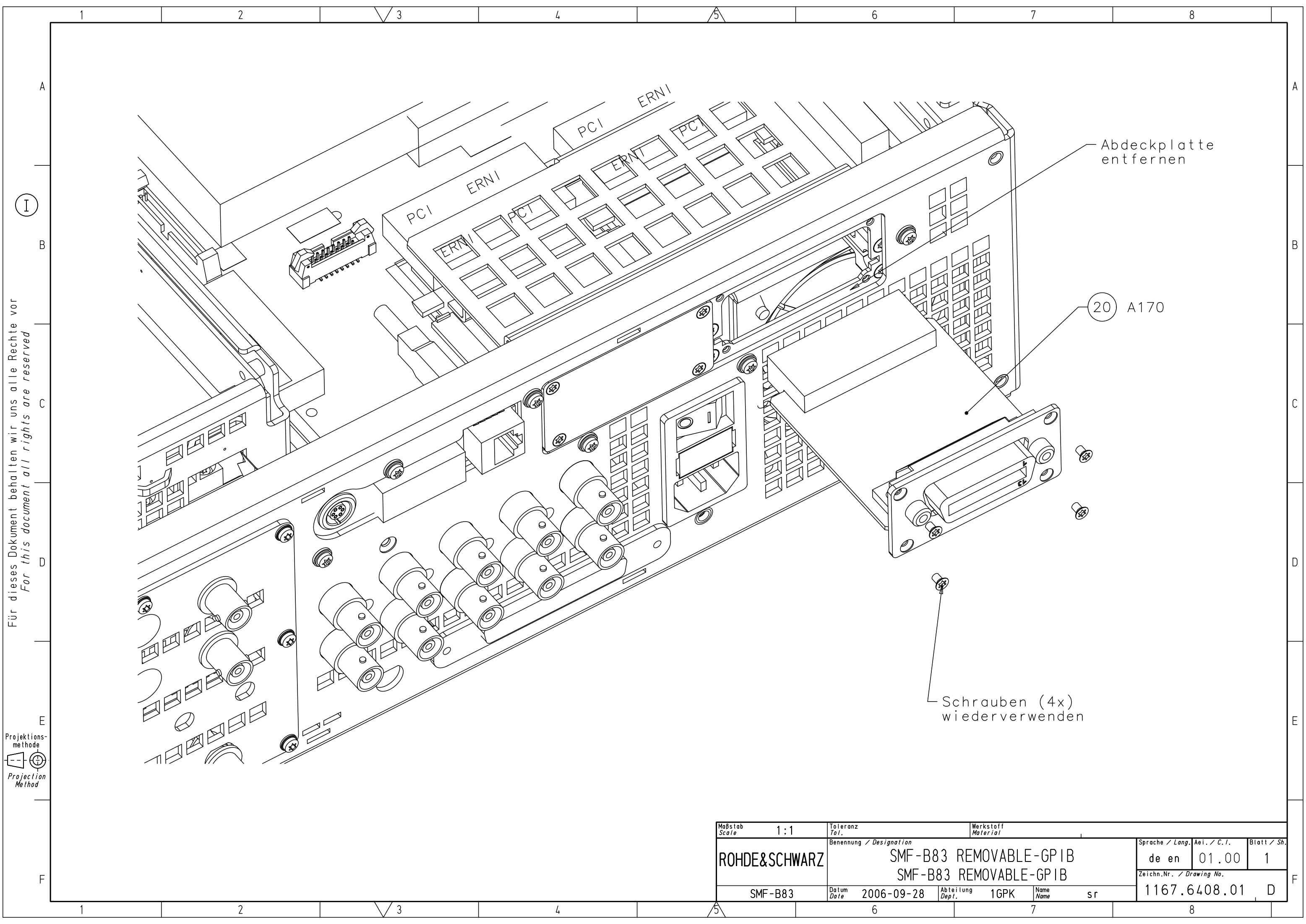
Die Nummern der Teile entsprechen der jeweiligen
Position in der Stueckliste 1167.7404.01

The parts / items mentioned in this drawing are included
in the corresponding parts list 1167.7404.01

Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Aei. / C.I.	Blatt / Sh.
ROHDE&SCHWARZ	Benennung / Designation	SMF-B31 HIGH-OUTPUT POWER SMF-B31 HIGH OUTPUT POWER	de en	01.00	1
SMF-B31	Datum Date	2006-09-28	Abteilung Dept.	1GPK	Name Name
				sr	
					Zeichn.Nr. / Drawing No.
					1167.7404.01
					D

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Projektions-
methode
Projection
Method



Maßstab Scale		1 : 1		Toleranz Tol.		Werkstoff Material			
ROHDE&SCHWARZ		Benennung / Designation SMF-B83 REMOVABLE-GPIB SMF-B83 REMOVABLE-GPIB				Sprache / Lang.		Ael. / C.I.	Blatt / Sh.
						de en		01.00	1
		SMF-B83		Datum Date	2006-09-28	Abteilung Dept.	1GPK	Name Name	sr
						1167.6408.01		D	

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Projektions-
methode
Projection
Method

Die Nummern der Teile entsprechen der jeweiligen
Position in der Stueckliste 1167.6608.01

The parts / items mentioned in this drawing are included
in the corresponding parts list 1167.6608.01

Maßstab Scale	1:1	Toleranz Tol.	Werkstoff Material					Sprache / Lang.			Aei. / C.I.	Blatt / Sh.
ROHDE&SCHWARZ		Benennung / Designation							de en		01.00	1
		SMF-B84 REMOVABLE-USB SMF-B84 REMOVABLE USB							Zeichn.Nr. / Drawing No.			
SMF-B84		Datum Date	2006-09-27	Abteilung Dept.	1GPK	Name Name	sr	1167.6608.01				D

Abdeckplatte entfernen
remove coverplate

20 A180

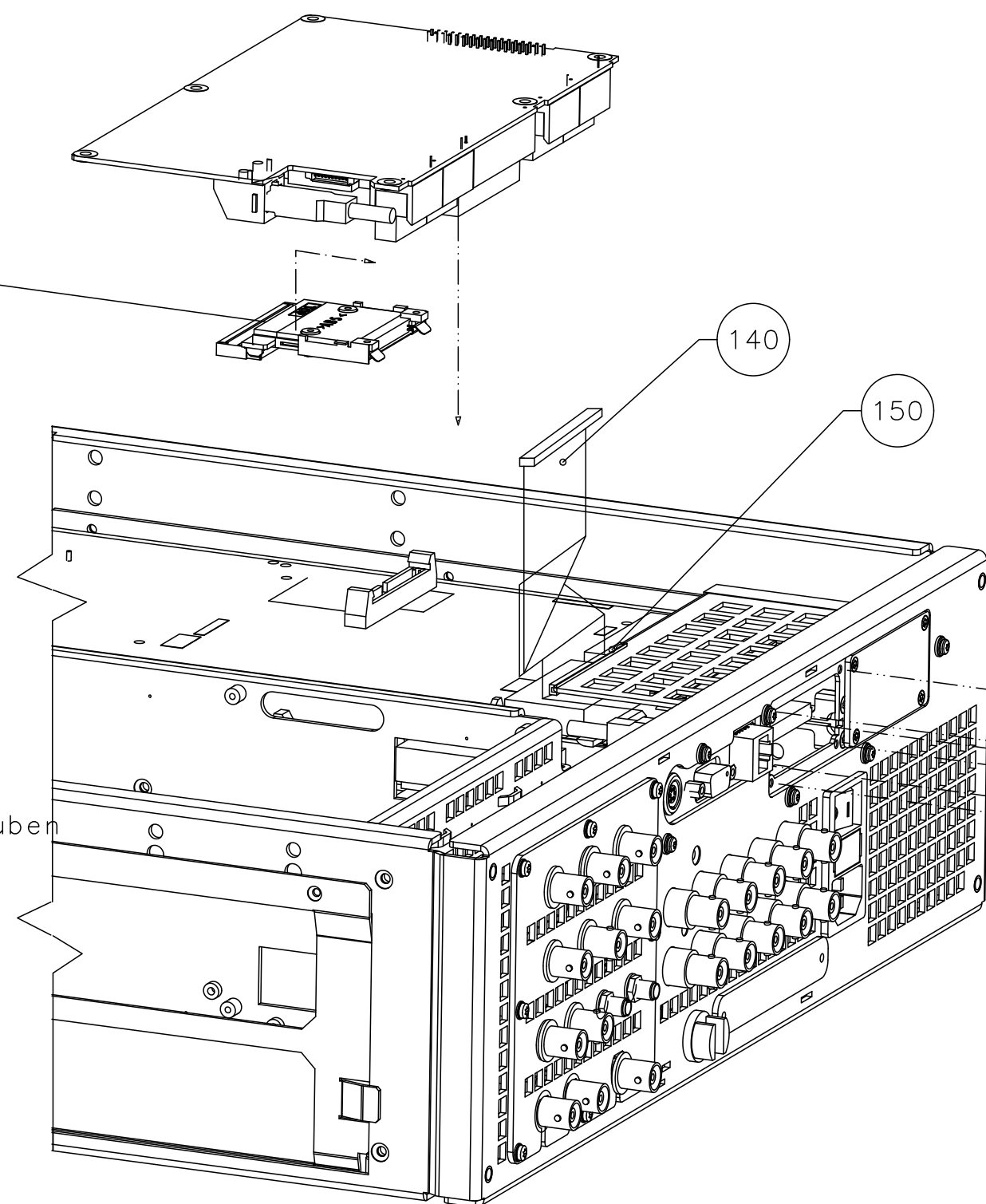
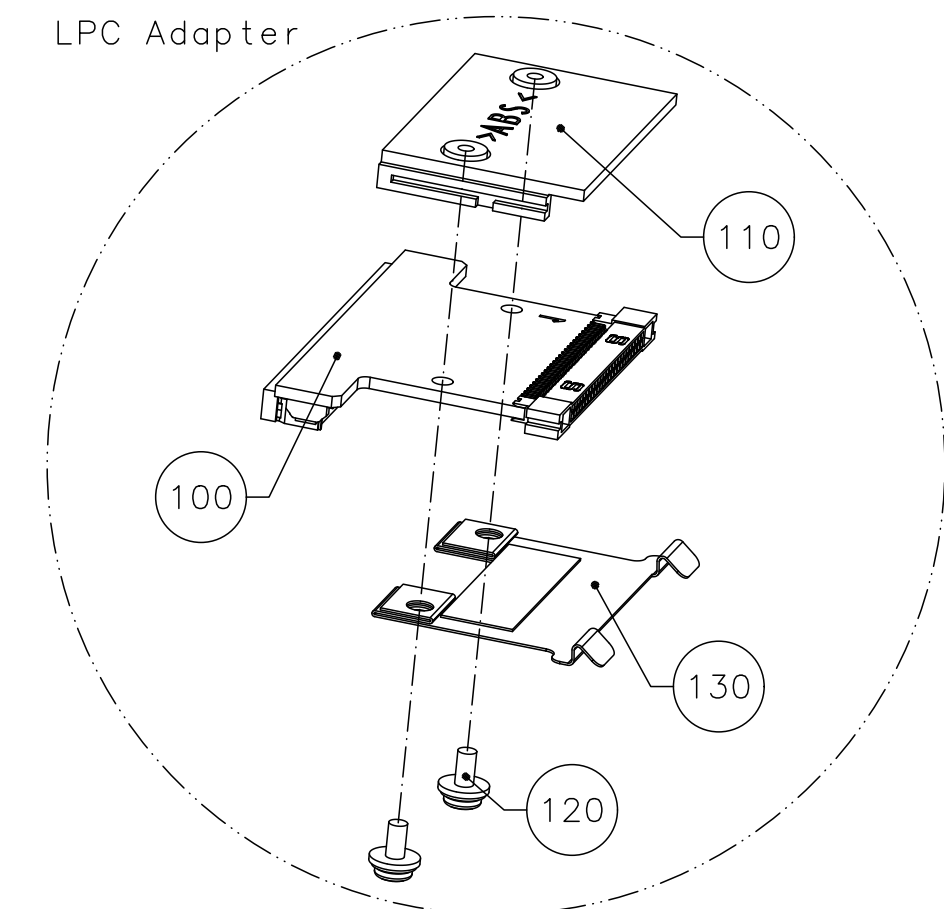
Schrauben (4x) wiederverwenden
reuse screws (4x)

Einbau der Option SMF-B85 Removable-Flash-Card
Installation of the Option SMF-B85 Removeable-Flash-Card

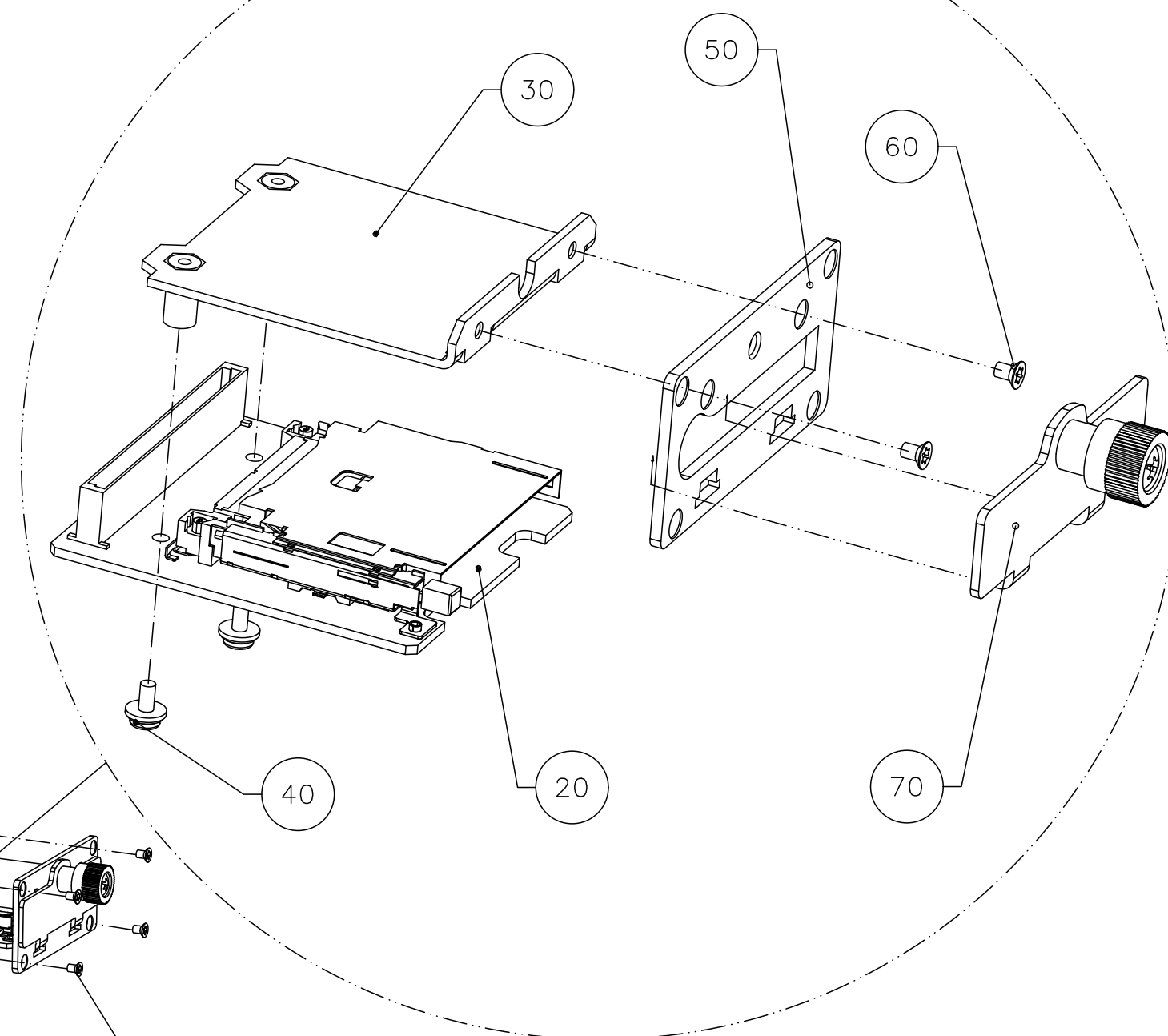
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Projektions-
methode
Projection
Method

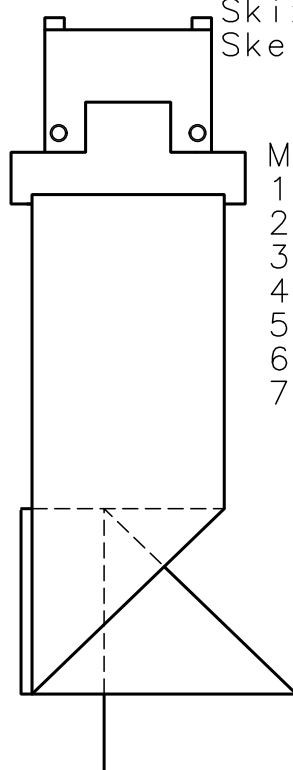
LPC Adapter



Flash Card Board



Skizze Kabel gefaltet
Sketch Folded Cable



Montagereihenfolge:

1. Kabel durch Einschuböffnung durchfuehren
2. Kabel an Flash Card Board einstecken
3. Flasch Card Board einschieben und anschrauben
4. Kabel an LPC Adapter anstecken
5. Kabel falten (siehe Skizze)
6. LPC Adapter in LPC Rechner einstecken
7. LPC Rechner anschrauben

Mounting Order:

1. pass cable through insertion opening
2. plug cable in Flasch Card Board
3. push in Flach Card Board and screw on
4. plug cable in LPC adapter
5. fold cable (look sketch)
6. plug LPC adapter in LPC controller
7. screw on LPC controller

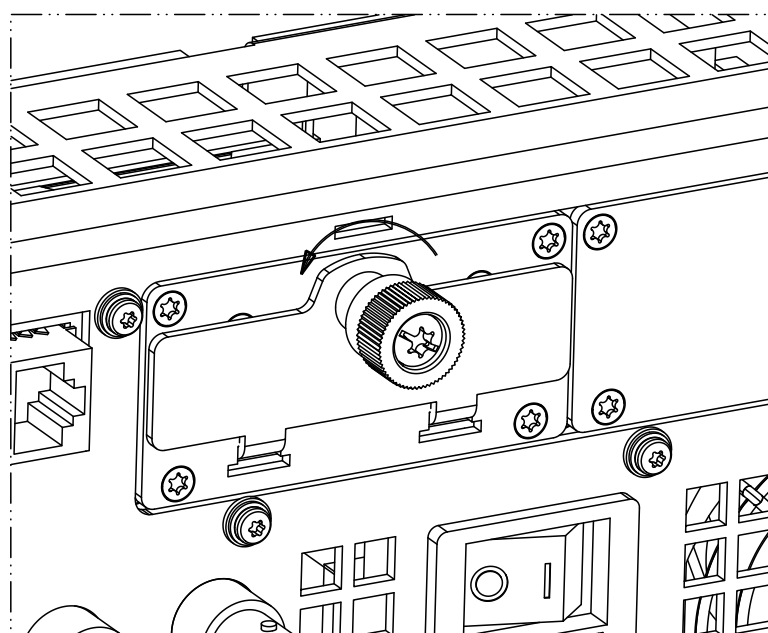
Schrauben wiederverwenden
reuse screws

Austauschen der Compact Flash Karte
Change of Compact Flasch Card

1

Raendelschraube
nach links
drehen und
Klappe oeffnen

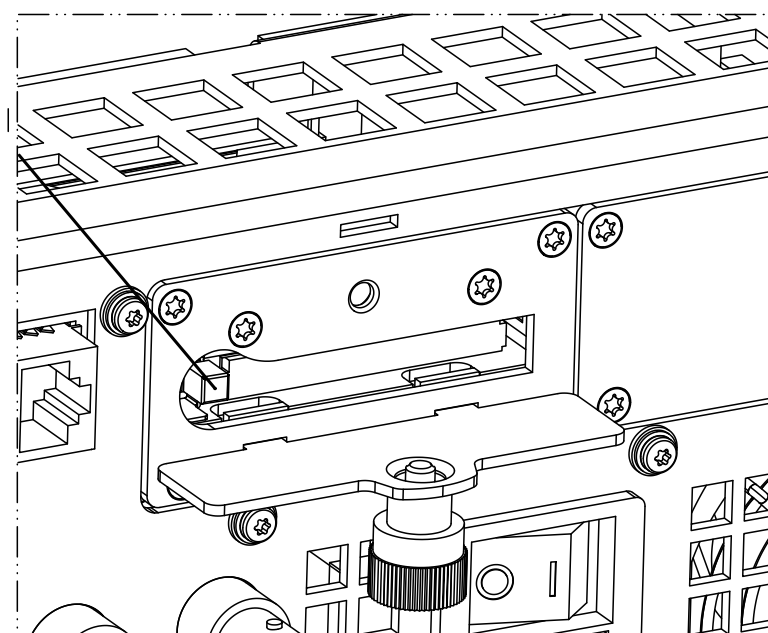
Turn captive
screw on the
left and open
the lid



2

Knopf zweimal
druecken

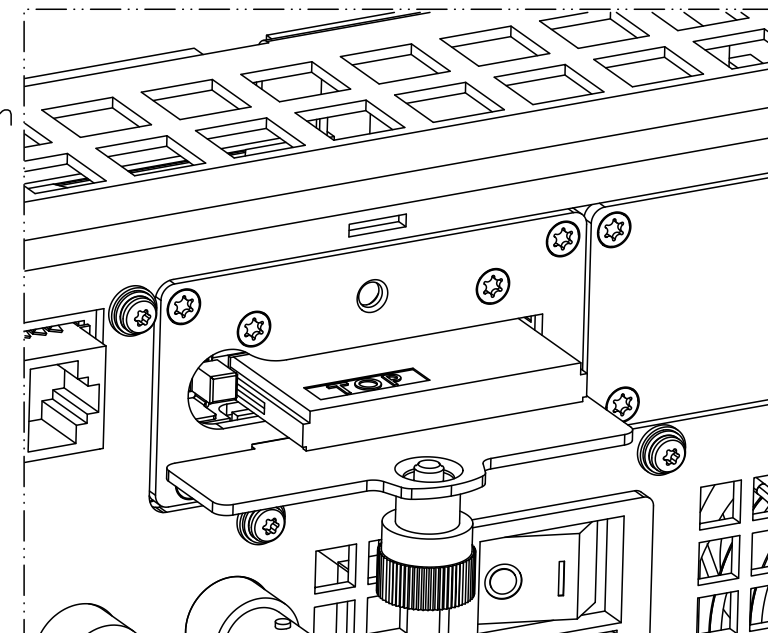
Push the
button
two times



3

Compact Flash
Karte
herausziehen

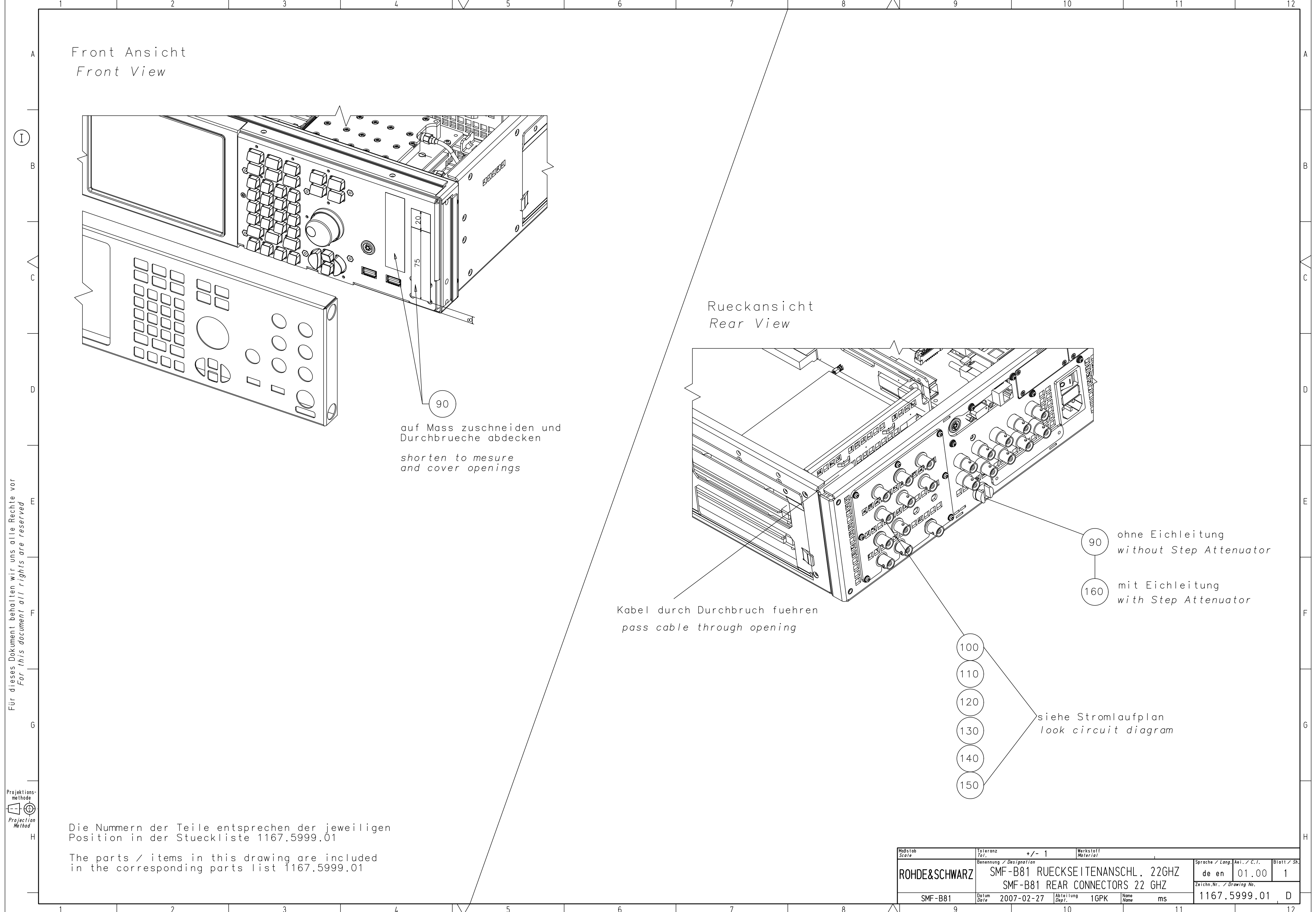
Pull out
the Compact
Flash Card



Die Nummern der Teile entsprechen der jeweiligen
Position in der Stueckliste 1167.6808.01

The parts / items in this drawing are included
in the corresponding parts list 1167.6808.01

Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang. Ael. / C.I.	Blatt / Sh.
ROHDE&SCHWARZ	Benennung / Designation	SMF-B85 REMOVABLE-FLASH-CARD SMF-B85 REMOVABLE FLASH CARD	de en 02.00	1
SMF-B85	Datum Date	2007-02-15	Abteilung Dept.	1GPK
	Name	ms	Zeichn.Nr. / Drawing No.	1167.6808.01 D



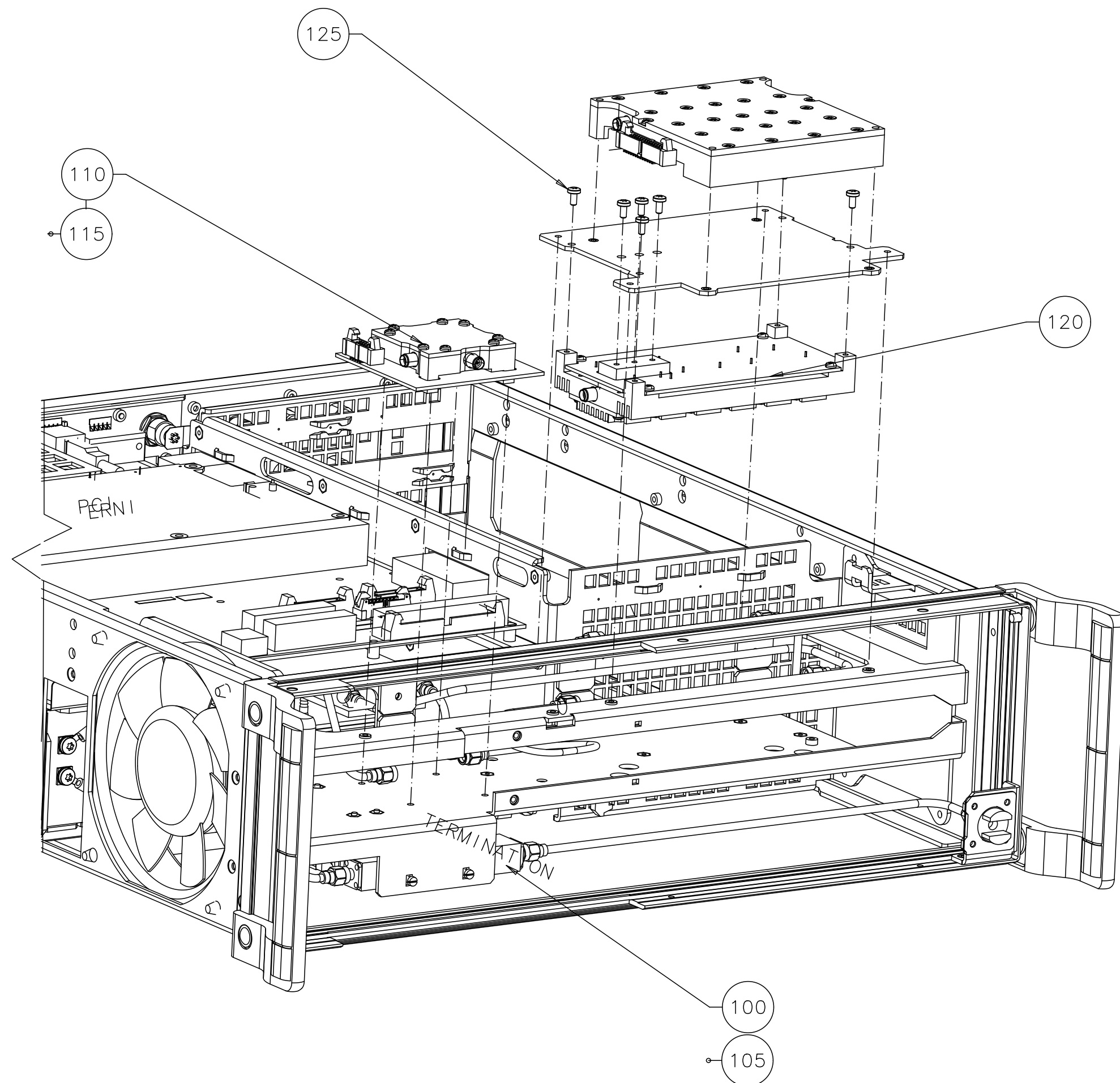
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Projektions-
methode
Projection
Method

Die Nummern der Teile entsprechen der jeweiligen
Position in der Stueckliste 1167.5999.01
The parts / items in this drawing are included
in the corresponding parts list 1167.5999.01

Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Äst. / C. I.	Blatt / Sh.
ROHDE&SCHWARZ	Benennung / Designation	SMF-B81 RUECKSEITENANSCHL. 22GHZ SMF-B81 REAR CONNECTORS 22 GHZ	de en	01.00	1
SMF-B81	Datum Date	2007-02-27	Abteilung Dept.	1GPK	Name Name
				ms	Zeichn.Nr. / Drawing No.
					1167.5999.01
					D

Explosionsansicht / Explosion View



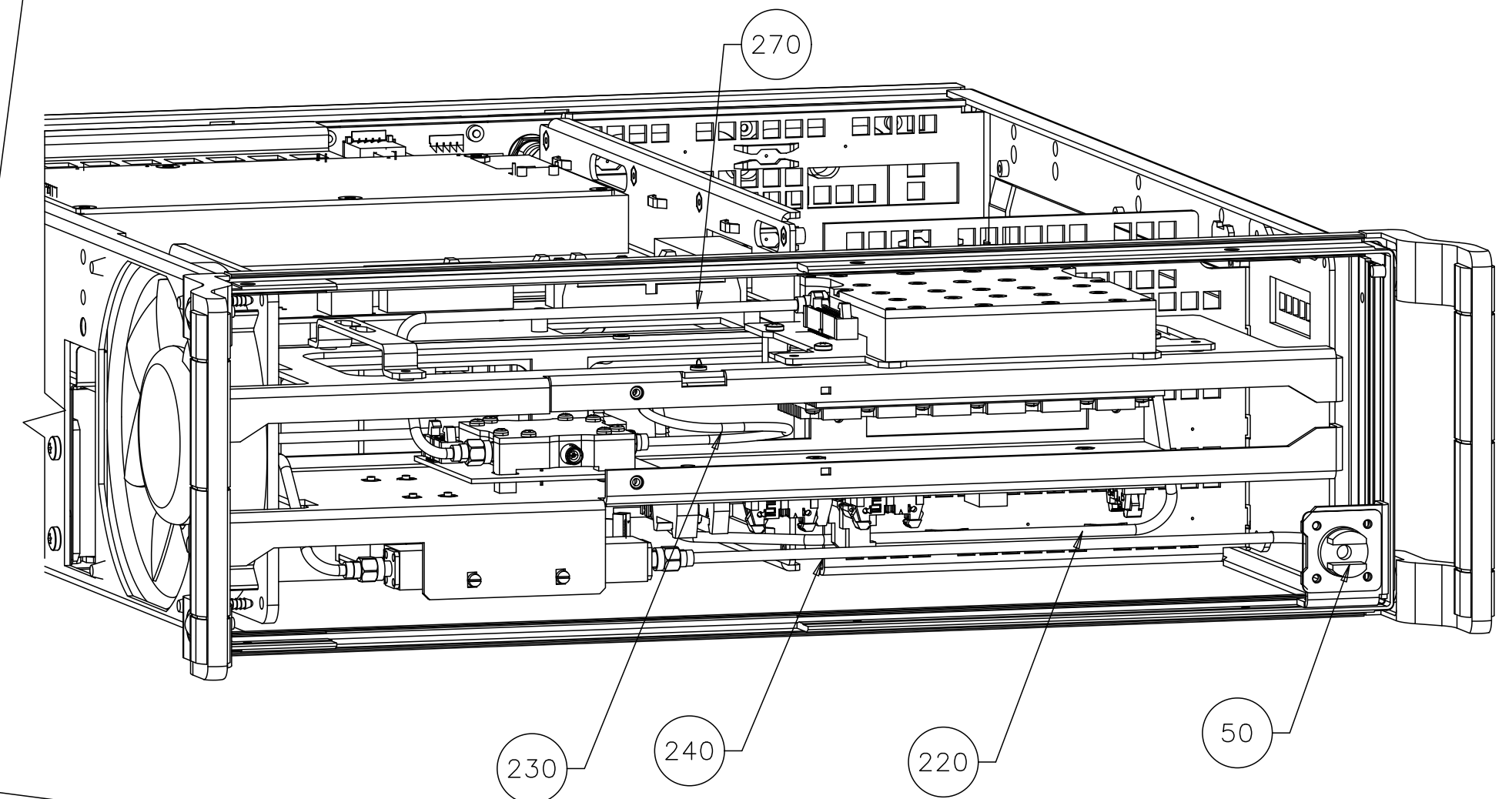
Montagereihenfolge / Mounting Order:

- 1) Pos. 120
- 2) Switched Filter (siehe Zeichnung / look drawing 1167.0000.01)
- 3) Pos. 100 (siehe Zeichnung / look drawing 1167.0000.01)
- 4) beliebig / in any order

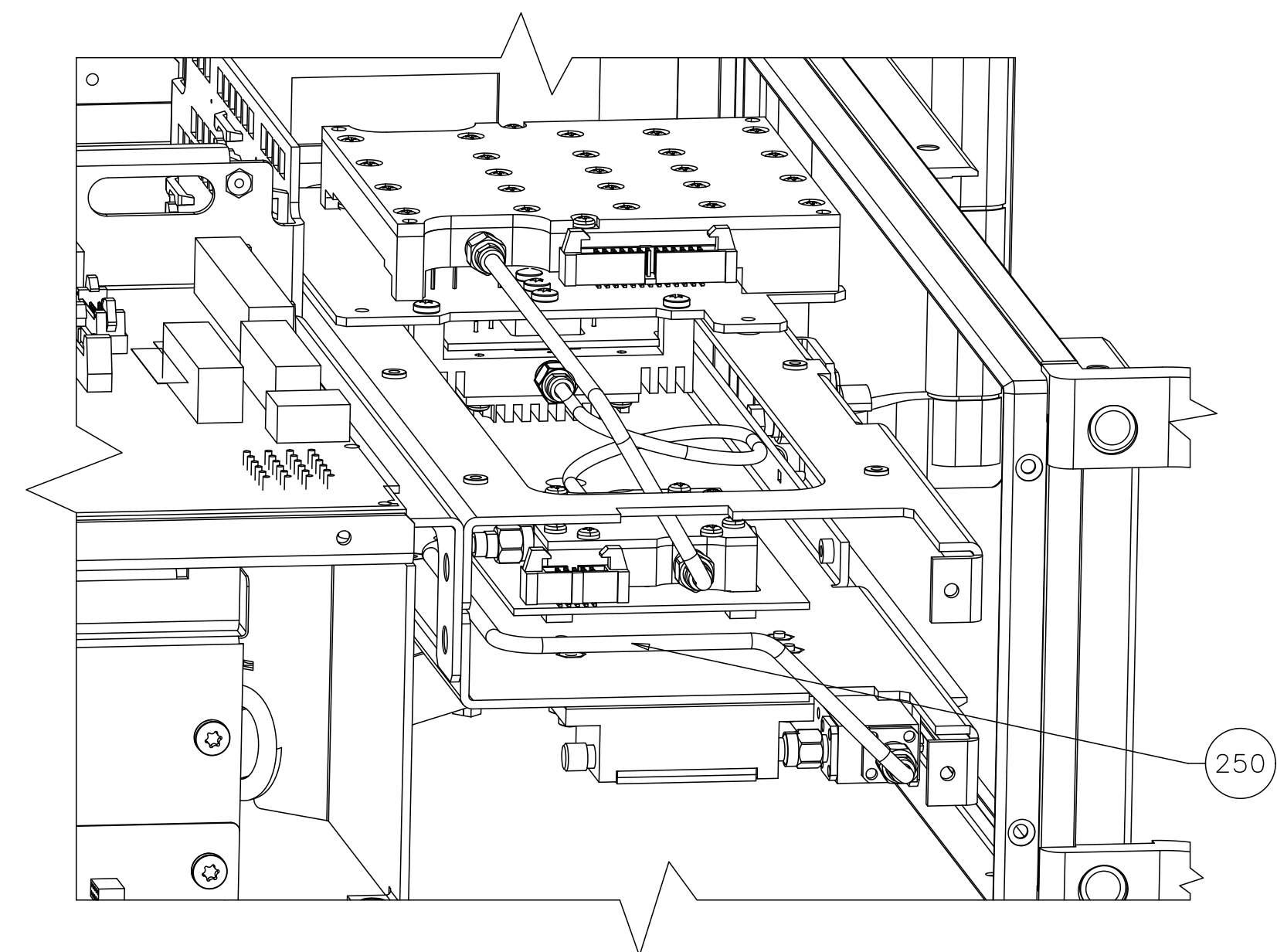
Die Nummern der Teile entsprechen der jeweiligen Position in der Stueckliste 1167.7204.01

The parts / items in this drawing are included in the corresponding parts list 1167.7204.01

3D Frontansicht / 3D Front View

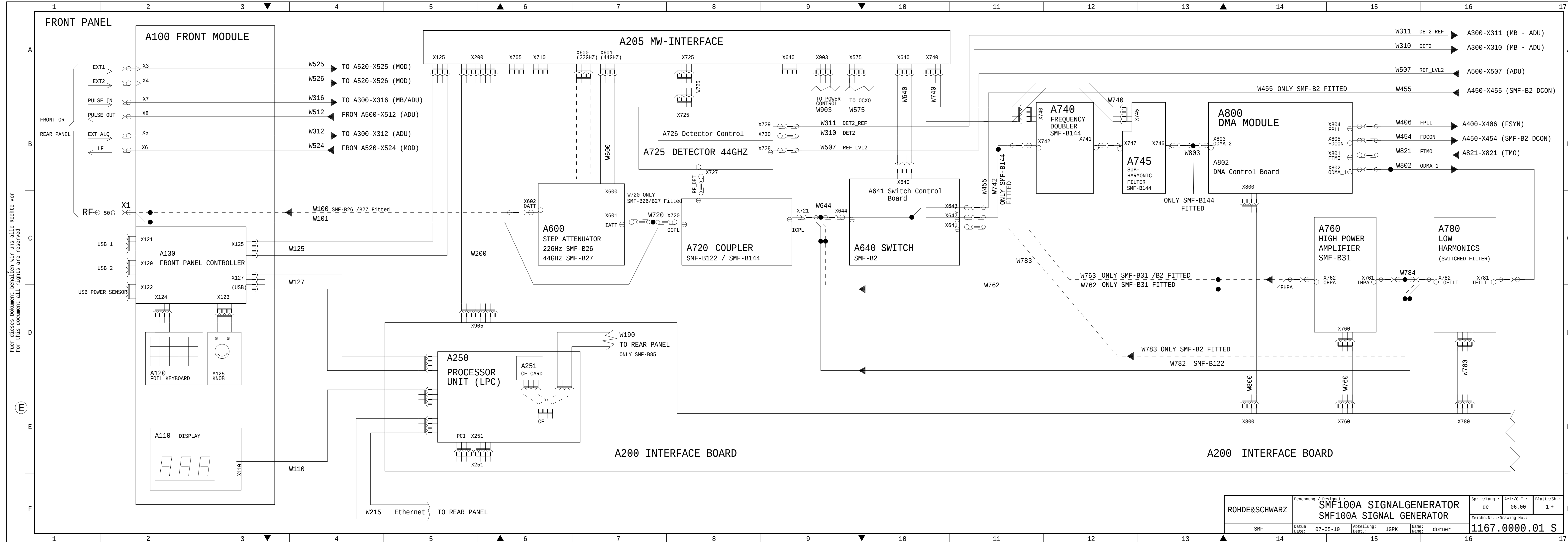


3D Seitenansicht links (Schnitt) 3D Left View in Section



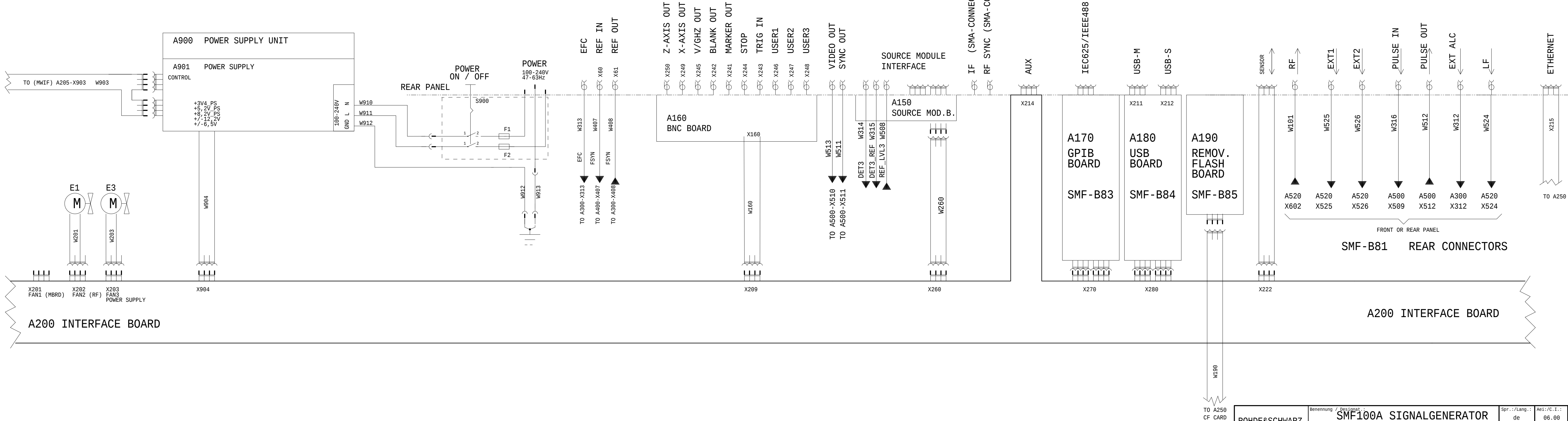
Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang. Ael. / C. I.	Blatt / Sh.
ROHDE&SCHWARZ	Benennung / Designation	SMF-B144 1 GHZ BIS 43.5 GHZ	de en	01.00
		SMF-B144 1 GHZ TO 43.5 GHZ		1
SMF-B144	Datum Date	2007-03-08	Abteilung Dept.	1GPK
	Name	ms	Zeichn.Nr. / Drawing No.	1167.7204.01

Block Circuit Diagram



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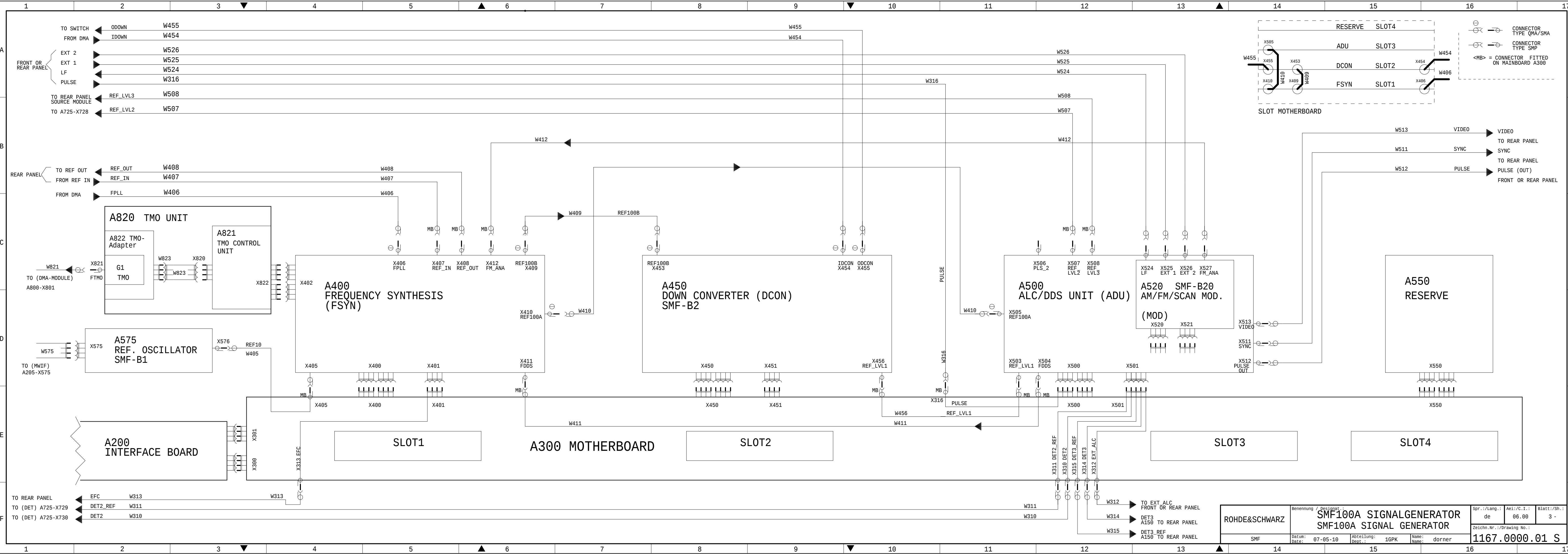


ROHDE&SCHWARZ	Benennung / Designat.: SMF100A SIGNALGENERATOR SMF100A SIGNAL GENERATOR			Spr.:/Lang.: de	Aei:/C.I.: 06.00	Blatt:/Sh.: 2 +
	Datum: 07-05-10			Zeichn.Nr.:/Drawing No.: 1167.0000.01 S		
SMF	Abteilung: 1GPK			Name: dorner		

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E

F



ROHDE&SCHWARZ	Benennung / Designat.: SMF100A SIGNALGENERATOR SMF100A SIGNAL GENERATOR			Spr.:/Lang.: de	Aei./C.I.: 06.00	Blatt:/Sh.: 3 -
	SMF	Datum: 07-05-10	Abteilung: 1GPK	Name: dorner	Zeichn.Nr.:/Drawing No.: 1167.0000.01 S	