



Service Manual

Vector Signal Generator R&S SM300

1147.1652.00 - Version 04

Instrument Order No. 1147.1498.03





ROHDE & SCHWARZ

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Test and Measurement Division
Mühldorfstraße 15
81671 München, Germany

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Before putting the product into operation for the first time, make sure to read the following



Safety Instructions

Rohde & Schwarz makes every effort to keep the safety standard of its products up to date and to offer its 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. This product 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, Rohde & Schwarz 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 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 operating manual and within its performance limits (see data sheet, documentation, the following safety instructions). Using the products requires technical skills and knowledge of English. It is therefore essential that the products be used exclusively by skilled and specialized staff or thoroughly trained personnel with the required skills. If personal safety gear is required for using Rohde & Schwarz products, this will be indicated at the appropriate place in the product documentation.

Symbols and safety labels

Observe operating instructions	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

Safety Instructions

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 other parts of the documentation. In these safety instructions, the word "product" refers to all merchandise sold and distributed by Rohde & Schwarz, including instruments, systems and all accessories.

Tags and their meaning

DANGER	This tag indicates a safety hazard with a high potential of risk for the user that can result in death or serious injuries.
WARNING	This tag indicates a safety hazard with a medium potential of risk for the user that can result in death or serious injuries.
CAUTION	This tag indicates a safety hazard with a low potential of risk for the user that can result in slight or minor injuries.
ATTENTION	This tag indicates the possibility of incorrect use that can cause damage to the product.
NOTE	This tag indicates a situation where the user should pay special attention to operating the product but which does not lead to damage.

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. It is therefore essential to make sure that the tags described here are always used only in connection with the associated documentation and the associated product. The use of tags in connection with unassociated products or unassociated documentation can result in misinterpretations 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 max. 2000 m. Unless specified otherwise in the data sheet, 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.

Safety Instructions

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.
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 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 (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. 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.
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 $V_{rms} > 30 V$, 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. Never remove the cover or part of the housing while you are operating the product. This will expose circuits and components and can lead to injuries, fire or damage to the product.

Safety Instructions

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 skilled electrician.
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 water, unless otherwise specified (see also safety instruction 1.). If this is not taken into account, there exists the danger of electric shock 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. 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 are hazardous waste. Dispose of them only in specially marked containers. Observe local regulations regarding waste disposal. Do not short-circuit batteries or storage batteries.
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. Please be aware of the weight of the product. Be careful when moving it; otherwise you may injure your back or other parts of your body.
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 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.



Por favor lea imprescindiblemente antes de la primera puesta en funcionamiento las siguientes informaciones de seguridad



Informaciones de seguridad

Es el principio de Rohde & Schwarz de tener a sus productos siempre al día con los standards de seguridad y de ofrecer a sus 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. Este 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 standards técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, deberá el usuario atenerse a todas las informaciones, informaciones de seguridad y notas de alerta. 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 solamente fue elaborado para ser utilizado en la industria y el laboratorio o para fines de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda ser dañada. 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 maluso del producto.

Se parte del uso correcto del producto para los fines definidos si el producto es utilizado dentro de las instrucciones del correspondiente manual del uso y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso de los productos hace necesarios conocimientos profundos y el conocimiento del idioma inglés. Por eso se deberá tener en cuenta de exclusivamente autorizar para el uso de los productos a personas péritas o debidamente minuciosamente instruidas con los conocimientos citados. 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.

Símbolos y definiciones de seguridad

Ver manual de instrucciones del uso	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 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 otro capítulo de esta documentación y que también son obligatorias de seguir. En las informaciones de seguridad actuales hemos juntado todos los objetos vendidos por 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	Indica un punto de peligro con gran potencial de riesgo para el usuario. Punto de peligro que puede llevar hasta la muerte o graves heridas.
ADVERTENCIA	Indica un punto de peligro con un potencial de riesgo mediano para el usuario. Punto de peligro que puede llevar hasta la muerte o graves heridas .
ATENCIÓN	Indica un punto de peligro con un potencial de riesgo pequeño para el usuario. Punto de peligro que puede llevar hasta heridas leves o pequeñas
CUIDADO	Indica la posibilidad de utilizar mal el producto y a consecuencia dañarlo.
INFORMACIÓN	Indica una situación en la que deberían seguirse las instrucciones en el uso del producto, pero que no consecuentemente deben de llevar a un daño del mismo.

Las palabras de señal corresponden a la definición habitual para aplicaciones civiles en el ámbito de la comunidad económica europea. Pueden existir definiciones diferentes a esta definición. Por eso se debiera tener en cuenta que las palabras de señal aquí descritas sean utilizadas siempre solamente en combinación con la correspondiente documentación 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

1. 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 principalmente 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.
A menos que se especifique otra cosa en la hoja de datos, se aplicará una tolerancia de $\pm 10\%$ sobre el voltaje nominal y de $\pm 5\%$ sobre la frecuencia nominal.
2. 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 périto 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. Despues de cada recambio de partes elementales para la seguridad deberá ser efectuado un control de

Informaciones de seguridad

- seguridad (control a primera vista, control de conductor protector, medición de resistencia de aislamiento, medición de medición de la corriente conductora, control de funcionamiento).
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 radiación HF, 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 está comprometido a valorar y señalar áreas de trabajo en las que se corra un riesgo de exposición a radiaciones aumentadas de riesgo aumentado 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 del la red de distribución. Si es necesario cambiar la preselección de la tensión también se deberán en caso dabo cambiar los fusibles correspondientes del prodcuto.
 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 ya que 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 (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 construcciones o instalaciones, se deberá instalar el interruptor al nivel de la instalación.

Informaciones de seguridad

12. No utilice nunca el producto si está dañado el cable eléctrico. 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.
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 de la EC950/EN60950.
18. Nunca abra la tapa o parte de ella si el producto está en funcionamiento. 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, deberá la toma de corriente estar protegida de manera que los productos o los usuarios 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 corto circuitos 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 el agua 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 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.

Informaciones de seguridad

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. Si las baterías o los acumuladores no son cambiados con la debida atención existirá peligro de explosión (atención celulas de Litio). Cambiar las baterías o los acumuladores solamente por los del tipo R&S correspondiente (ver lista de piezas de recambio). Baterías y acumuladores son deshechos problemáticos. Por favor tirenlos en los recipientes especiales para este fin. Por favor tengan en cuenta las prescripciones nacionales de cada país referente al tratamiento de deshechos. Nunca sometan las baterías o acumuladores a un corto circuito.
28. Tengan en consideración de que en caso de un incendio pueden escaparse gases tóxicos del producto, que pueden causar daños a la salud.
29. 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.
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 sujecion 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 tenidas en cuenta. 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 y el fabricante no asumirá ninguna clase de responsabilidad por accidentes o colisiones.
33. Dado el caso de que esté integrado un producto de laser en un producto R&S (por ejemplo CD/DVD-ROM) no utilice otras instalaciones o funciones que las descritas en la documentación. De otra manera pondrá en peligro su salud, ya que el rayo laser puede dañar irreversiblemente sus ojos. Nunca trate de descomponer estos productos. Nunca mire dentro del rayo laser.

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 Rohde & Schwarz equipment always up-to-date, please subscribe to our electronic newsletter at

<http://www.rohde-schwarz.com/www/response.nsf/newsletterpreselection>

or request the desired information and upgrades via email from your Customer Support Center (addresses see below).

Feedback

We want to know if we are meeting your support needs. If you have any comments please email us and let us know CustomerSupport.Feedback@rohde-schwarz.com.

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 Customer.Support@rsa.rohde-schwarz.com

East Asia

Monday to Friday (except Singaporean public holidays)

8:30 AM – 6:00 PM Singapore Time (SGT)

Tel. +65 6 513 0488

Fax +65 6 846 1090

E-mail Customersupport.asia@rohde-schwarz.com

Rest of the World

Monday to Friday (except German public holidays)

08:00 – 17:00 Central European Time (CET)

Tel. from Europe +49 (0) 180 512 42 42

From outside Europe +49 89 4129 13776

Fax +49 (0) 89 41 29 637 78

E-mail CustomerSupport@rohde-schwarz.com



Spare Part Express Service

Spare Part Express
Service address

Phone: +49 89 4129-12465

Fax: +49 89 4129-13306

Email: werner.breidling@rsd.rohde-schwarz.com

Information

All spare parts for this product are available from the spare part express service from Rohde & Schwarz.

List of Rohde & Schwarz Service Locations

**Note**

The latest list of Rohde & Schwarz Service Locations can be downloaded from the R&S Smart Instruments internet site:

www.smart-instruments.de

1 Service Concept

About this chapter	Chapter 1 describes the service concept, the installation and update of the software and how to install and remove the spare parts.
More information	Chapter 2 shows a performance test. Chapter 3 describes the adjustment of a 10 MHz crystal. Chapter 4 is a functional description. Chapter 5 provides troubleshooting information.

1.1 Introduction

Smart Instruments family 300 All measurement instruments of the Smart Instruments family 300 are based on the same mechanical principle: the instrument case consists of a closed metal carrier onto which two identical plastic cases are mounted. The lateral slot between the two plastic cases is used to insert the handle or to fix the adaptor for rack mounting.

The instruments differ by the printing on the front panel and the front and rear connectors. All connectors are firmly mounted to the generator module which is inserted into the instrument from the rear. The control PC and the power supply are also closed modules which are inserted into the instrument in a similar way as the generator module.

These three types of modules are interconnected via the backplane which is located at the front of the modules. The backplane distributes power from the power supply to the modules and provides access to the USB bus, which is the internal communication medium in the instruments.

The backplane, the control PC module and the power supply are identical for all instruments of the family 300 and are available as spare parts. The generator module itself is also a spare part and can be exchanged in case of failure. This replacement process eliminates the need of repair on component level and allows for fast repair cycles.

To ensure correct function of an instrument after module exchange the modules need to be registered inside the instrument using the Series300 wizard. If the control PC is exchanged, the MMI for an individual instrument (such as SM300) needs to be downloaded to the module.

The generator module spare part is already calibrated and does not require recalibration before mounting it into the instrument.

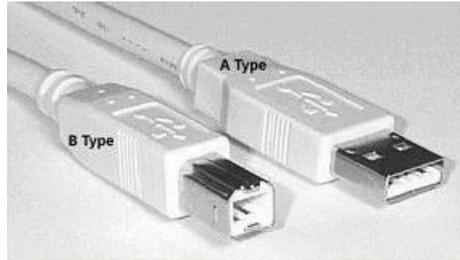
1.2 Installation of Software Updates and Drivers

Please refer also to the latest Release Note for software updates. Release Notes and update files are stored on the GLORIS firmware/software board.

1.2.1 Installing the Device Drivers

1.2.1.1 Installing Steps for Windows™ 2000

Connecting R&S SM300 to the PC R&S SM300 is connected to the PC via the USB interface. The connection cable has two plug types. Plug A is connected to the computer (↗ computer manual) and plug B is connected to the R&S SM300 (↗ R&S SM300 operating manual, Chapter 2.2 Rear View).



The CD ROM must be in the installation drive of the PC in order to install the drivers.

1. Switch on the R&S SM300 and the PC.
2. Connect the instrument to the PC with the USB cable. The PC (Windows™) recognizes the connected instrument and reports new hardware. This message appears only when an R&S SM300 is installed for the first time.



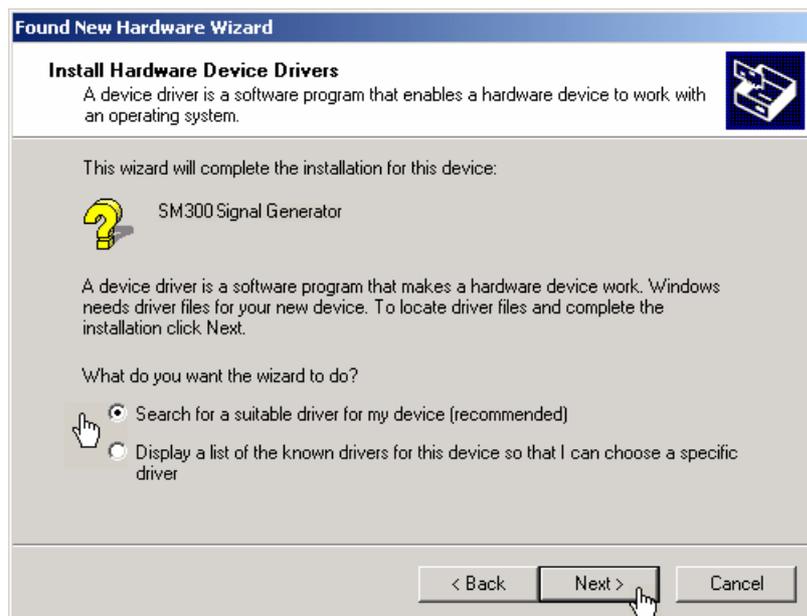
If the R&S SM300 is not automatically recognized, check that the USB master switch of the R&S SM300 is at AUTO (↗ R&S SM300 operating manual, Chapter 6.3.4.3 Configuring the Instrument Interfaces).

Installing device drivers

- Click **<Next>** to continue the installation.



- Select **<Search for a suitable driver for my device>** and click **<Next>** to continue the installation.

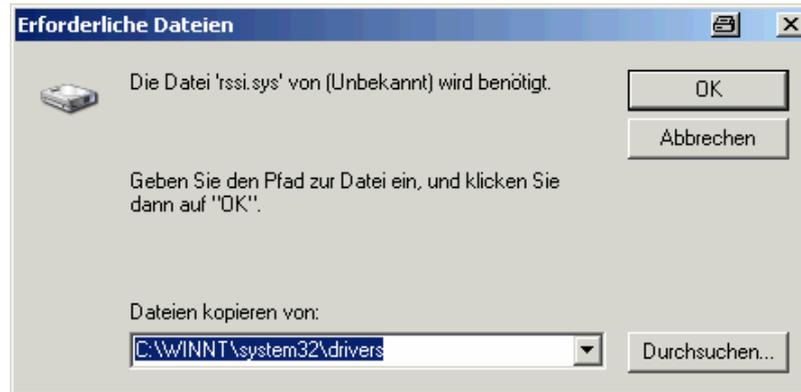


- Click **<OK>** to continue the installation.

**Caution**

Depending on the history of your driver installations, the installation procedure may vary in some steps. If your system is not able to locate the driver files, please select them manually. The driver files will be installed from the update software to the following directories:

- rssi.inf (c:\winnt\inf\)
- rssi.sys (c:\winnt\system32\drivers)



6. Click **<Finish>** to complete the installation.

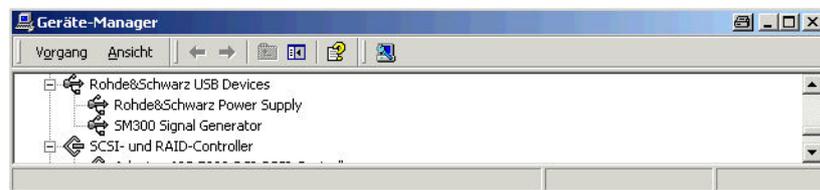


This is followed by the installation of the device driver for the **Rohde & Schwarz Power Supply**. Windows generally "remembers" all the necessary information when installing the Signal Generator R&S SM300 and installs the Rohde & Schwarz Power Supply without a query. However, depending on the system, the installation assistant might be activated.



In this case, repeat instructions 3. to 6. to successfully complete the installation.

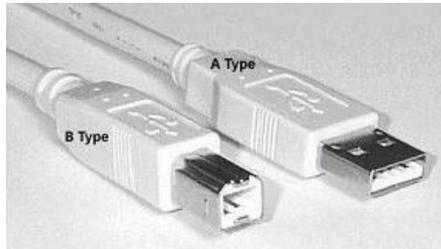
The drivers are now correctly installed and this can be checked using the device manager.



1.2.1.2 Installing Steps for Windows™ XP

Connecting R&S SM300 to the PC

R&S SM300 is connected to the PC via the USB interface. The connection cable has two plug types. Plug A is connected to the computer (↗ computer manual) and plug B is connected to the R&S SM300 (↗ R&S SM300 operating manual, Chapter 2.2 Rear View).



The CD ROM must be in the installation drive of the PC in order to install the drivers.

1. Switch on the R&S SM300 and the PC.
2. Connect the instrument to the PC with the USB cable. The PC (Windows™) recognizes the instrument when it is connected and reports new hardware. This message appears only when an R&S SM300 is installed for the first time.



If the R&S SM300 is not automatically recognized, check that the USB master switch of the R&S SM300 is at AUTO (↗ R&S SM300 operating manual, Chapter 6.3.4.3 Configuring the Instrument Interfaces).

Installing device drivers

3. Select **<Install the software automatically>** and click **<Next>** to continue the installation.

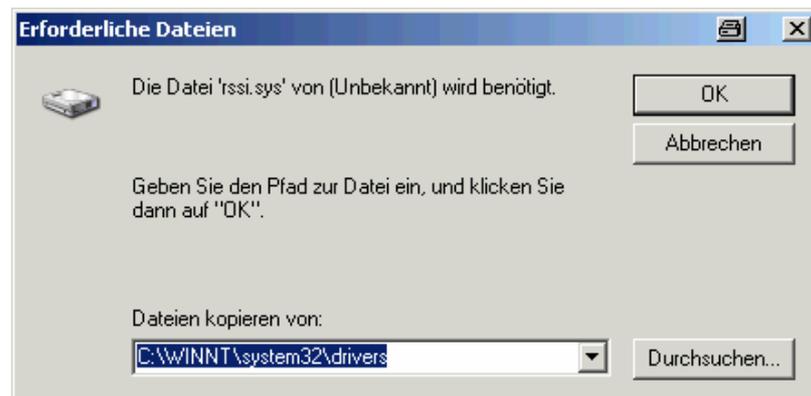


- Click **<OK>** to continue the installation.

**Caution**

Depending on the history of your driver installations, the installation procedure may vary in some steps. If your system is not able to locate the driver files, please select them manually. The driver files will be installed from the update software to the following directories:

- rssi.inf (c:\winnt\inf)
- rssi.sys (c:\winnt\system32\drivers)



- Click **<Finish>** to successfully complete the installation.

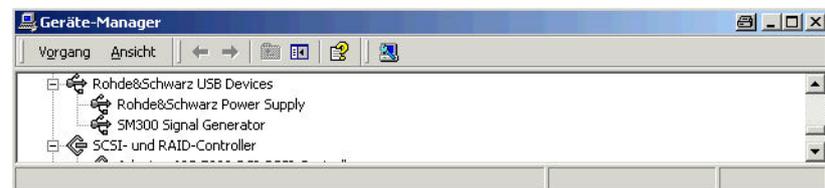


This is followed by the installation of the device driver for the **Rohde & Schwarz Power Supply**. Windows generally "remembers" all the necessary information when installing the Signal Generator R&S SM300 and installs the Rohde & Schwarz Power Supply without a query. However, depending on the system, the installation assistant might be activated.



In this case, repeat instructions 3. to 5. to successfully complete the installation.

The drivers are now correctly installed and this can be checked using the device manager.



1.2.2 Installation of Software Updates

Software application The software of the R&S SM300 modules (control PC, SM300 generator module, power supply) is updated using the "Series300 Software Manager" application. The following section provides an introduction on how to do this.



Note

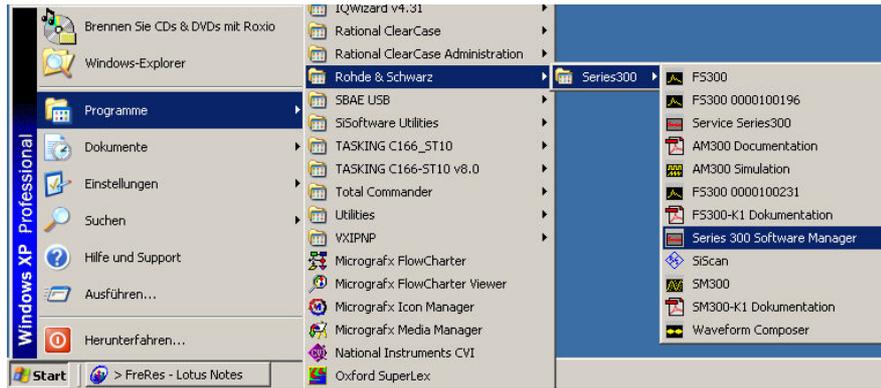
Please install the "Series 300 Software Manager" application. It is supplied also on the GLORIS board.

The "Series 300 Software Manager" checks which modules require update and performs the update for all modules in one step. It is not possible for the user to update individual modules only.

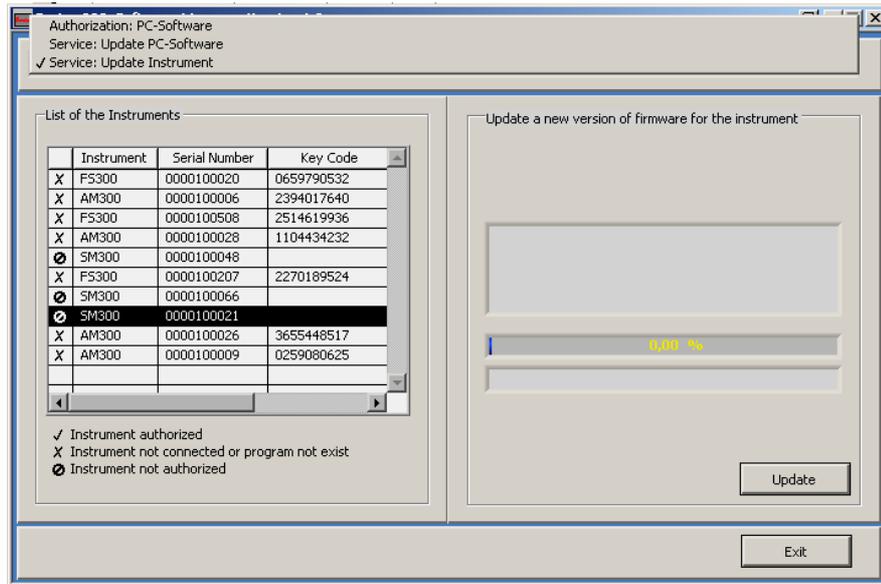
Example filename for update: SM300_Release_1_1.out.

Installation of Software Updates and Drivers

Starting the Series 300 Software Manager application

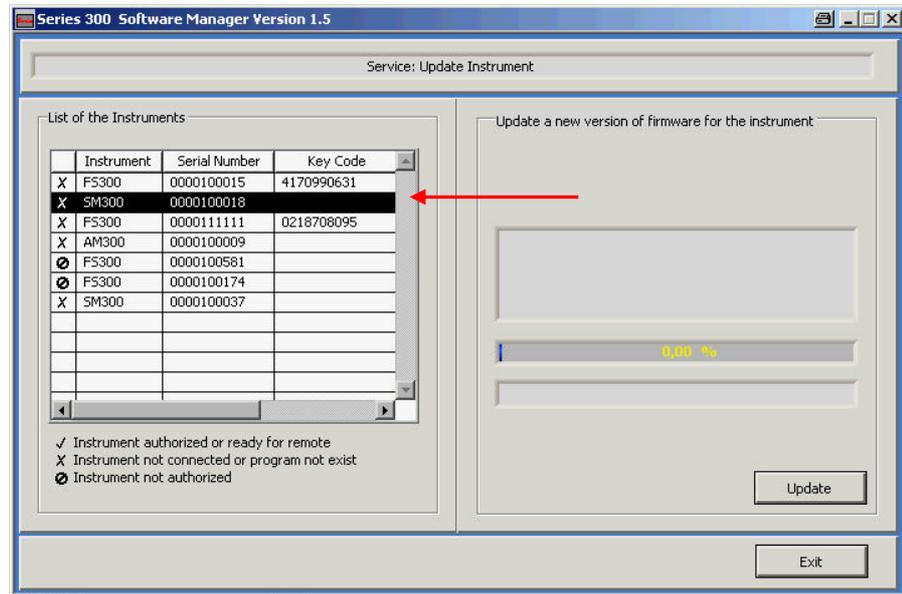


Series 300 Software Manager interface



1. Select the update function “Service: Update Instrument” by clicking the large button at the top with the left mouse button (outline highlighted in red).

Starting the update



The “Service: Update Instruments” window will open. It is used to control the update process.

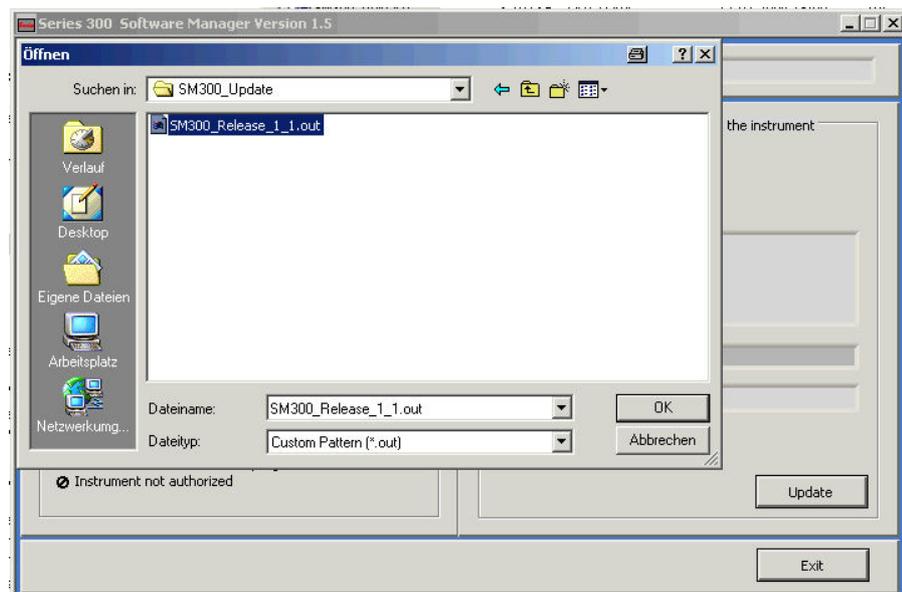
2. Select the device you want to update from the “List of Instruments” by clicking on it with the left mouse button.

The “Service: Update Instruments” window

3. Press the **<Update>** button to select the file you want to load into the instrument.

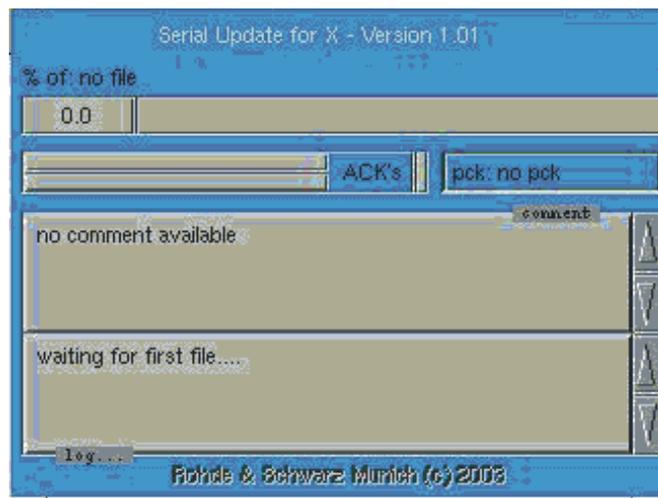
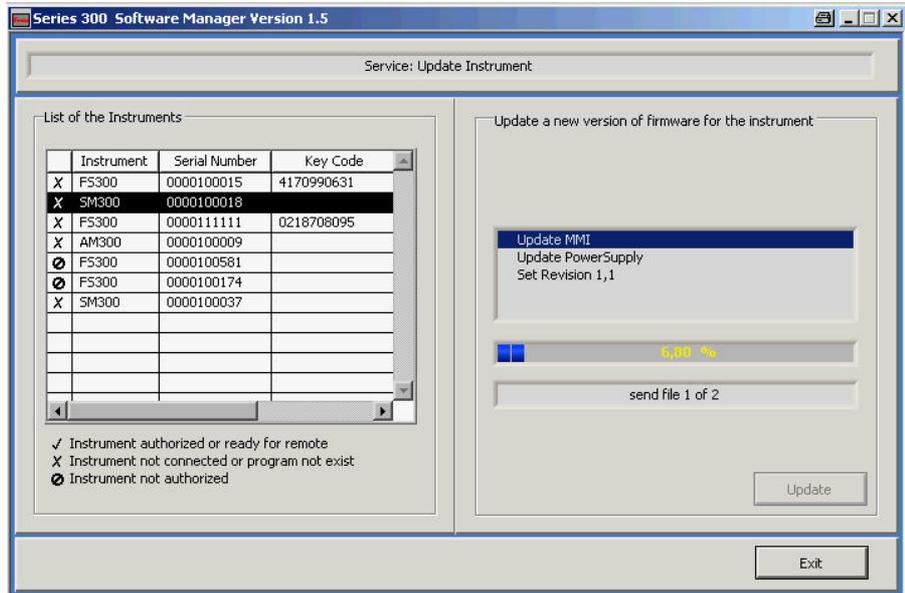
The update files have the extension .out. Depending on the contents of the .out file, the devices will be updated (control PC, SM300 generator module, power supply).

Select the update file



The following figure shows an example of the **MMI update** and a screenshot of the device during the update.

Update window for MMI update



The following figures show an **update of the SM300 generator module** and the power supply and a subsequent pop-up menu of the application.



Caution

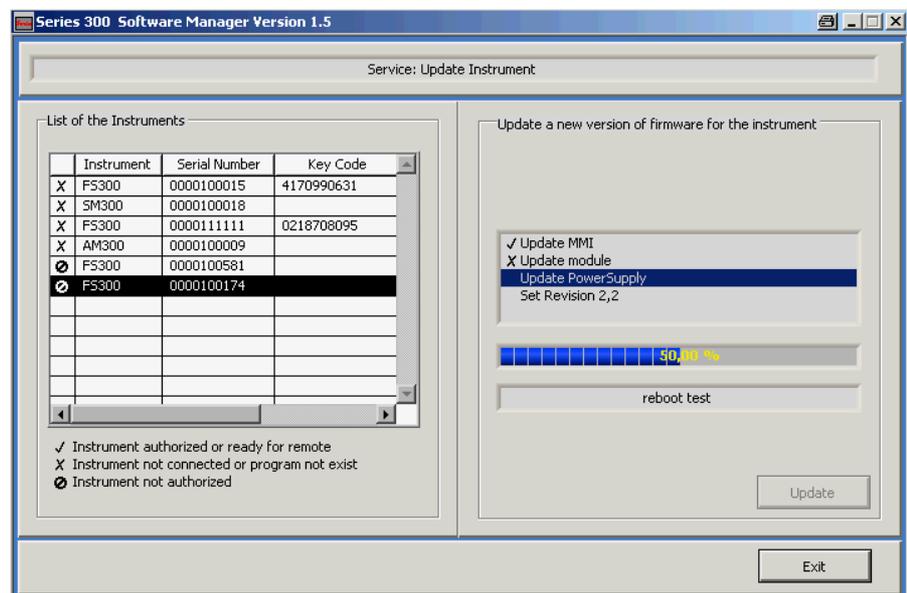
Do not switch off the device while the system is being updated if there is no prompt from the Series 300 Software Manager application. After the file is selected, the devices included in the .out file will automatically be updated.

Module software cannot be updated with a new version if not supported.

During the update of the SM300 module, the standard remote control screen will appear on the MMI. During the update of the power supply, no LEDs on the front panel of the R&S SM300 will light up, and the R&S SM300 will appear to be switched off. Please observe the update status on the external PC to make sure that the system is still running.

It might be necessary to install the USB drivers again during the update process.

Module update



Driver installation



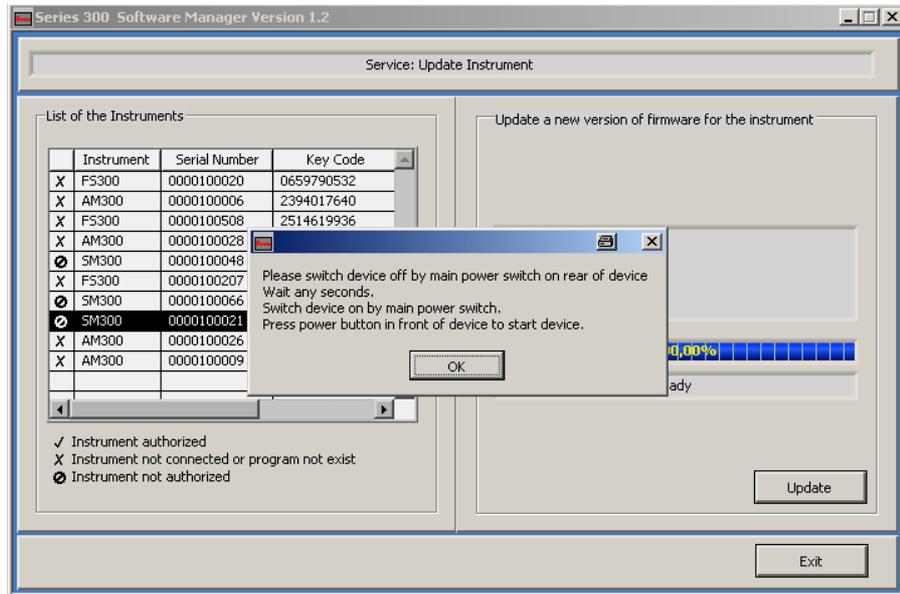
Caution

It might be necessary to install the power supply USB driver (rssi.sys) again during the update process. This must be done during a time interval of approx. 1 minute, otherwise the update of the power supply module will fail and the complete update needs to be restarted again.

Please carry out the instructions described in chapter "Installing the Device Drivers" again (see Section 1.2.1).

Installation of Software Updates and Drivers

Update of the SM300 generator module and the power supply and a subsequent pop-up menu of the application

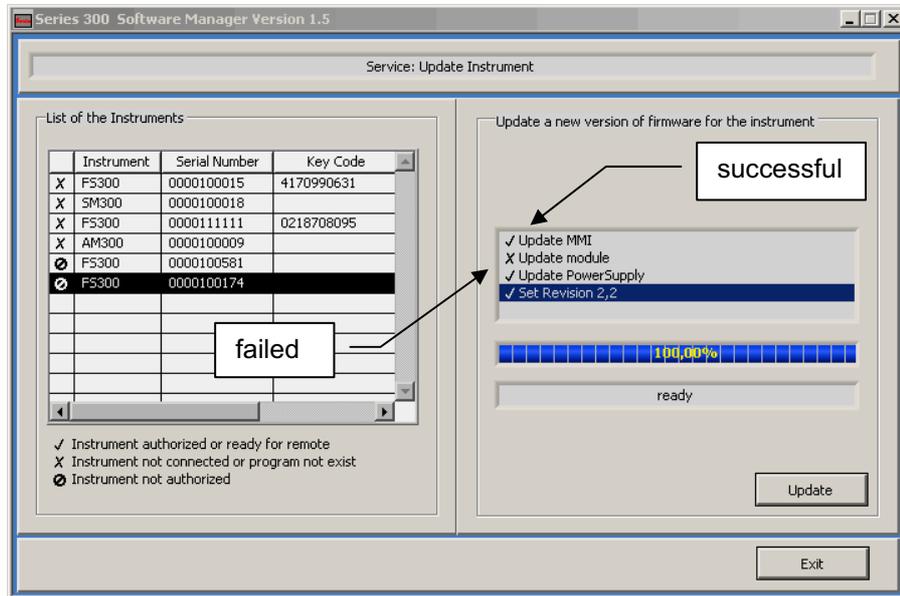


After switching on the instrument for the first time after a successful firmware update, the following system message might occur once:

SYSTEM-MESSAGES: dd/mm/yy hh:mm PS ERROR 0x6011: Parameter 0x000000C0 and 0x00

MMI Error windows (red popup): PS 0x6011

In this case the unit needs to be switched off and on again. This system message does not appear again during further power-on cycles.



Note

Successful updates are indicated with a tick (✓). Failed updates are indicated with a cross (x). Should any of the updates fail to install, please retry until they are successful.

1.3 Instrument Assembly for Board and Module Exchange

1.3.1 Tools and Accessories

Tools for assembly/ disassembly

- Torque screwdriver
- Phillips head screwdriver
- Slotted screwdriver
- Loctite 243, R&S Order No.: 0088.3675.00
- Tweezers
- Several containers for screws

General remarks about screws

- The screwdriver shown in the pictures is symbolic only. Screws must be tightened at the specific torque. (see section 1.3.1.1)!
- When tightening the screws, pay close attention to self-locking. If necessary, secure the screws in place with Loctite 243!

1.3.1.1 Torque Specifications for Screws

In accordance with
company standard
HVB130de

M	1.4	2	2.5	3	4	5	6	8	10
MAS	–	0.29	0.66	1.03	2.35	4.6	8	18	36
MAG	0.07	0.17	0.45	0.75	2.3	4.1	–	–	–

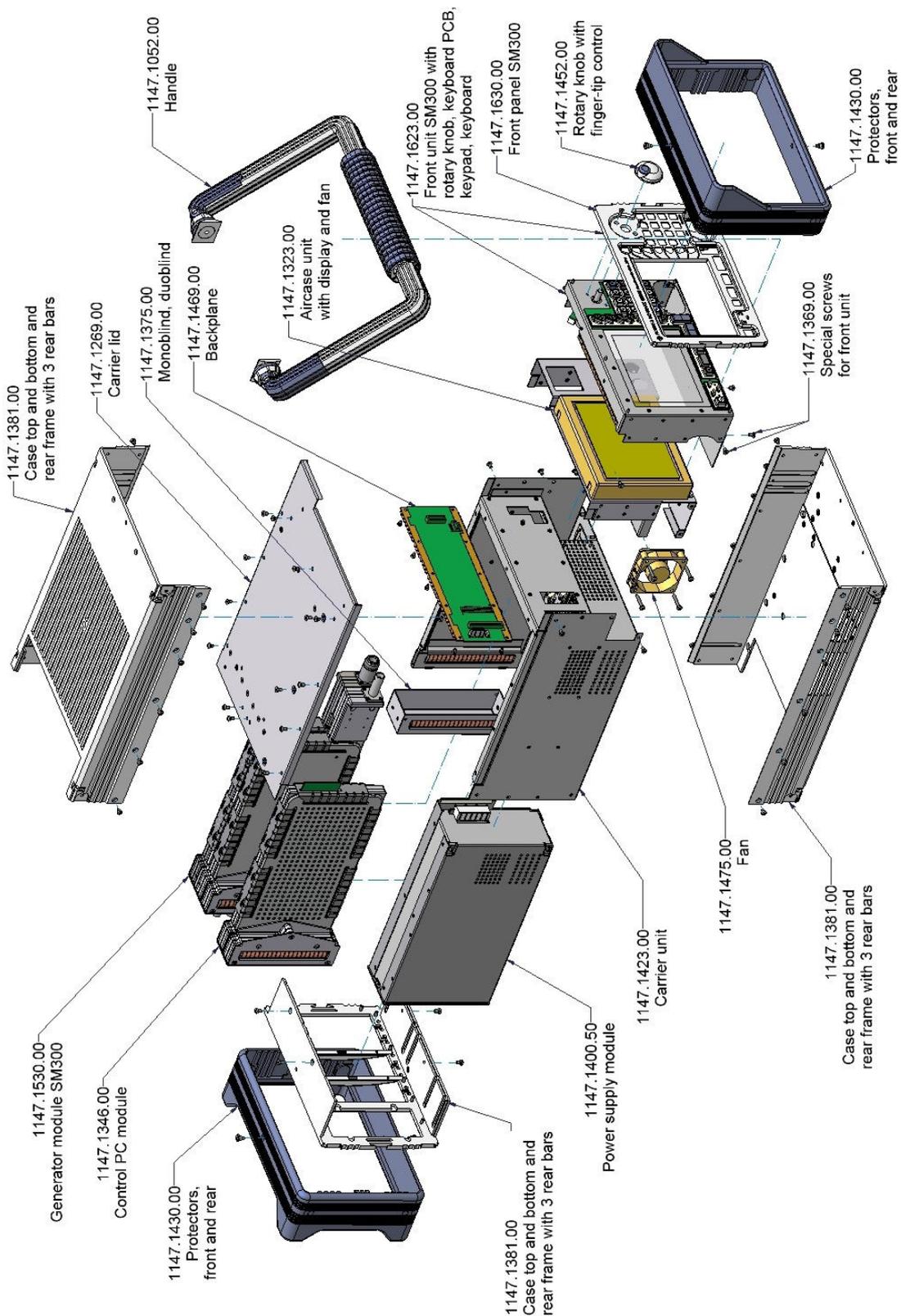
M = thread size

MAS = recommended starting torque for screws in Nm

MAG = recommended starting torque for set screws in Nm

1.3.2 Exploded Diagram with Spare Parts List

1.3.2.1 Exploded Diagram with Spare Parts List



1.3.2.2 Spare Parts List

Description	R&S Spare Parts Order No.
Protectors, front and rear	1147.1430.00
Handle	1147.1052.00
Case top and bottom and rear frame with 3 rear bars	1147.1381.00
Rotary knob with finger-tip control	1147.1452.00
Carrier lid	1147.1269.00
Front panel SM300	1147.1630.00
Front unit SM300 with rotary knob, keyboard PCB, keypad, keyboard	1147.1623.00
Monoblind, duoblind	1147.1375.00
Aircase unit with display and fan	1147.1323.00
Fan	1147.1475.00
Generator Module SM300	1147.1530.00
Control PC module	1147.1346.00
Power supply module	1147.1400.50
Backplane	1147.1469.00
Carrier unit	1147.1423.00
Special screws for front unit	1147.1369.00
R&S SM300 operating manual, German/English with drivers CD	1147.1646.00
Service manual SM300	1147.1652.00

1.3.3 Detailed Description of Replacement Procedure

1.3.3.1 Protectors, Front and Rear

Removing

- Undo 4 side screws and 2 screws at top and bottom.
- Remove screws using tweezers if necessary (see Figure 1-1).
- Take off protector (see Figure 1-2).



Figure 1-1



Figure 1-2

Installing

- Remount protector on instrument. The side tabs on the protector must be pressed into the slot.



Caution

The protector's soft plastic can become damaged during installation!

- Fasten 4 side screws (DIN7985 M3×12).
- Fasten 2 screws at top and bottom (DIN7985 M3×6 for front; DIN7985 M3×8 for rear).

1.3.3.2 Handle

Removing

- Remove front protector (see section 1.3.3.1).
- Open lateral tension lever on handle. Pull handle out towards the front using both hands.



Figure 1-3



Caution

Handle can jam in the slot if pressure is applied on only one side!

Installing

1. Open lateral tension lever on handle. With both hands on front side of handle, push it into lateral slots (see Figure 1-3).
2. Position handle as desired and close tension lever.
3. Install front protector. (see section 1.3.3.1).

1.3.3.3 Case Top and Bottom and Rear Frame with 2 Rear Bars

Removing the rear frame

1. Remove both protectors (see section 1.3.3.1).
2. Remove handle (see section 1.3.3.2).
3. Undo 12 screws on rear. (see Figure 1-5) .
4. Undo two upper and two lower screws.
5. Pull off frame with rear bars toward rear.(see Figure 1-6) (Rear bars are held in place in frame by means of frictional connection).

Removing the case top and bottom

1. Undo 12 side screws. (see Figure 1-4).
2. Undo upper and lower screws (one each).
3. Remove cases. (see Figure 1-7).



Note

Please note that spare part 1147.1381.00 is shipped with 3 rear bars. For the SM300 only 2 are needed.



Figure 1-4

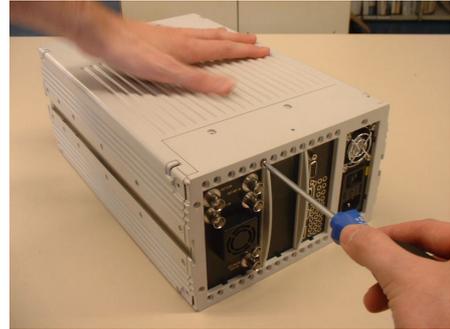


Figure 1-5

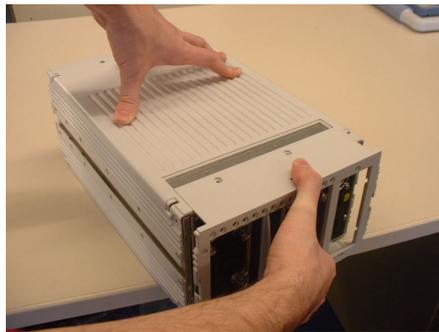


Figure 1-6



Figure 1-7

Installing the case top and bottom

1. Remount upper and lower case (until flush with front panel).
2. Fasten two upper and lower screws (DIN7985 M3×4).
3. Fasten 12 side screws (DIN7985 M3×4).

Installing the rear frame

1. Push frame into cases until it engages (audible).
2. Fasten 2 screws in side recesses and 2 screws in recesses for power pack. (DIN7985 M3×8).
3. Fasten 16 or 8 screws for modules (DIN7985 M3×8).
4. Fasten 2 upper and 2 lower screws (DIN7985 M3×5).
5. Install handle (see section 1.3.3.2).
6. Install both protectors (see section 1.3.3.1).

1.3.3.4 Rotary Knob including Finger-Tip Control

Removing the rotary knob

- Pull off rotary knob (may require using slotted screwdriver or tweezers).

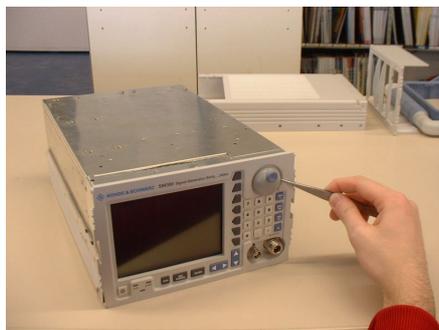


Figure 1-8

**Caution**

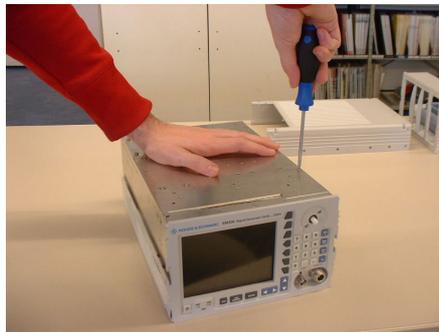
The front panel can easily be damaged when doing this!

Installing the rotary knob

- Put rotary knob back on and push into place manually.

1.3.3.5 Carrier Lid**Removing the carrier lid**

1. Remove both protectors (see section 1.3.3.1).
2. Remove handle (see section 1.3.3.2).
3. Remove rear frame and upper(!) shell (see section 1.3.3.3).
4. Undo 13 screws M3×4 (see Figure 1-9).
5. Undo 6 screws on power supply M3×5 (recessed).
6. Pull off carrier lid directly toward top. (see Figure 1-10).

**Figure 1-9****Figure 1-10****Caution**

Pay close attention to any damage to twist springs on top of carrier unit. If more than two contacts are missing, the twist spring must be replaced.

Damage to contact clamp in front unit is possible!

Openings (carrier unit) and holes (carrier lid) must be in alignment!

Installing the carrier lid

1. Remount carrier lid on carrier unit.
2. Fasten 13 screws (DIN7985 M3×4).
3. Fasten 6 screws on power supply (DIN7985 M3×5).

**Caution**

Openings (carrier unit) and holes (carrier lid) must be in alignment!

1. Install case top and rear frame (see section 1.3.3.3).
2. Install handle (see section 1.3.3.2).
3. Install both protectors (see section 1.3.3.1).

1.3.3.6 Front Panel SM300**Removing the front panel**

1. Remove both protectors (see section 1.3.3.1).
2. Remove handle (see section 1.3.3.2).
3. Remove rear frame and both cases (see section 1.3.3.3).
4. Undo 7 special screws (two on each side, see Figure 1-11; 3 at bottom see Figure 1-12).
5. Pull out the complete unit towards the front.

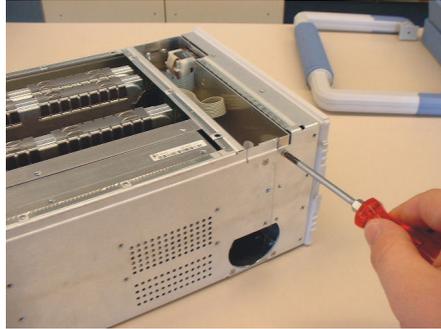


Figure 1-11

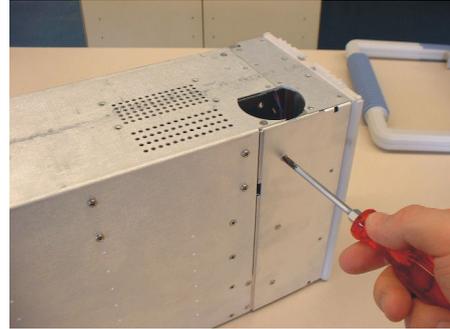


Figure 1-12

**Caution**

The keyboard cable is very short; do not stretch it too far!

6. Disconnect keyboard cable (short flat cable). (see Figure 1-13; Figure 1-14).
7. Remove rotary knob (see section 1.3.3.4).
8. Undo 2 screws below rotary knob and pull spinwheel out toward rear (see Figure 1-15).
9. Place front panel board on soft surface.
10. Undo 6 fastening screws on front panel SM300 (see Figure 1-16).
11. Remove keyboard PCB and keypad (see Figure 1-17, Figure 1-18).

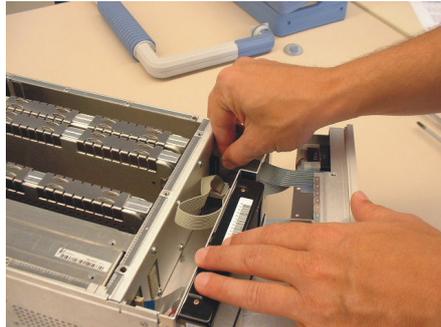


Figure 1-13

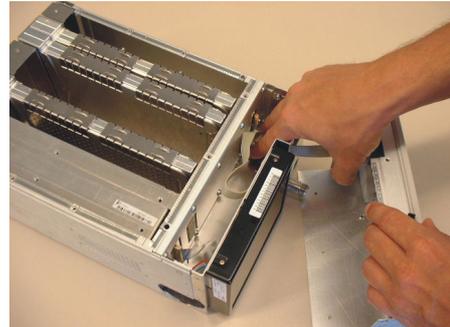


Figure 1-14

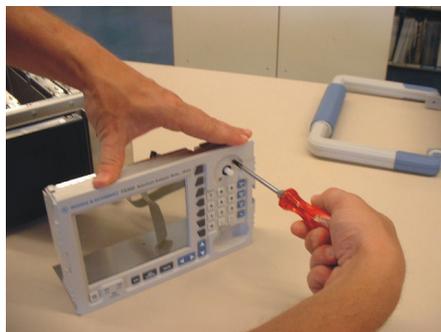


Figure 1-15

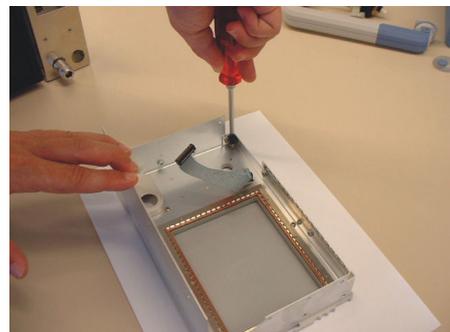


Figure 1-16

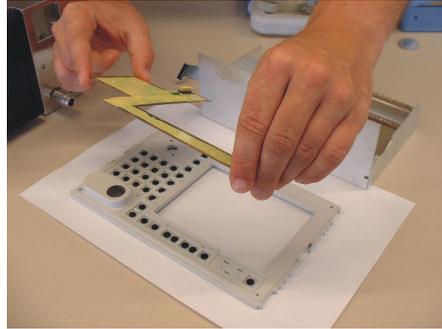


Figure 1-17

Installing the front panel

1. Place keypad and PCB back into front panel and press into place.
2. Place front unit on front panel and center it with edge of display window.
3. Fasten with 6 screws (DIN7985 M2.5×5).
4. Plug in keyboard cable.

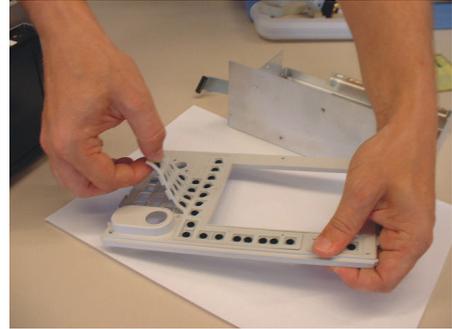


Figure 1-18



Caution

Make sure the color marking of spinwheel cable is at the top and the color marking of keyboard cable points towards the display plug!

5. Secure spinwheel with 2 screws in front unit (DIN7985 M2.5×8).
6. Install rotary knob (see section 1.3.3.4).
7. Mount front unit on carrier unit.
8. Fasten 7 special screws (similar to DIN7985 M3×5). When installing side special screws, pull front unit forward.
9. Reinstall both cases and rear frame (see section 1.3.3.3).
10. Reinstall handle (see section 1.3.3.2).
11. Reinstall both protectors (see section 1.3.3.1).

1.3.3.7 Disassembled Front Unit with Rotary Knob, Keyboard PCB, Keypad

Removing and Installing see section 1.3.3.6

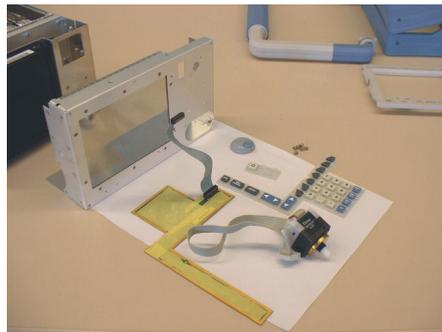


Figure 1-19

1.3.3.8 Duoblind

Removing the duoblind

1. Remove both protectors (see section 1.3.3.1).
2. Remove handle (see section 1.3.3.2).
3. Remove rear frame and both cases (see section 1.3.3.3).
4. Remove carrier lid (see section 1.3.3.5).
5. Undo screws for duoblind, located at bottom of instrument (see Figure 1-20).
6. Pull duoblind out toward rear of instrument (see Figure 1-21).



Caution

Module clamp can snag on adjacent module!

Installing the duoblind

1. Push duoblind into instrument from rear.



Caution

Module clamp can snag on adjacent module

2. Fasten screws located at bottom (DIN7985 M3×4).
3. Install carrier lid (see section 1.3.3.5).
4. Install both cases and rear frame (see section 1.3.3.3).
5. Install handle (see section 1.3.3.2).
6. Install both protectors (see section 1.3.3.1).

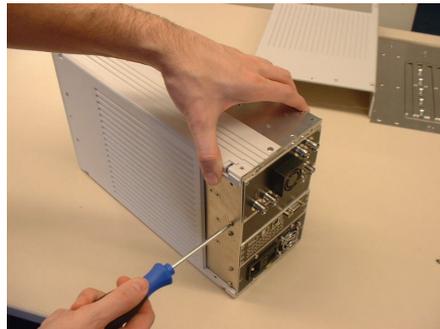


Figure 1-20



Figure 1-21



Note

Spare part 1147.1375.00 consist of a monoblind and a duoblind. For the SM300 only the duoblind is needed. The monoblind can be used for FS300.

1.3.3.9 Aircase Unit with Display and Fan

Removing aircase unit

1. Remove both protectors (see section 1.3.3.1).
2. Remove handle (see section 1.3.3.2).
3. Remove rear frame and both cases (see section 1.3.3.3).
4. Remove carrier lid (see section 1.3.3.5).
5. Remove front unit (see section 1.3.3.7).
6. Remove duoblind (see section 1.3.3.8).
7. Remove generator module (see section 1.3.3.11).
8. Undo 5 special screws on side (see Figure 1-22) and lower 2 special screws (see Figure 1-23).
9. Undo 2 countersunk screws (see Figure 1-24) located below the backplane.
10. Route spinwheel and keyboard cables through opening and disconnect from backplane. Disconnect display cable and fan cable latch from backplane.
11. Pull aircase unit off toward front (see Figure 1-25).



Caution

Make sure the color marking of spinwheel cable is at top and the color marking of keyboard cable points towards the display plug!

Installing aircase unit

1. Mount aircase unit on instrument from front.
2. Connect display cable and fan cable latch to backplane.
3. Route spinwheel and keyboard cables through opening and plug into backplane.
4. Press aircase unit onto carrier unit and fasten it in place with 5 special screws on side and 2 special screws at bottom (similar to DIN 7985 M3×5).
5. Fasten two countersunk screws located below backplane (DIN 96 M2.5×6).
6. Install generator module (see section 1.3.3.11).
7. Install duoblind (see section 1.3.3.8).
8. Install front unit (see section 1.3.3.7).
9. Install carrier lid (see section 1.3.3.5).
10. Install both cases and rear frame (see section 1.3.3.3).
11. Install handle (see section 1.3.3.2).
12. Install both protectors (see section 1.3.3.1).

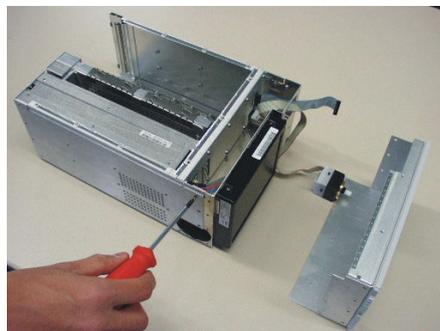


Figure 1-22

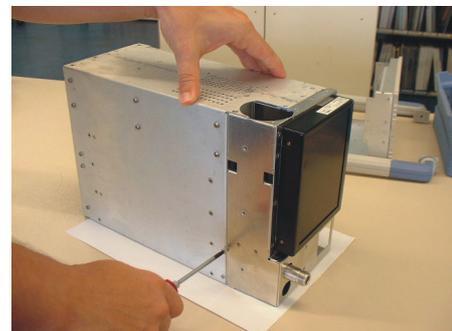


Figure 1-23



Figure 1-24

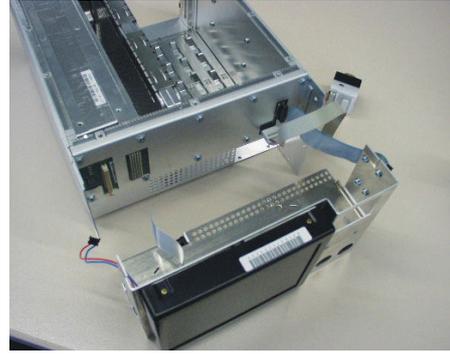


Figure 1-25

1.3.3.10 Fan in Aircase Unit

Removing the fan

1. Remove both protectors (see section 1.3.3.1).
2. Remove handle (see section 1.3.3.2).
3. Remove rear frame and both cases (see section 1.3.3.3).
4. Remove carrier lid (see section 1.3.3.5).
5. Remove front unit (see section 1.3.3.7).
6. Remove duoblind (see section 1.3.3.8).
7. Remove aircase unit (see section 1.3.3.9).
8. Undo 4 fan screws and remove with tweezers (see Figure 1-26).
9. Ply cable latch cover off. Ply sides of latch cover outward with tweezers and then pull cable latch cover toward rear (see Figure 1-28).
10. Route fan cable through opening in front unit and push fan out from aircase unit toward side (see Figure 1-27).

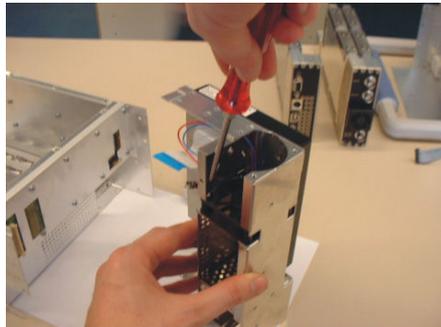


Figure 1-26

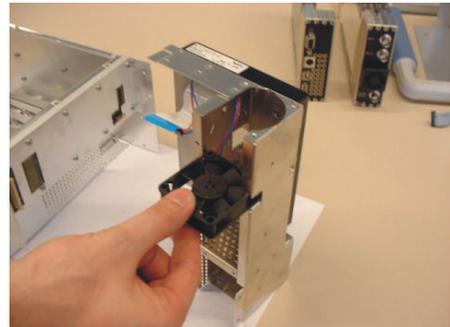


Figure 1-27

Installing the fan

1. Route fan cable through opening in aircase unit.
2. Push fan into aircase unit.
Note: Note proper air direction (arrow points inward) and most suitable position for fan cable.
3. Ply fan cable latch cover on. Make sure that cable latch engages in cover and check connection.
Note: Note pin assignment! (see Figure 1-29)

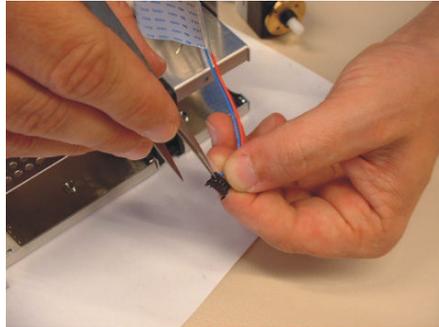


Figure 1-28

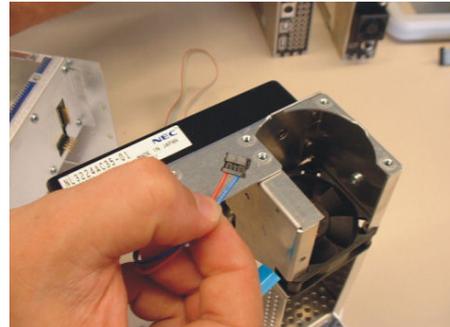


Figure 1-29

4. Fasten 4 fan screws, using tweezers to position them (DIN7985 M3×18).
5. Install aircase unit (see section 1.3.3.9).
6. Install duoblind (see section 1.3.3.8).
7. Install front unit (see section 1.3.3.7).
8. Install carrier lid (see section 1.3.3.5).
9. Install both cases and rear frame (see section 1.3.3.3).
10. Install handle (see section 1.3.3.2).
11. Install both protectors (see section 1.3.3.1).

1.3.3.11 Generator Module SM300

Removing generator module SM300

1. Remove both protectors (see section 1.3.3.1).
2. Remove handle (see section 1.3.3.2).
3. Remove rear frame and both cases (see section 1.3.3.3).
4. Remove carrier lid (see section 1.3.3.5).
5. Remove duoblind (see section 1.3.3.8).
6. Pull generator module out toward rear of instrument. When removing the module, make sure that the springs in the carrier unit are not damaged (see Figure 1-30).

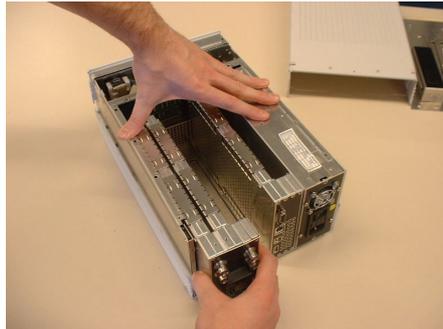


Figure 1-30

Installing generator module SM300

1. Insert generator module from the top, push it into the instrument until it connects to backplane. When installing the module, make sure that the springs in the carrier unit are not damaged.
2. Install duoblind (see section 1.3.3.8).
3. Install carrier lid (see section 1.3.3.5).
4. Install both cases and rear frame (see section 1.3.3.3).
5. Install handle (see section 1.3.3.2).
6. Install both protectors (see section 1.3.3.1).

1.3.3.12 Control PC Module

Removing the control PC module

1. Remove both protectors (see section 1.3.3.1).
2. Remove handle (see section 1.3.3.2).
3. Remove rear frame and both cases (see section 1.3.3.3).
4. Remove carrier lid (see section 1.3.3.5).
5. Remove duoblind (see section 1.3.3.8).
6. Pull control PC module out toward rear of instrument. When removing the module, make sure that the springs in the carrier unit are not damaged (see Figure 1-31).



Figure 1-31

Installing the control PC module

1. Insert control PC module from top, and push it in until it connects with backplane. When removing the module, make sure that the springs in the carrier unit are not damaged.
2. Install duoblind (see section 1.3.3.8).
3. Install carrier lid (see section 1.3.3.5).
4. Install both cases and rear frame (see section 1.3.3.3).
5. Install handle (see section 1.3.3.2).
6. Install both protectors (see section 1.3.3.1).

1.3.3.13 Power Supply

Removing the power supply

1. Remove both protectors (see section 1.3.3.1).
2. Remove handle (see section 1.3.3.2).
3. Remove rear frame and both cases (see section 1.3.3.3).
4. Remove carrier lid (see section 1.3.3.5).
5. Remove duoblind (see section 1.3.3.8).
6. Remove control PC module (see section 1.3.3.12).
7. Undo 6 special screws at bottom.
8. Pull power supply out toward rear. Do not apply strong pressure on backplane (risk of damage to conductor tracks on PCB). After removing power supply, remove any splinters that may be present in carrier unit.



Caution

Be careful not to lose the silicon profile.

Installing the power supply

1. Before installing power supply, check silicone profile in front area.
2. Insert power supply into carrier unit from rear and plug it into backplane. Do not apply strong pressure on backplane when doing so (risk of damage to conductor tracks on PCB).
3. Fasten 6 special screws at bottom (similar to DIN 7985 M3×5).
4. Install control PC module (see section 1.3.3.12).
5. Install duobind (see section 1.3.3.8).
6. Install carrier lid (see section 1.3.3.5).
7. Install both cases and rear frame (see section 1.3.3.3).
8. Install handle (see section 1.3.3.2).
9. Install both protectors (see section 1.3.3.1).



Figure 1-32

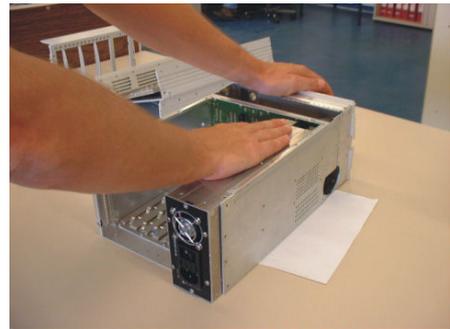


Figure 1-33

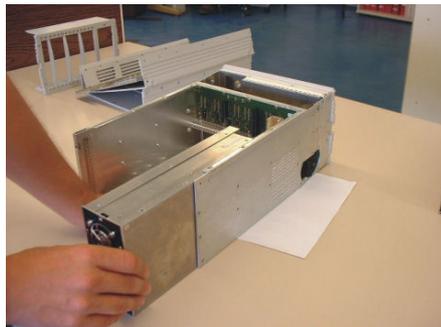


Figure 1-34



Figure 1-35

1.3.3.14 Backplane

- Removing backplane**
1. Remove both protectors (see section 1.3.3.1).
 2. Remove handle (see section 1.3.3.2).
 3. Remove rear frame and both cases (see section 1.3.3.3).
 4. Remove carrier lid (see section 1.3.3.5).
 5. Remove duoblind (see section 1.3.3.8).
 6. Remove control PC module (see section 1.3.3.12).
 7. Remove power supply (see section 1.3.3.13).
 8. Disconnect cables for spinwheel, keyboard, display and fan from backplane (see Figure 1-36).
 9. Undo 10 screws (see Figure 1-37).
 10. Push backplane diagonally toward bottom (see Figure 1-38) and position it horizontally in carrier unit (see Figure 1-39).
 11. Lift it diagonally and remove by lifting toward the top of the instrument (see Figure 1-40).



Caution

When inserting the backplane, make sure that it does not damage on the press-in nuts in the carrier unit.

12. Disconnect both clamps from backplane.

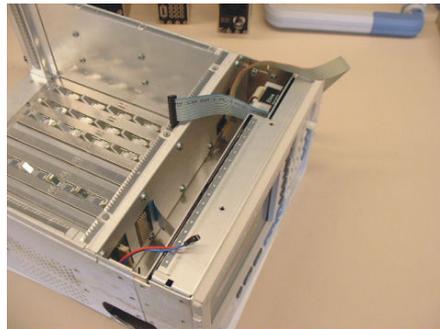


Figure 1-36

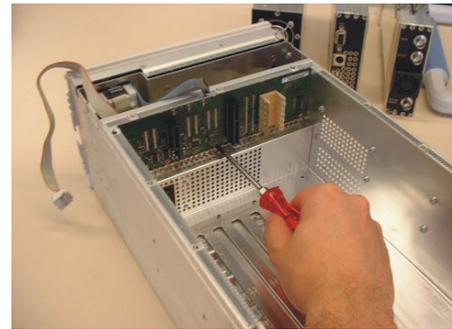


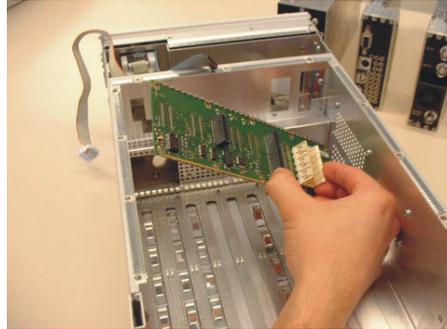
Figure 1-37



Figure 1-38



Figure 1-39

**Figure 1-40****Installing backplane**

1. Plug both clamps into backplane.
2. Route backplane diagonally into carrier unit and position it slightly before final position (see Figure 1-41). Plug flat cable (display) into connector and press upper and lower clips on connector. Make sure that neither of the two cables gets pinched between backplane and carrier unit when being installed.

**Figure 1-41**

3. Move backplane to its final position, which may require slightly bending the carrier unit apart to avoid contact with the press-in nuts.
4. Fasten 10 screws (DIN 7985 M2.5×4).
5. Plug cables for spinwheel and keyboard into backplane.

**Caution**

Make sure the color marking of spinwheel cable is at the top and the color marking of keyboard cable points towards the display plug!

6. Install power supply (see section 1.3.3.13).
7. Install control PC module (see section 1.3.3.12).
8. Install duoblink (see section 1.3.3.8).
9. Install carrier lid (see section 1.3.3.5).
10. Install both cases and rear frame (see section 1.3.3.3).
11. Install handle (see section 1.3.3.2).
12. Install both protectors (see section 1.3.3.1).

1.3.3.15 Carrier Unit

Removing the carrier unit

1. Remove both protectors (see section 1.3.3.1).
2. Remove handle (see section 1.3.3.2).
3. Remove rear frame and both cases (see section 1.3.3.3).
4. Remove carrier lid (see section 1.3.3.5).
5. Remove duobind (see section 1.3.3.8).
6. Remove control PC module (see section 1.3.3.12).
7. Remove power supply (see section 1.3.3.13).
8. Remove front unit (see section 1.3.3.7).
9. Remove aircase unit (see section 1.3.3.9).
10. Remove backplane (see section 1.3.3.13).

Installing the carrier unit

1. Install backplane (see section 1.3.3.13).
2. Install aircase unit (see section 1.3.3.9).
3. Install front unit (see section 1.3.3.7).
4. Install power supply (see section 1.3.3.13).
5. Install control PC module (see section 1.3.3.12).
6. Install duobind (see section 1.3.3.8).
7. Install carrier lid (see section 1.3.3.5).
8. Install both cases and rear frame (see section 1.3.3.3).
9. Install handle (see section 1.3.3.2).
10. Install both protectors (see section 1.3.3.1).

1.3.3.16 Special Screws for Front Unit

Removing the special screws

1. Remove both protectors (see section 1.3.3.1).
2. Remove handle (see section 1.3.3.2).
3. Remove rear frame and both cases (see section 1.3.3.3).
4. Undo 7 special screws (2 on each side, 3 at bottom).

Installing the special screws

5. Fasten 7 special screws (similar to DIN 7985 M3×5). When installing special screws on side, pull front unit off toward front.
6. Install both cases and rear frame (see section 1.3.3.3).
7. Install handle (see section 1.3.3.2).
8. Install both protectors (see section 1.3.3.1).

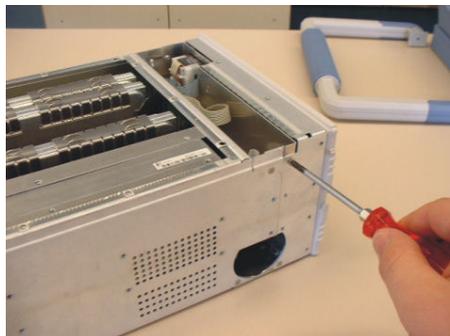


Figure 1-42

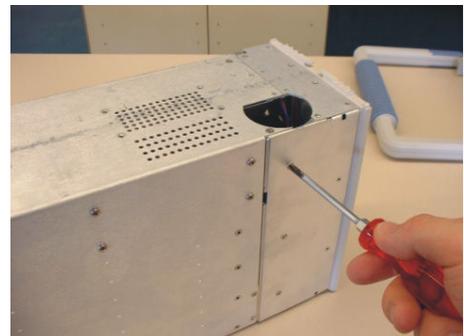


Figure 1-43

1.4 Replacing Modules

1.4.1 Replacing the Control PC Module

A step by step guide for the replacement of a control PC module

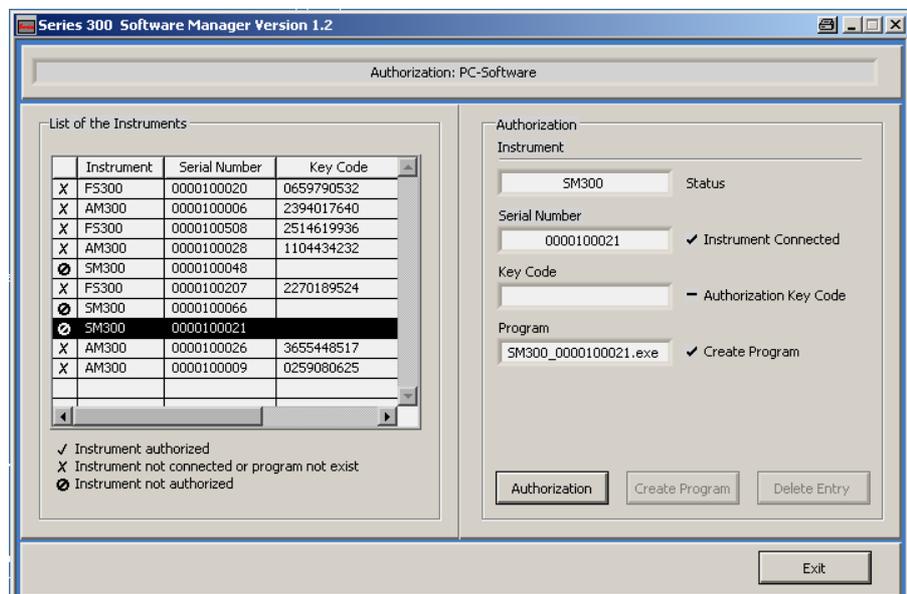
1. Change the control PC module (see section 1.3.3.12).
2. Connect the SM300 to the mains.
3. Switch on the SM300 at the rear (power supply AC switch); if the SM300 is in standby mode, switch it on using the button at the front.
4. The SM300 will now boot. You will see a blue “Booting...” screen on the MMI display, then a screen “Loading application ...” and finally a screen indicating “remote”. Now the instrument is ready for software download.

 **Note**

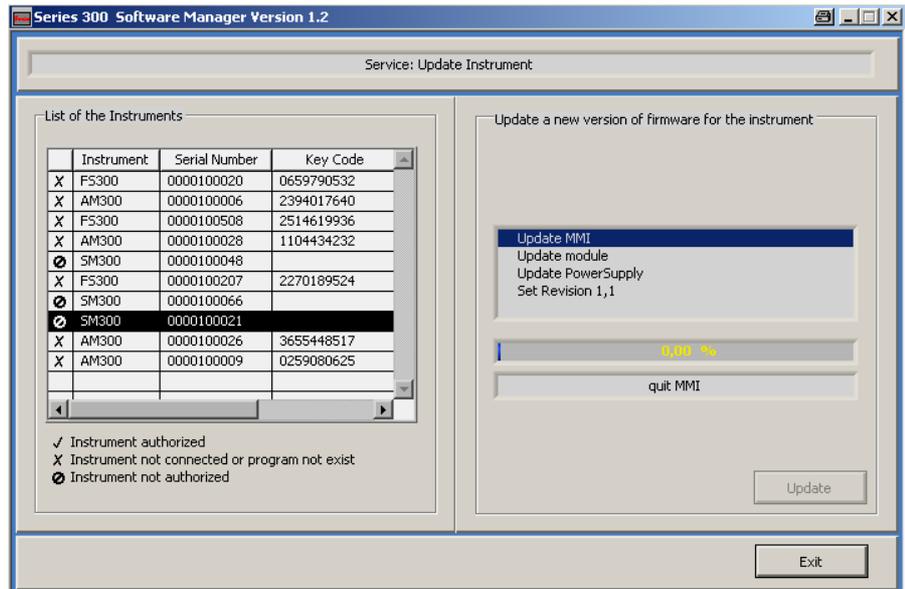
The control PC module spare part is delivered with MMI software for the FS300 on it, not for the SM300. Therefore please bear in mind that the software, before use, must be replaced with that of the SM300.

Installing the MMI Software

5. Using a USB cable, connect the SM300 to the PC which is running the “Series 300 Software Manager” software.
6. Start the “Series 300 Software Manager” software as described in section 1.2.2 “Installation of Software Updates”.
7. After the software window has opened on the screen, it will show an entry for the SM300 which has just been connected to the PC. The serial number of the device will appear next to it.
8. Click on the serial number of the SM300 you wish to repair. The table entry will be marked black and there will be a check mark in front of the text “Instrument connected”.



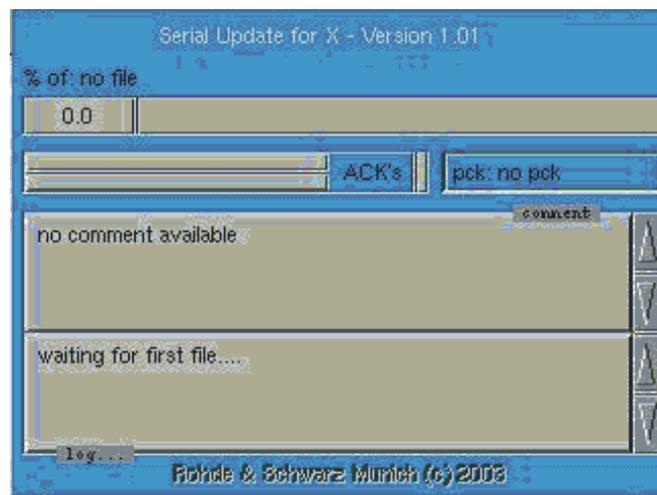
9. As described in section 1.2.2, open the “Update function” of the “Series 300 Software Manager” by clicking the large button at the top of the window.
10. Click the update button, and a dialog box will appear asking you to select an update file (*.out file).



Note

For every instrument (FS300, SM300, AM300) there is one “overall” *.out file containing all software/firmware packages needed for an update of the instrument.

- Click **<Update>**. The download will be started and the following window appears as long as the download is proceeding.



- Once the download is complete, the SM300 will reboot automatically.

Troubleshooting

If the SM300 is still in remote mode after restart it could be due to one of the following:

- The USB cable has not been removed from the instrument.
- There could be a problem with the USB connection (backplane, module) that is preventing the control PC from communicating with the generator module.
- A wrong software version has been installed, please check version of the *.out file.
- An error occurred during download and the software was not correctly installed. In this case, please repeat steps 5 to 12.

Replacing Modules

Registering module and verifying instrument

If you have not run the “Module Registration Software” as described in section 1.5, please do it now. Otherwise the replaced control PC module is not registered correctly within the instrument.

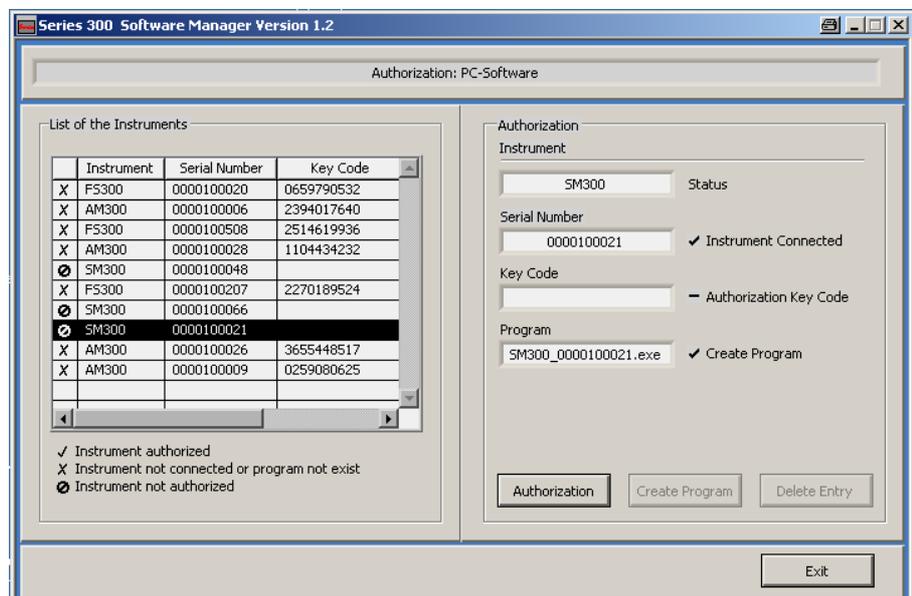
Once the instrument has been completely updated and reassembled, please follow the instructions in section 1.6 to ensure correct functionality of the whole instrument.

1.4.2 Replacing the Generator Module

A step by step guide for the replacement of a generator module

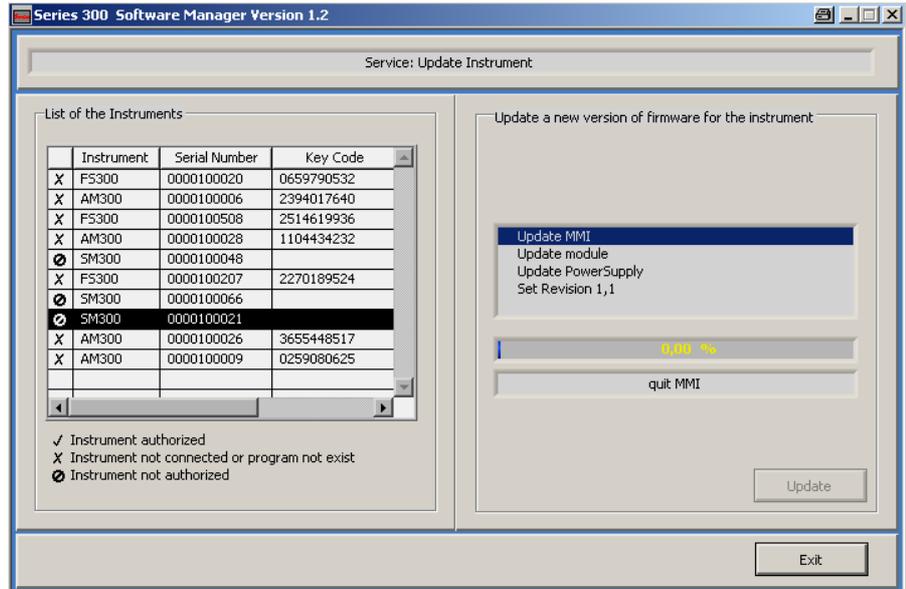
1. Change the generator module (see section 1.3.3.11).
2. Connect the SM300 to the mains.
3. Switch on the SM300 at the rear (power supply AC switch); if the SM300 is in standby mode, switch it on using the button at the front.
4. The SM300 will now boot. You will see a blue “Booting....” screen on the MMI display, then a screen “Loading application ...” and finally a screen indicating “remote”. Now the instrument is ready for software download.
5. Using a USB cable, connect the SM300 to the PC which is running the “Series 300 Software Manager” software.
6. Start the “Series 300 Software Manager” software as described in section 1.2.2 “Installation of Software Updates”.
7. After the software window has opened on the screen, it will show an entry for the SM300 which has just been connected to the PC. The serial number of the device will appear next to it.
8. Click on the serial number of the SM300 you wish to repair. The table entry will be marked black and there will be a check mark in front of the text “Instrument connected”.

Installing the MMI Software



Installing the MMI Software

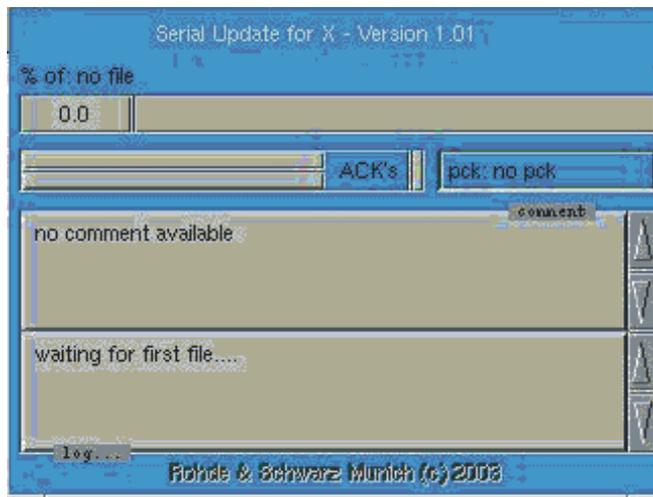
9. As described in section 1.2.2, open the “Update function” of the “Series 300 Software Manager” by clicking the large button at the top of the window.
10. Click the update button, and a dialog box will appear asking you to select an update file (*.out file).



Note

For every instrument (FS300, SM300, AM300) there is one “overall” *.out file containing all software/firmware packages needed for an update of the instrument.

11. Click **<Update>**. The download will be started and the following window appears as long as the download is proceeding.



12. Once the download is complete, the SM300 will reboot automatically.

Note

If the correct version of the firmware is already installed on the generator module, the "Series 300 Software Manager" will alert you. The update software screen will show and "X" in front of the entry for updating the firmware to signal that the firmware was not changed.

Replacing Modules

Troubleshooting

If the SM300 is still in remote mode after restart it could be due to one of the following:

- The USB cable has not been removed from the instrument.
- There could be a problem with the USB connection (backplane, module) that is preventing the control PC from communicating with the generator module.
- A wrong software version has been installed, please check version of the *.out file.
- An error occurred during download and the software was not correctly installed. In this case, please repeat steps 5 to 12.

Registering module and verifying instrument

If you have not run the “Module Registration Software” as described in section 1.5, please do it now. Otherwise the replaced generator module is not registered correctly within the instrument.

Once the instrument has been completely updated and reassembled, please follow the instructions in section 1.6 to ensure correct functionality of the whole instrument.

1.5 Module Registration Software

1.5.1 Introduction

Registration software

The Series 300 module registration software is used to register new or repaired modules inside an instrument and to write service information to the instrument.

The software can also be used to modify incorrect or to enter missing part numbers and serial numbers into modules (see “Incorrect or missing part numbers and serial numbers handling”).

Calibration certificate for the customer

It is also used to generate a one-page calibration certificate after the generator module is replaced. All generator modules that are shipped as spare parts have already been calibrated. The detailed calibration report for the module is included in the module shipment.

The calibration certificate for the customer consists of the one-page certificate plus the module calibration report. The one-page certificate is required in order to match the module part and serial numbers to the instrument part and serial numbers.

The Series 300 module registration software needs to be run **every** time any of the following spare parts have been replaced:

Spare parts

1147.1530.00	Generator module SM300
1147.1346.00	Control PC module
1147.1400.50	Power supply module
1147.1623.00	Front unit SM300 with spinwheel, keyboard PC and keypad
1147.1469.00	Backplane

Important note

The Series 300 module registration software is required in order to ensure that the instrument will function correctly after the measurement, power supply and PC modules are replaced.

If the front unit and backplane are replaced, instrument function will not be affected, but running the service application is highly recommended to track changes and repairs in the instrument.

This application was created for use in authorized services centers only. It allows the user to view instrument data and current instrument configuration. The user can enter all necessary information about modifications performed and store them on the instrument.

The steps to be performed are as follows:

Get serial numbers

- The serial numbers of the measurement, power supply and control PC modules will be read out automatically before and after replacement. If the backplane and front unit (which includes the keyboard PCB) are to be replaced, the board serial numbers of the spare parts need be read from the board or package label. Serial number format: Module serial numbers are six-digit decimal numbers. Example: 100576. Board serial numbers are nine- or ten-digit decimal numbers. Example: 235000645.

Save instrument data to a file

- This step is necessary only when replacing the power supply. The reason is that all instrument data is stored there. When replacing the power supply, the data from the old unit has to be read out, stored to a file and imported into the spare part. To do this, the user needs to connect the instrument (still containing the old power supply) to the USB, run the application, read out data from the instrument and store it to a file (see “Control buttons” below). If the power supply is so badly damaged that this cannot be done, it is important to read the instrument and backplane serial numbers from the instrument and write them down before starting the application.

Perform modifications

- After all necessary spare parts have been replaced, connect the instrument to the USB, run the application and use the Series 300 wizard to store all modifications on the instrument (see section “Series 300 wizard” below).

Incorrect or missing part numbers and serial numbers handling

- If the part number or serial number of the measurement module or PC module is incorrect or missing, connect the instrument to the USB, run the application and click “Read from Instrument” button. During this action the application detects the errors and displays the “Part number error” or “Serial number error” messages described in section “Possible Error Messages”. In this messages you will get the information about how is the application going to restore the values, or you will be asked to enter the values manually. After confirming these messages, the new part numbers and serial numbers will be written into the instrument before the application reaches the “PROGRAM IDLE” status (see section “User Interface Description”).

**Caution**

It is mandatory to restart the instrument to make these changes visible on MMI.

**Caution**

The control PC module software has to be installed before running this software, as described in section 1.4.1.

1.5.2 Software Release

This application can be used for R&S SM300 software release 1.1 and later versions.

1.5.3 Software Installation

1.5.3.1 Hardware Requirements

Minimum hardware to run the R&S Series 300 Module Registration Software

- PC with 500 MHz processor
- 128 MB RAM
- Monitor running in 1280×1024 resolution (recommended)
- USB port and USB cable

1.5.3.2 Software Requirements

Operating system and software to run the R&S Series 300 Module Registration Software

- **Windows 2000** or **Windows XP**
- **LabVIEW 6.1** runtime (will be installed automatically together with the application)
- **Windows USB** drivers (will be installed automatically together with the application)
- One of the following supported programs must be installed and set to the default printer if certificate generation is required (see section 1.5.3.3) certificate generator:
 - Acrobat Writer
 - PdfFactory
 - PdfFactory Pro

1.5.3.3 Installation Steps

Install the R&S Series 300 Module Registration Software

1. Download the Series 300 module registration software from the Lotus Notes database "Firmware-Software"
2. Save it to your hard disk, extract the **.zip** file and run the executable **setup.exe**
3. During installation, you will be asked to select "Destination folder". This document refers to this directory as:
[installation directory]
4. For certificate generation, copy the appropriate **.dll** file for **pdf** generation software that you installed (see section 1.5.3.2) from directory
[installation directory]\DLLs
5. to directory
[installation directory]\data
6. with the name
html2pdf.dll
7. Set the scaling of the **pdf** generation software to 90%.
8. To start the application, run the executable
[installation directory]\Series300-ModReg.exe

1.5.4 Software Usage

1.5.4.1 Software Directory Structure

Installation directory The software is stored on your hard disk in directory (see section 1.5.3.3):

[installation directory]

This directory contains the following subdirectories and files:

📁 *Certificates*

Instruments subdirectories will be generated after creation of a certificate for the particular instrument.

└─ 📁 <i>FS300</i>	Certificates for R&S FS300 instruments
└─ 📁 <i>SM300</i>	Certificates for R&S SM300 instruments
└─ 📁 <i>.....</i>	
📁 <i>data</i>	Data necessary for running the software
📁 <i>DLLs</i>	.dll files for supporting various pdf file generation software (see section 1.5.3.3)
📁 <i>Pictures</i>	Pictures used in the certificate
📁 <i>USB-driver</i>	Windows USB drivers, for Family 300 instruments
📄 <i>Series300-ModReg.exe</i>	Executable file
📄 <i>Series300-ModReg.ini</i>	Configuration file

1.5.4.2 Getting Started

Procedure

1. When you are ready to run the application for the first time or if your system configuration has been changed (reinstallation, default printer or pdf generation software was changed, configuration file was corrupted, etc.), follow the installation steps (see section 1.5.3.3).
2. Obtain the serial numbers for all required spare parts (they will be needed later) (see section 1.3.2.2).
3. If the power supply is replaced, connect the instrument to the USB first, run the Series 300 module registration software and store the data from the instrument by clicking the “Read from Instrument” and then “Save to File” buttons, if the power supply is still in a condition to do so.
4. Make the necessary changes on the instrument (replace the generator module, control PC module, power supply, backplane or front unit). Also install SW on control PC module.
5. Connect the instrument to the USB and run the Series 300 module registration software executable:
[installation directory]\Series300-ModReg.exe
6. If you are prompted to install a driver for the instrument, navigate the installer to the following directory (see section 1.5.4.1):
[installation directory]\USB-driver
7. Use control buttons to control the application (see “Control buttons” in chapter 1.5.5).

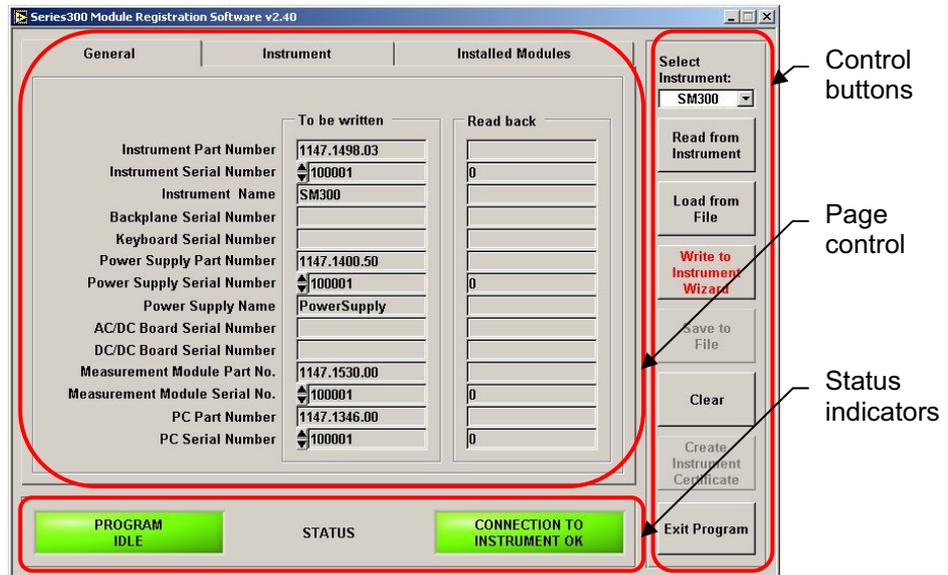
1.5.5 User Interface Description

After the program described above is started, the following user interface appears on the PC screen, including the default values in the indication fields.

Note

This software is generic for all series 300 products and uses therefore as a descriptor for the instrument specific module the term “Measurement Module“

Main window with default values



Page control

Information about the instrument is divided into the following pages:

- **General** – Brief overview of part numbers, serial numbers, instrument name and part names. This page contains two fields (see “Main window with default values” above):
 - **To be written**
Contains default part numbers and names together with serial numbers of currently connected measurement and PC modules.
 - **Read back**
Contains data read out from the instrument.
These fields allow you to see the difference between the current instrument configuration and data written in the instrument.
- **Instrument**
Provides all necessary information about the instrument, i.e. product date, part number, serial number, instrument name, backplane serial number, keyboard serial number, modification history, last service department information and instrument firmware release.
- **Installed Modules**
This is a module history list updated with the current instrument configuration (modules currently connected are indicated by a tick). When you load data from a file, this list will be updated.

Control buttons

- **Select Instrument**
Instrument type selector
- **Read from Instrument**
Reads data from instrument (“Read back” field) and detects the current instrument configuration (“To be written” field). (see “Page control” above).
- **Load from File**
Loads instrument data from the file (current instrument configuration will not be detected).
- **Write to Instrument Wizard**
The Series 300 wizard appears. It will guide you through the process of storing data on the instrument (see “Series 300 wizard for modifying instrument data” below).
- **Save to File**
Loads data from the instrument and stores it to a file.
- **Clear**
Sets all indicators and controls to their default values.
- **Create Instrument Certificate**
Generates a one-page instrument certificate (see “Certificate generator” below).
- **Exit Program**
Ends application.

Status indicators

- **Program status indicator**
Indicates the status of the application – as long as the colour red is shown (i.e. PROGRAM BUSY), the application will not accept any further input or button clicks from the user interface. The colour green (i.e. PROGRAM IDLE) indicates that the application is ready to accept commands from the user.



- **Connection status indicator**
Indicates whether the instrument selected by the instrument selector (see “Control buttons” above) is connected to the USB port.



 **Note**

After an instrument is connected to a PC via the USB, up to four seconds may elapse before the indicator responds.

Waiting for instrument status

When the application reads from or writes to the instrument and if the instrument is not in the appropriate status, the “Wait for instrument status” window will be displayed.



**Series 300 wizard
for modifying
instrument data**

The Series 300 Wizard is a utility for modifying data stored on the instrument. It is activated by clicking the "Write to the Instrument Wizard" button (see "Control buttons" above). The user is guided step by step through entering the data. The number of steps and required information depend on the action selected (see "Wizard start window" below). The last step is to store data on the instrument. The user may repeat this procedure as many times as necessary.

Wizard start window

Description of the actions:

- **Backplane exchange**
Choose this if the backplane was replaced. You will be asked to enter the serial number of the new backplane, so keep in mind to obtain it and write it down before starting the application.
- **Keyboard exchange**
Choose this if the front unit containing the keyboard was replaced. You will be asked to enter the serial number of the new keyboard, so keep in mind to obtain it from the label on the box and write it down before starting the application.
- **Measurement module exchange**
Choose this if the measurement module was replaced.
- **PC module exchange**
Choose this if the PC module was replaced.
- **Power supply exchange**
Choose this if the power supply was replaced. When replacing the power supply, the data from the old unit has to be read out, stored to a file. To do this, you need to connect the instrument (still containing the old power supply) to the USB, run the application, read out data from the instrument and store it to a file (see section "User Interface Description"). If the power supply is so badly damaged that this cannot be done, it is important to read the instrument, backplane and keyboard serial numbers from the instrument and write them down before starting the application.
- **Other action**
Choose this if none of above listed actions describes the modification you made on the instrument. This gives you the possibility to enter the modification description for the service circular, as well as the service information, and store them on the instrument.

Certificate generator The certificate generator generates a one-page calibration certificate for the instrument that is connected via a USB by using loaded data (see "Control buttons" above). The user is allowed to edit various fields (see "Certificate items window" below). After confirmation, a temporary .html file is created and converted to a .pdf file by using the pdf generation software (see section 1.5.3.3). This file is stored in the directory

[installation directory]\Certificates\[instrument type]

The file name is

partnumber_serialnumber_timestamp.pdf

**Note**

The **pdf** file that is generated (instrument certificate) may be divided into two pages. Therefore, the scaling of the software for generating the **pdf** file needs to be set to 90 %. (see section 1.5.3.3).

Certificate items window

Certificate Number	100000000000
Customer	
Order Number	
Place of Calibration	Althofen
Scope of Calibration	Standard-Calibration
Result of Calibration	Measurement Results in Specifications
Date of Calibration	28.10.2003
Performance on Receipt	
Extent of the Certificate	1 page Calibration Certificate

OK Cancel

1.5.6 Possible Error Messages

Too many devices error

Occurs if you connect more than one instrument at a time to the USB.



- Disconnect all unnecessary instruments and click "Continue".

Reading from PC module error

Occurs if reading from the control PC module was not successful.



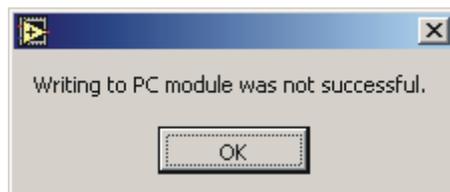
There are three possible reasons:

- The control PC module has not booted yet. Click <OK> and retry several seconds later.
- The control PC module has an older firmware version that does not support reading of its data.
- Control PC-SW still not updated.

Writing to PC module error

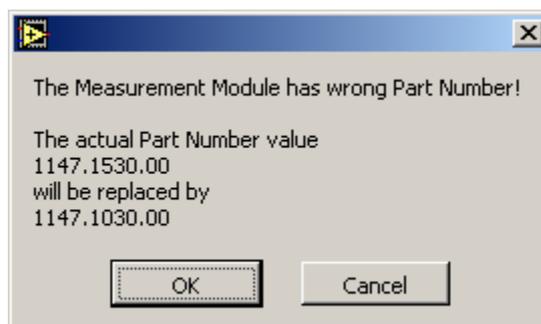
Occurs if writing to the control PC module was not successful. Two possible reasons:

- The control PC module has not booted yet. Click <OK> and retry several seconds later.
- The control PC module has an older firmware version that does not support writing data to the control PC.



Part number error

Occurs during "Read from Instrument " action when the measurement module or PC module has a wrong part number.



- Click **<OK>** to set the correct value
- Wait for "PROGRAM IDLE" status
- Restart the instrument

Serial number error

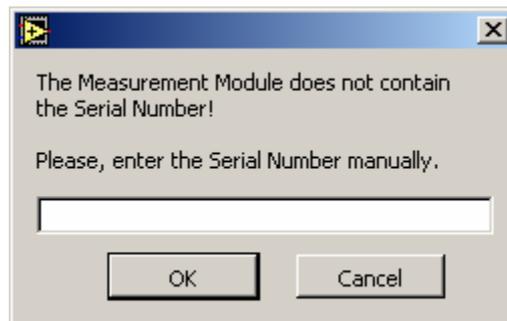
Occurs during "Read from Instrument" action if the measurement module or PC module does not contain the serial number.

If the corresponding serial number for this module was found, following window will appear:



- Click **<OK>** to the value displayed in the message
- Wait for "PROGRAM IDLE" status
- Restart the instrument

If the corresponding serial number for this module was not found, following window will appear:



- Enter correct serial number
- Click **<OK>** to set the entered value
- Wait for "PROGRAM IDLE" status
- Restart the instrument

Firmware release error

Occurs if the combination of firmware versions of the MMI, measurement module and power supply does not correspond to any of the firmware releases listed in the configuration file. There are two possible reasons:

- The configuration file is out-of-date. Get the latest version of the Series 300 module registration software or the updated .ini file (SM300-releases.ini in directory \data) supplied with the software release. This combination of firmware versions is not allowed. Update firmware of the whole instrument to a regular release.



**Significant values
difference error**

Occurs if values from an instrument are not identical to the default values specified for this instrument, i.e. part numbers and names.



- Click **<OK>** to continue and run the **Series 300 Wizard** to enter all modifications made to the instrument.

After you have exited the wizard and performed **Read from instrument**, this window should not appear again.

User abort error

Occurs if you cancel an action (e.g. Waiting for instrument status). The following window will appear:



- Click **<OK>** to continue.

1.6 Functional Test

Once the spare parts have been replaced, check that the instrument is functioning correctly:

1. Run the self test (result must be **passed**).
2. Check the spinwheel and each button on the keypad.
3. Check the USB bus interfaces with the Series 300 module registration software. If this software is running, the USB interface has been checked.
4. Check the reference frequency as described in section 2.4.3
5. Check the RF level as described in section 2.4.4.1 "Test method for level in measurement range of power meter"
6. Check the time and date, and correct them if necessary.
7. Check whether all messages have been deleted (see section 5.2.2).
8. Set instrument to the factory default settings (preset).

2 Performance Test

About this chapter

This chapter provides the necessary information for checking the technical data of the R&S SM300. Before proceeding, please read the general notes on the test procedure listed below. A list of the measuring equipment required for the performance test is provided in the next section. A test report form is found at the end of this chapter.

The rated characteristics of the signal generator are checked after a warm-up time of at least 15 minutes.

A defined default state is set prior to each measurement by pressing the PRESET key.

The values stated hereafter are not guaranteed values. Only the data sheet specifications are binding.

2.1 General

Technical data for the R&S SM300 can be checked in the following ways:

Check technical data by method A)

A) Have the instrument calibrated by an R&S representative with an ACS calibration system.

Advantages:

- Automatic procedure
- Low measurement uncertainties
- Calibration
- In most cases, the instrument does not have to leave the country

Check technical data by method B)

B) Send the instrument to the factory (Germany).

Advantages:

- Automatic procedure at final test setup
- Minimum measurement uncertainties
- Calibration and readjustment

Check technical data by method C)

C) Manual test as described in this chapter.

Required documents

- R&S SM300 operating manual
- R&S SM300 data sheet



Note

Recommended reading: Articles regarding "measurement uncertainty" and "tolerance analysis" in the ETSI Technical Report ETR 028, June 1997

2.2 Measuring Instruments and Auxiliary Equipment

Item	Instrument type	Recommended characteristics	Suitable unit	R&S Order No.	Use/measurement
1	Frequency counter	Frequency range up to fmax Internal reference 10 MHz	Contained in item 2 or 10		Frequency accuracy
2	RF spectrum analyzer	Frequency range up to fmax	FSEA30	1065.6000.30	Settling time level accuracy Output reflection coefficient Harmonics Spurious Pulse modulation
3	Signal generator with high spectral purity	Phase noise at 1 GHz: typ. <-128 dBc/Hz at 20 kHz	SME03 SMHU	1038.6002.03 0835.0011.52	output reflection coefficient SSB phase noise Broadband noise
4	Storage oscilloscope	DC 100 MHz, 0.1V/div			SSB phase noise Pulse modulation
5	Phase noise test set	Mixer: 10 MHz to fmax Lowpass filter: approx. 500 kHz Preamplifier with gain of approx. 30 dB, input noise <2 nV (1 Hz), DC decoupling after mixer for oscilloscope			SSB phase noise
6	RF power meter	9 kHz to fmax	NRVS with NRV-Z51	1020.1809.02 0857.9004.02	Level accuracy
7	Precision attenuators	Frequency range 9 kHz to fmax Attenuation 0 to 125 dB I = 50 Ω	RSG	0831.3515.02	Level accuracy
8	Controller	IEC-625-1 interface			Settling time
9	SWR bridge	1 MHz to fmax Directivity >40 dB	ZRC	1039.9492.55/ 1039.9492.52	Output reflection coefficient
10	Modulation analyzer	100 kHz to fmax , AM, FM, PhiM, stereo coder, distortion meter, weighting filter ITU-R, ITU-T	FMB with option FMA-B1, FMA-B2, FMA-B3, FMA-B4	856.5005.52 855.2002.52 855.0000.52 856.0003.52 855.6008.52	Residual FM Residual AM AM/FM/PhiM modulation LF generator
11	Sinewave generator	10 Hz to 500 kHz,	ADS AFG	1012.4002.02 0377.2100.02	AM/FM/PhiM modulation
12	AC/DC voltmeter	DC to 1 MHz	URE3	350.5315.03	LF generator
13	Low-noise preamplifier	5 kHz to fmax Gain >20 dB, Noise figure <10 dB			Level accuracy

Table 2-1: Measuring equipment and accessories

2.2.1 Test Setups

The quality of the test setup affects the measurement procedures.



Note

Use only high-quality coaxial cables and connectors, as well as calibrated measuring equipment.

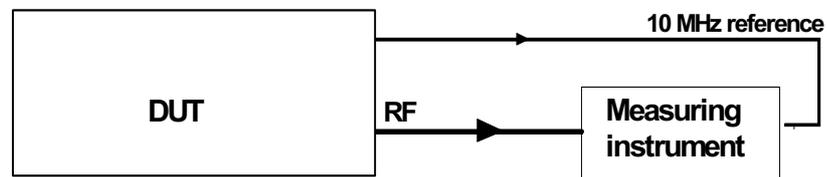
2.2.1.1 Standard Test Setup

Test setup 1:

Test equipment

- Modulation analyzer
(Table measuring equipment and accessories, item 10) or
- Spectrum analyzer
(Table measuring equipment and accessories, item 2) or
- Frequency counter
(Table measuring equipment and accessories, item 1)

Test setup



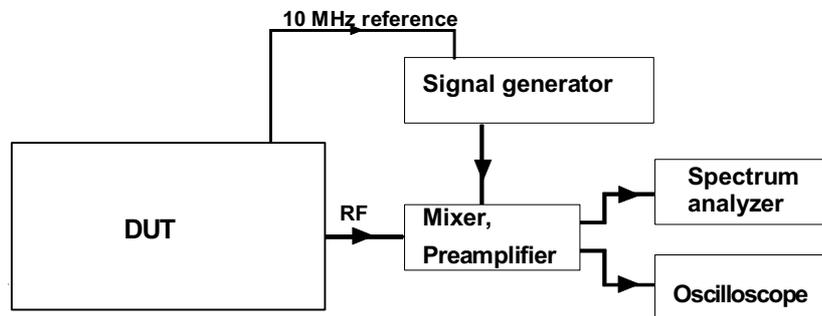
2.2.1.2 Test Setup for SSB Phase Noise

Test setup 2:

Test equipment

- Second signal generator
(Table measuring equipment and accessories, item 3)
- Phase noise test set, consisting of
- Mixer with lowpass and preamplifier
(Table measuring equipment and accessories, item 5)
- Oscilloscope (Table measuring equipment and accessories, item 4)
- Spectrum analyzer
(Table measuring equipment and accessories, item 2)

Test setup



2.3 Measurement Uncertainty

Perform a tolerance analysis Due to the specifications of the R&S SM300, the measuring equipment must meet stringent requirements. Since the required measurement uncertainty of the equipment depends on the test setup used, a tolerance analysis needs to be performed.

Tolerances in the test report To be able to trace back errors in the measurement, the measurement uncertainty should also be recorded in the test report.

The tolerances specified in the test report refer to the values specified in the data sheet, i.e. the measurement uncertainties of the test setup used are to be taken into account as well.

Unless otherwise specified, the specified tolerances indicated are always to be observed.



Note

Please take into account the ETSI Technical Report ETR 028. The specified tolerances refer to the R&S SM300 data sheet.

2.4 Manual Test Procedure

Measurement performance The suggested frequencies and levels at which the measurements should be performed have been selected according to the instrument concept. Other frequencies and levels can also be selected within the scope of values mentioned in the data sheet.



Note

Before testing the rated specifications, allow the instrument to warm up for at least 15 min. The ambient temperature should be 23° C to 26° C.

Before starting a test Before starting a test, use the Preset function of the R&S SM300 to place the instrument in a defined condition.

Tested specifications Several specifications in the data sheet are not tested. Due to their digital implementation, it is not necessary to test them directly. All these specifications are indirectly taken into account with the following measurements.

2.4.1 Self test

Self test before testing performance The R&S SM300 has a self test mode which checks that the instrument is functioning properly and assists in troubleshooting. Before the performance test is carried out, the self test should be called up and performed. If the self test fails, the following tests are for failure analysis only.

2.4.2 Interface Test

2.4.2.1 USB Bus Interfaces

- | | |
|-------------|--|
| Preparation | 1. Install PC Software R&S SM300-K1 on the PC. Connect the USB interface of the R&S SM300 and the external PC via USB cable. |
| Test | 2. Run R&S SM300-K1 as described in the operating manual. |
| Preparation | 3. Connect an appropriate printer or USB Stick to the R&S SM300. |
| Test | 4. Access this device by the external PC. The device must be accessible. |

2.4.3 Reference Frequencies

For adjustment of the internal reference oscillator, synchronization with an external reference frequency is performed.

**Note**

The resolution of the frequency counter/analyzer should be max. 1/10 of the maximum permissible deviation.

2.4.3.1 REF IN

The frequency and level ranges and the pull-in range are checked. The signal generator and the frequency counter must be synchronized (test setup 1). Set SM300 to 1 GHz and 0 dBm level.

- | | |
|-------------|--|
| Preparation | 1. Feed in at REF IN : 10 MHz sinewave, 0.5 V (rms) |
| Test | 2. The counter should read 1 GHz \pm resolution of counter. |
| Preparation | 1. Feed in at REF IN : 10 000.05 MHz sinewave, 0.5 V(rms) |
| Test | 2. The counter should read 1 GHz \pm resolution of counter. |
| Preparation | 1. Feed in at REF IN : 9 999.95 MHz sinewave, 2 V(rms). |
| Test | 2. The counter should read 1 GHz \pm resolution of counter. |

2.4.3.2 REF OUT

The level and frequency are checked.

- | | |
|-----------|--|
| Procedure | 1. Set the R&S SM300 to internal reference. |
| | 2. Measure at REF OUT : 10 MHz \pm 20 Hz, voltage >0.5 V(pp). |

2.4.3.3 Internal Reference Frequency Adjustment

The internal reference frequency oscillator can only be adjusted by using a PC and special adjustment software..

- | | |
|-----------|---|
| Procedure | Refer to Chapter 3 Adjustment of 10 MHz Crystal |
|-----------|---|

2.4.4 LEVEL

2.4.4.1 Level Frequency Response and Linearity

- Test equipment**
- Power meter (Table measuring equipment and accessories, item 6)
 - Precision attenuator (Table measuring equipment and accessories, item 7)
 - Spectrum analyzer (Table measuring equipment and accessories, item 2)
 - Low-noise preamplifier (Table measuring equipment and accessories, item 13)

Test method for level in measurement range of power meter (up to approx.- 20 dBm)

- Test setup** Connect power meter to RF output connector
- Settings on SM300**
- Test frequencies: 10.4 MHz, 249 MHz, 1549 MHz, 2989 MHz
 - Test level: 13 dBm, 10 dBm, 5 dBm, 0 dBm, -5 dBm, -10 dBm, -15 dBm, -20.0 dBm
- Settings on power meter**
- Carry out a ZEROING prior to level measurements
 - The level on SM300 is switched off with RF OFF
- Measurement**
- Measure level at test frequencies
 - The frequency response is the difference between the highest and lowest measured value
 - The level error is the deviation from the set value

Measurement procedure for low levels (> -115 dBm)



Caution

A prerequisite for correct measurements is that the components used are completely RF-shielded

- Test method** Levels below the measurement range of the power meter can be measured by a comparison measurement using a precision attenuator and a sensitive test receiver or spectrum analyzer. The reference is formed by a level measurement for example at 10 dBm by means of the power meter.
- Test setup**
- Connect a precision attenuator to the RF connector of SM300
- Connect the attenuator output to a spectrum analyzer via RF-leakage-proof test cables
- Connect 10 MHz references with each other
- Settings on SM300**
- Test frequencies: 10.4 MHz, 249 MHz, 1549 MHz, 2989 MHz
 - LEVEL 10 dBm
 - REF to external
- Settings on test receiver or analyzer**
- Center frequency = test frequency
 - Span = 0 Hz
- Settings on precision attenuator** Attenuation = 125 dB

Manual Test Procedure

Measurement

- Read the level on the test receiver or analyzer and note down as a reference value. It should be ideally 10 dBm minus 125 dB attenuation equal to -115 dBm. Select measurement bandwidth of a small value to obtain an accurate reading.
- The deviation from the reference value shown on analyzer display is the level error.

Measurement at levels < -115 dBm



Caution

A prerequisite for correct measurements is that the components used are completely RF-shielded

Test setup

Switch a low-noise preamplifier between SM300 and precision attenuator.

Measurement

- Perform a calibration at a measured level.
- It is thus possible to measure levels down to the lower limit of SM300

Level on SM300	Attenuation of attenuator
Reference level	125 dB
Reference level -5 dB	120 dB
Reference level -10 dB	115 dB
Reference level -20 dB	105 dB
Reference level -40 dB	85 dB
Reference level -60 dB	65 dB
Reference level -80 dB	45 dB
Reference level -100 dB	25 dB
Reference level -120 dB	5 dB
Reference level -125 dB	0 dB

Table 2-2: Test level 2 Level accuracy

2.4.5 Spectral Purity

2.4.5.1 Harmonic Suppression

Test setup	Test setup 1 with spectrum analyzer
Settings on SM300	<ul style="list-style-type: none"> ▪ LEVEL 10 dBm (or max. level according to data sheet) ▪ Frequencies: 10 kHz, 100 kHz, 1MHz, 10 MHz, 100 MHz, 300 MHz, 400 MHz, 500 MHz, 1000 MHz, 1200 MHz, 3000 MHz
Setting on spectrum analyzer	<ul style="list-style-type: none"> ▪ Reference level = test level+10 dB, 10 dB/div ▪ Span 300 kHz, resolution 30 kHz
Measurement	<ul style="list-style-type: none"> ▪ First measure the fundamental level as reference, then search signals at twice or three times the carrier frequency. Make sure that spectrum analyzer is not overdriven.
Evaluation	The harmonic suppression is the level difference between the measured harmonic and the SM300 output signal (in dBc, with reference to the carrier).

2.4.5.2 Nonharmonics Suppression

Test setup	Test setup 1 with spectrum analyzer
Settings on SM300	<ul style="list-style-type: none"> ▪ Level 10 dBm ▪ Frequencies: any



Note

The values for setting the spectrum analyzer are reference values and depend on the analyzer used. The required settings have to be verified prior to each measurement.

2.4.5.3 SSB Phase Noise

Test setup	Test setup 2
Settings on SM300	<ul style="list-style-type: none"> ▪ REF to external ▪ LEVEL 0 dBm (or level to mixer specification) ▪ FREQUENCY 1 GHz
Test method 2 (preferred)	You can use as an alternative the normal Phase Noise measurement functionality of the spectrum analyzer FSEA30 (Table 2-1, item 2)
Test method 1	The two signal generators are set to the test frequency and synchronized with a phase shift of 90° (phase quadrature). The RF carrier is suppressed by mixing to 0 Hz. Due to the phase quadrature the mixer supplies a voltage that corresponds to the phase difference between the input signals. The phase difference is measured by the spectrum analyzer and can be converted into SSB phase noise.

- Measurement**
1. Set the levels of two signal generators according to the specifications of the used mixer.
 2. For calibration purposes reduce level of EUT by 40 dB and detune a signal generator by 20 kHz. Test signal for harmonics, the 2nd and 3rd harmonic should be more than 30 dB below the fundamental. Measure and note reference value at 20 kHz on analyzer.
 3. Revoke detuning and establish phase quadrature. To do this, set level of EUT again and detune phase offset on auxiliary generator. Observe mixer output voltage on oscilloscope until the voltage becomes 0.
 4. Read noise voltage on analyzer that is normalized to a bandwidth of 1 Hz (noise level).

Evaluation Form the difference to the reference level and add 6 dB for the measured (correlated) second sideband and 40 dB to level switching. If the noise level of the second signal generator is not at least 10 dB better than that of the EUT, the noise component of the reference transmitter too has to be determined and calculated.

The value found gives the correct noise level.

Example The reference level is to be measured at 12 dBm. At 20 kHz a noise level of -78 dBm (1 Hz) is determined. The difference is 90 dB. In addition to the correction for the second sideband (6 dB) and the level switching (40 dB) a noise level of -136 dB or of -136 dBc (dB with reference to the carrier power) is obtained. If two identical signal generators are used, the result has to be reduced by 3 dB for the (uncorrelated) noise power of the reference transmitter.

The final result is then -139 dBc.

2.4.5.4 I/Q Modulation Frequency Response

- Test equipment** Spectrum analyzer (Table 2-1, item 2)
Signal generator (Table 2-1, item 3).
- Test setup** Connect the Rf output of the SM300 to the spectrum analyzer, connect the signal generator to the I input of SM300.
- Test method** By applying a sinewave AC voltage to the I (or Q) input, an amplitude modulation with a suppressed carrier is generated. The modulation frequency response is determined by measuring the sidebands as a function of the frequency of the applied AC voltage.

- Measurement**
1. Settings on SM300
Test level 0 dBm, test frequency 850 MHz
Select Modulation I/Q
 2. Settings on signal generator
Voltage 0.5 V (V_{peak}) corresponding to 4 dBm.
 3. Settings on analyzer
Center frequency = test frequency, Span 30 kHz, RBW 10 kHz,
Reference level = test level + 6 dB Scale 2 dB/div.
 4. Vary the frequency from 9 kHz to 40 MHz on the signal generator and measure the modulation sidebands on the analyzer (CENTER FREQ. = test frequency + modulation frequency).
 - The resulting level of a sideband frequency is the average value of the left and the right sideband level.
 5. For evaluation, determine the difference between the highest and the lowest sideband.
The modulation frequency response is the difference between the highest and the lowest sideband.

2.4.6 Pulse Modulation

- Test setup** Test setup 1 with spectrum analyzer
- Settings on SM300**
- LEVEL 10 dBm
 - FREQ 1 GHz
 - MODULATION PULSE On time 100 ms, Off time 100 ms
- Setting on spectrum analyzer**
- Center 1 GHz
 - Zero Span
 - Reference level 10 dBm
- Measurement**
1. Note down ON time on spectrum analyzer
 2. Note down OFF time on spectrum analyzer

2.4.7 Internal Modulation Generator



Note The setting time is a pure computing time and does not have to be measured.

2.4.7.1 Level Accuracy

- Test equipment** AC voltmeter (Table Measuring equipment and accessories, item 12)
- Test setup** Connect AC voltmeter to LF connector of SM300
- Settings on SM300** LF OUTPUT
Test level: 10 mV, 100 mV, 2 V
- Measurement** Measure output level

2.4.7.2 Frequency Response

- Test equipment** AC voltmeter (Table measuring equipment and accessories, item 12)
- Test setup** Connect AC voltmeter to LF connector of SM300.

Settings on SM300	Test frequency: 10 Hz, 100 Hz, 1 kHz, 10 kHz, 80 kHz
Measurement	Measure frequency response. The frequency response is the difference between the highest and lowest level.

2.4.7.3 LF-Spurious

Test equipment	Modulation analyzer (synchronized with SM300)
Test setup	Connect LF voltmeter input of modulation analyzer to LF connector of SM300.
Settings on SM300	Frequencies: 10 kHz, 20 kHz, 80 kHz
Measurement	<ol style="list-style-type: none">1. Read actual frequency on audio or spectrum analyzer.2. Read distortion on audio analyzer.

2.4.7.4 Residual FM

Test setup	Test setup 1 with modulation analyzer
Settings on SM300	<ul style="list-style-type: none">▪ LEVEL 0 dBm▪ FREQ 1 GHz
Setting on modulation analyzer	<ul style="list-style-type: none">▪ Demodulation: FM▪ Detector: RMS▪ Filter: ITU-T (CCITT) or 20 Hz to 23 kHz
Measurement	Read frequency deviation on modulation analyzer on both filters.

2.4.7.5 Residual AM

Test setup	Connect modulation analyzer to RF output of SM300
Settings on SM300	<ul style="list-style-type: none">▪ LEVEL 0 dBm▪ FREQ 1 GHz
Setting on modulation analyzer	<ul style="list-style-type: none">▪ Demodulation: AM▪ Detector: RMS▪ Filter: 20 Hz to 23 kHz
Measurement	Read residual AM on modulation analyzer.

2.4.8 Amplitude Modulation

2.4.8.1 AM Deviation Setting

Test setup	Test setup1 with modulation analyzer
Settings on SM300	<ul style="list-style-type: none">▪ LEVEL 0 dBm▪ FREQ 666 MHz▪ Test deviation of AM deviation: 1%, 30%, 80% LFGGenFreq 1 kHz
Measurement	Read modulation depth on modulation analyzer.

2.4.8.2 AM Frequency Response

Test setup	Test setup1 with modulation analyzer
Settings on SM300	<ul style="list-style-type: none"> ▪ LEVEL 0 dBm ▪ FREQ 222 MHz ▪ MODULATION AM DEPTH 60% LFGGenFreq 10 Hz to 20 kHz
Measurement	<ol style="list-style-type: none"> 1. Determine modulation frequency response by varying the LF generator frequency. 2. Repeat measurement with external sinewave generator with setting MODULATION EXT. (Setting on sinewave generator: 1 Vpeak) <p>The modulation frequency response is the difference between the highest and lowest modulation depth.</p>

2.4.8.3 AM Distortion

Test assembly	Test setup1 with modulation analyzer
Settings on SM300	<ul style="list-style-type: none"> ▪ LEVEL 0 dBm ▪ FREQ 111 MHz ▪ MODULATION AM DEPTH 30%, 80% LFGGenFreq 1 kHz
Measurement	Read distortion on modulation analyzer.

2.4.9 Frequency Modulation

2.4.9.1 FM Deviation Setting

Test setup	Test setup 1 with modulation analyzer
Settings on SM300	<ul style="list-style-type: none">▪ LEVEL 0 dBm▪ FREQ 1 GHz▪ MODULATION FM DEVIATION 100 kHz LFGGenFreq 1 kHz
Setting on modulation analyzer	<ul style="list-style-type: none">▪ Demodulation: FM▪ Detector: peak detector▪ Filter: 20 Hz to 23 kHz
Measurement	Read frequency deviation on modulation analyzer

2.4.9.2 FM Frequency Response

Test setup	Test setup 1 with modulation analyzer
Settings on SM300	<ul style="list-style-type: none">▪ LEVEL 0 dBm▪ FREQ 1 GHz▪ Deviation 50 kHz
Setting on modulation analyzer	<ul style="list-style-type: none">▪ Demodulation: FM▪ Detector: peak detector
Measurement	The modulation frequency response is determined by varying the generator frequency of the internal LF generator in the FM menu from 20 Hz to 20 kHz. It is obtained from the difference between the lowest and highest measured deviation.

2.4.9.3 FM Distortion

Test setup	Test setup 1 with modulation analyzer
Settings on SM300	<ul style="list-style-type: none">▪ LEVEL 0 dBm▪ FREQ 777 MHz▪ Deviation 50 kHz LFGGenFreq 1 kHz
Setting on modulation analyzer	<ul style="list-style-type: none">▪ Demodulation: FM▪ Detector: peak detector▪ Audio: distortion
Measurement	Read distortion on modulation analyzer.

2.4.9.4 Output Reflection Coefficient

Test setup	Test setup 1 (use SWR bridge instead of the block mixer, preamplifier; the scope is not used).
-------------------	--

Measurement procedure

Since the SWR of a source is to be measured, a purely passive measurement using the SWR bridge is only possible at levels for which the SWR is determined by the output impedance of the electronic attenuator.

For higher levels, the effect of level control has to be considered. This is done by means of an auxiliary generator which sends a wave with a slightly offset carrier frequency (difference frequency within the level bandwidth of level control) to the EUT. The carrier frequency is superimposed by the outgoing wave. Given an ideal internal impedance, the outgoing wave of the EUT alone flows back to the SWR bridge. At any other internal impedance, there is a superposition of the two components which, due to the frequency offset, results in a beat. The SWR can be concluded from the amplitude ratio of this beat.

Settings on SM300

- LEVEL 0 dBm, -26 dBm
- FREQ test frequency SWR
- Test frequency: 100 MHz, 500 MHz, 1 GHz, 1.3 GHz, 1.7 GHz, 2.0 GHz, 2.2 GHz, 2.7 GHz, 3.0 GHz

Settings on spectrum analyzer

- Center frequency = test frequency
- Span = 0 Hz
- Reference level= test level
- Resolution and video bandwidth = 10 kHz
- Linear level scale
- Sweep time = 30 ms

Settings on 2nd signal generator

- Frequency = test frequency – 100 Hz
- First RF OFF

Measurement

1. Now bring the displayed line to the center of the screen by changing the reference level and subsequently note it down.
2. Unscrew SWR bridge from SM300 and increase level on second signal generator so that the reference level is again measured on the analyzer.
3. Screw SWR bridge or directional coupler again to SM300.

A more or less undulating line can now be seen on the spectrum analyzer. This line represents the SWR of SM300.

Calculate SWR from the maximum and minimum voltage according to the following equation: $SWR = u_{max}/u_{min}$.

Passive measurement of SWR at output levels of SM300 below -25 dBm

Settings on SM300

- LEVEL -26 dBm
- FREQ far from test frequency (>10 MHz)

Settings on 2nd signal generator

- Frequency = test frequency
- Level = 10 dBm

Measurement

1. Unscrew SWR bridge from EUT and note down level measured on analyzer as reference value.
2. Screw on SWR bridge or directional coupler again and determine new level on analyzer.

The test level/reference level voltage ratio is the output reflection coefficient r of the EUT.

3. Determine the standing wave ratio (SWR) according to the following formula $SWR = (1+r)/(1-r)$.

2.5 Performance Test Report

ROHDE & SCHWARZ	Performance test report	Signal Generator SM300	Stock No.: 1147.1498.03
Model (SM300): Serial number: Tested by: Date: Signature:			

Parameter tested	Contained in	Min. value	Actual value	Max. value	Unit	Tolerance limit
Display and keyboard	Page	Tested				
Reference frequency, deviation	Page					
Level Frequency response and linearity	Page			+/- 1	dB	
Spectral purity						
Harmonics at level =10 dBm	Page			-20	dBc	
Nonharmonics CW	Page			-50	dBc	
SSB phase noise 1 GHz at 20 kHz carrier spacing	Page			-95	dBc/Hz	
Broadband noise 1 GHz at 2 MHz carrier spacing	Page			-120	dBc/Hz	
I/Q Modulation frequency response	Page			+1/-2	dB	
Residual FM rms at 1 GHz 0.3 to 3 kHz (ITU-T) 0.02 to 23 kHz				<10 <60	Hz Hz	
Residual AM rms				0.03	%	

Parameter tested	Contained in	Min. value	Actual value	Max. value	Unit	Tolerance limit
Internal modulation generator Level accuracy at f = 1 kHz 10 mV 100 mV 2 V Frequency response up to 20Hz, level >100 mV Spurious f <80Hz, level 2V load 600 Ω	Page Page Page	8 98 1.8		12 102 2.02 0.5 <-60	mV mV V dB dBc	
Amplitude modulation Depth setting at 1 kHz Modulation depth 10% 30% 80% Distortion at 1 kHz Modulation depth 30% Modulation depth 80%	Page Page			+/-5 +/-5 +/-5 2 2	% % % % %	
Frequency modulation Deviation error RF 1 GHz, AF 1 kHz, deviation 100 kHz Distortion RF 1 GHz, AF 1 kHz, deviation 50 kHz	Page Page	96		104 1	kHz %	
Pulse modulation On/off ratio	Page			0.6 to 1.5		
Output impedance SWR	page			1.5		

Table 2-3 Performance test report

3 Adjustment of 10 MHz Crystal

This software can be used to adjust the 10 MHz reference of the R&S SM300. To do this, you need the following equipment:

- R&S SM300 reference calibration software (available from the GLORIS firmware/software board)
- PC with USB port; OS: Win98/Win2000/WinXP
- Frequency counter with 0.1 Hz accuracy at 10 MHz

3.1 Device Installation

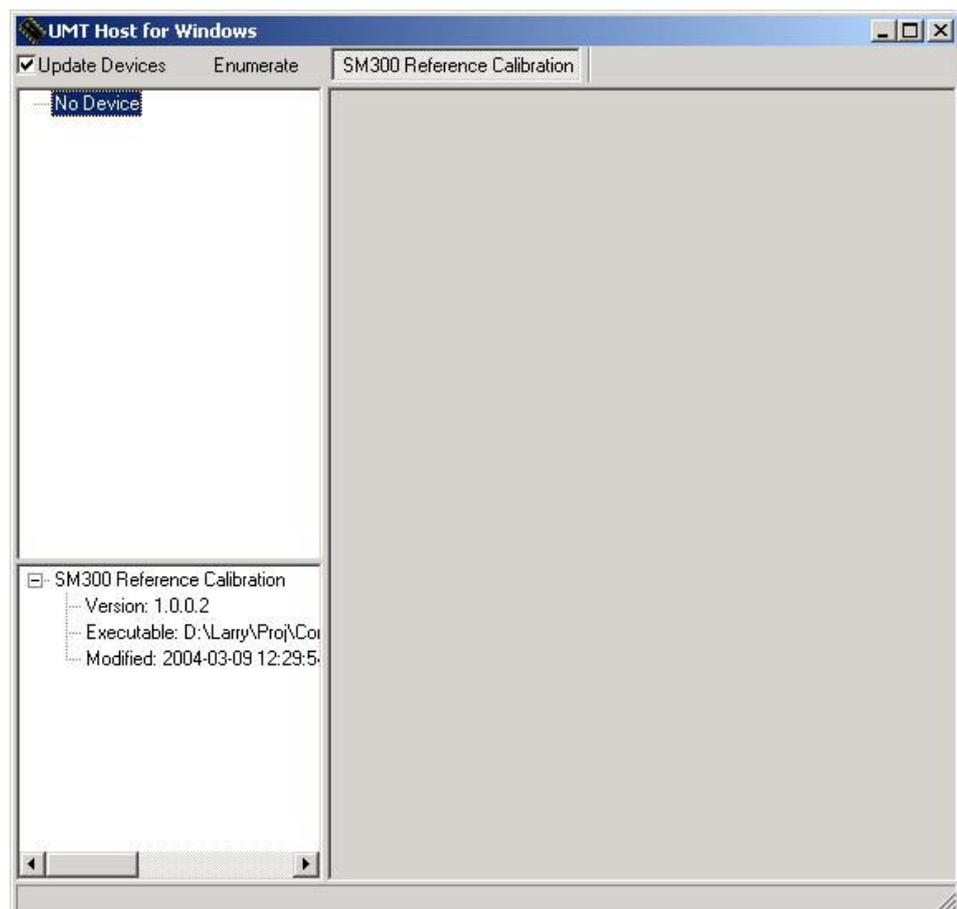
When the R&S SM300 is connected to the PC via a USB, the operating system detects the new USB device. You may be required to enter the location of the driver. The driver is supplied with the software in subfolder **driver**.

3.2 Software Execution

1. Run **umt_host.exe**.

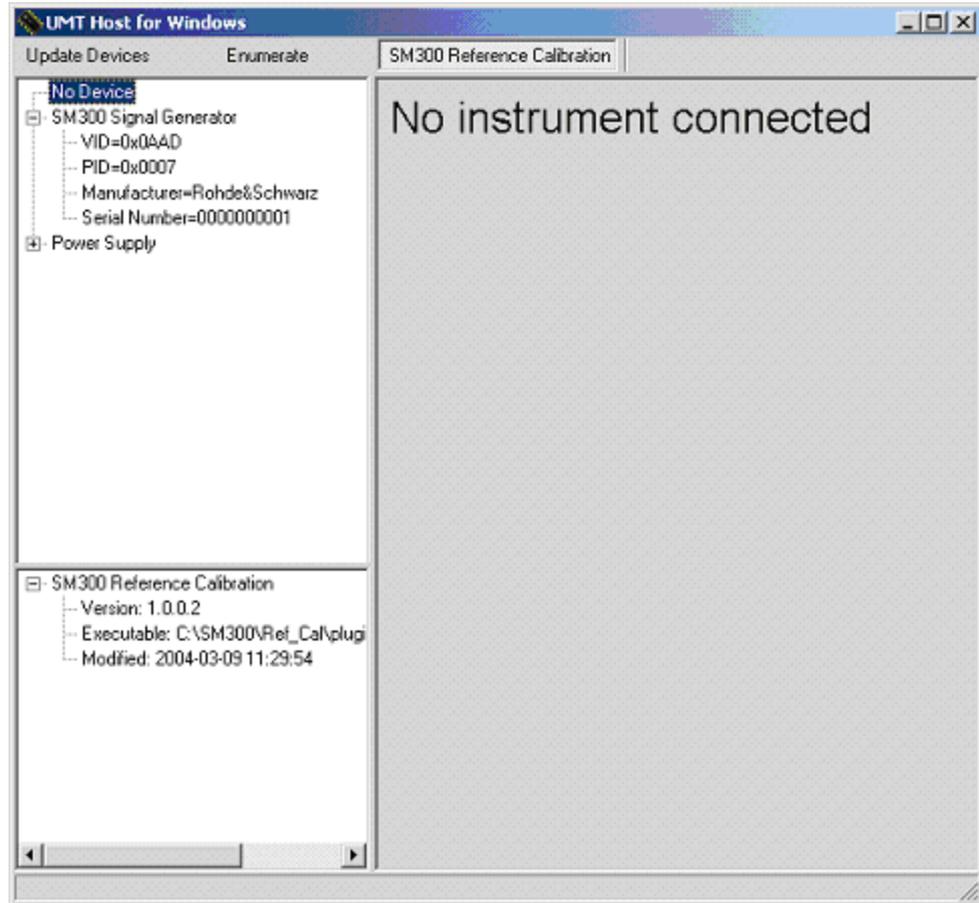
If there is no active device on the USB, the following window will appear:

Application window if no USB device is active



If the device is active, the application window detects it and displays the list of available devices in the upper left pane; see “Main window with default values” above.

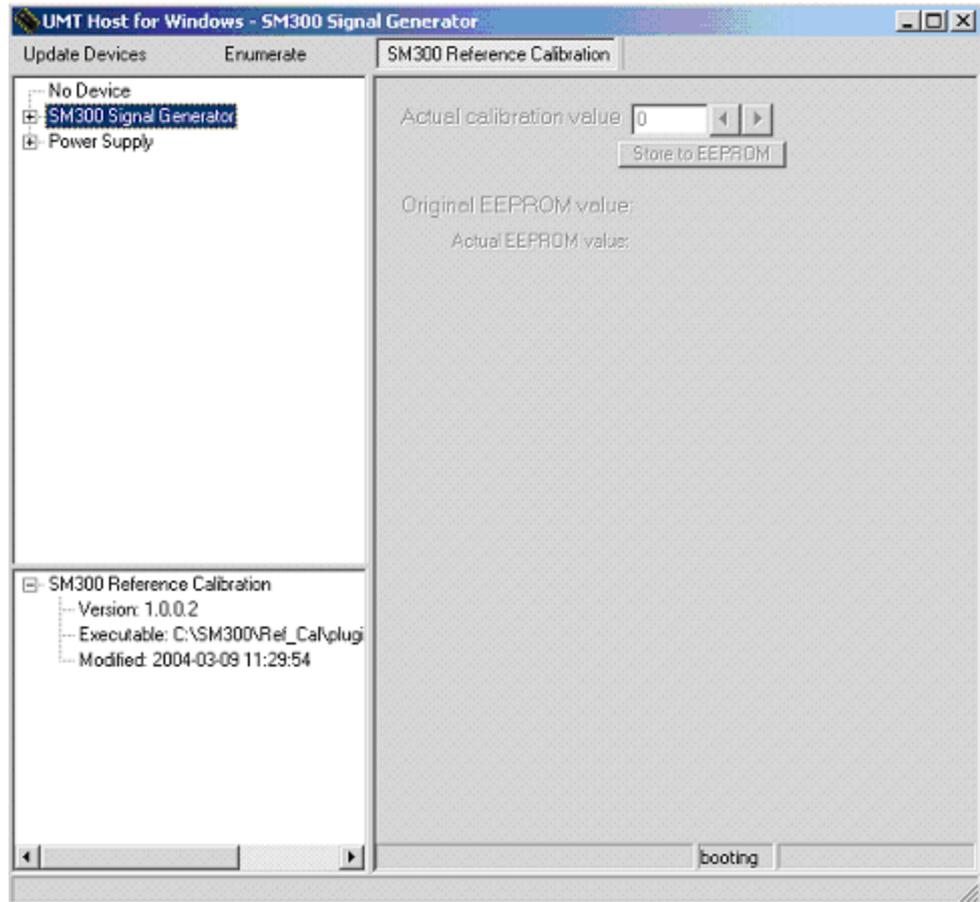
Application window after detecting active devices



2. To display the calibration window, click on **SM300 Signal Generator**.

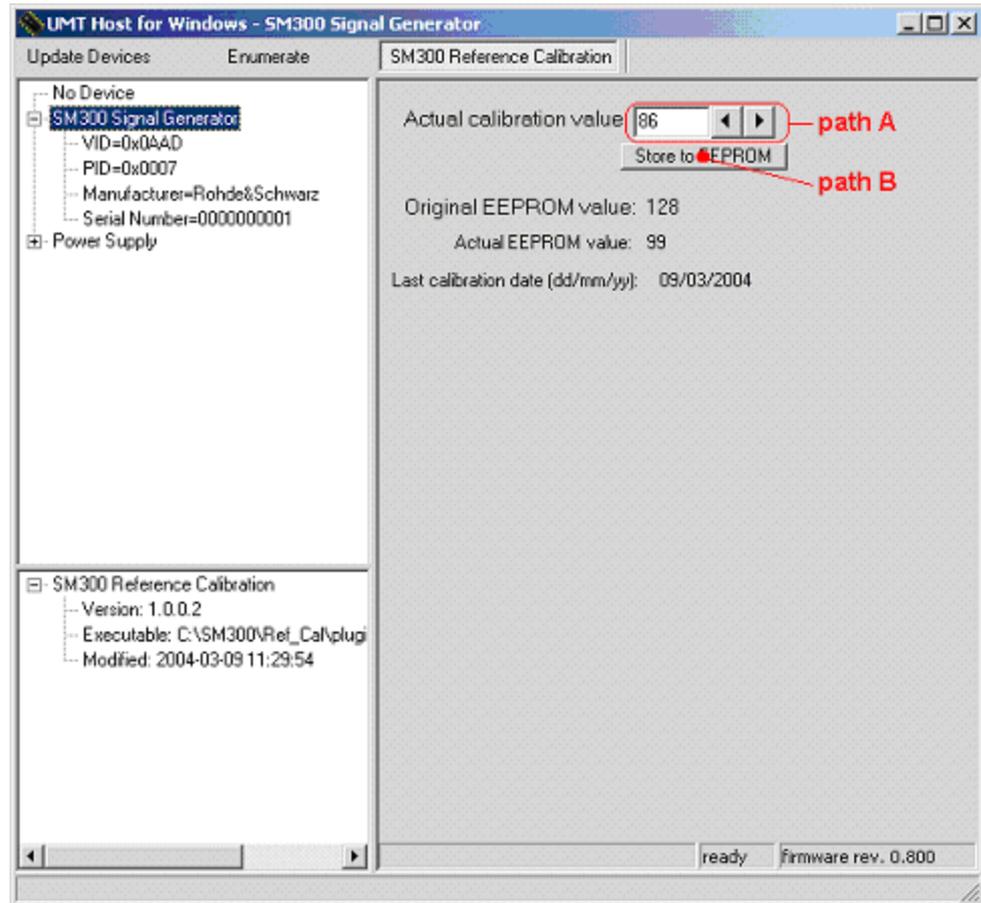
If the device is booting, a disabled window will appear; see “Application window if selected device is booting” below.

Application window if selected device is booting



If the device is ready for operation, the following window will appear.

Application window if selected device is ready



Calibration scheme

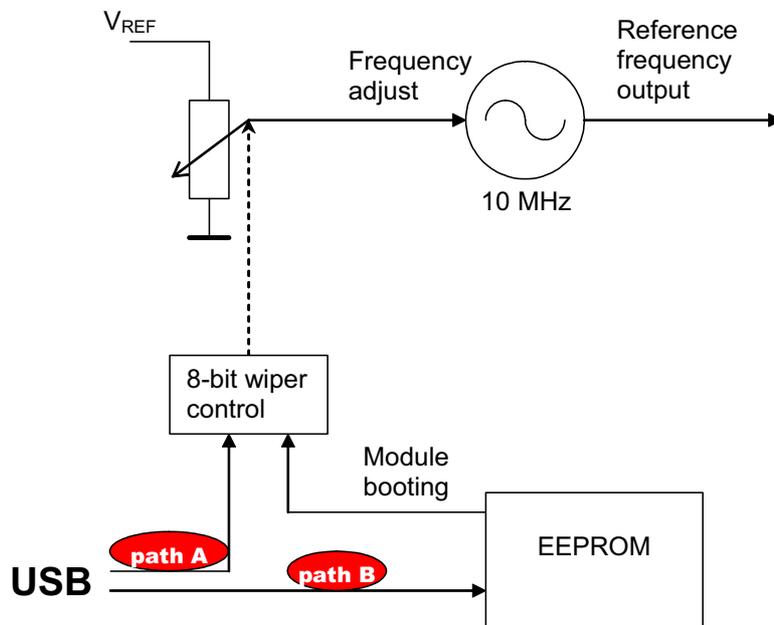


Figure 3-1

3.3 Operation

Tuning the reference oscillator

Figure 3-1 shows the calibration scheme for the R&S SM300 reference oscillator.

The 10 MHz reference oscillator is tuned by the voltage from the potentiometer. The wiper of this potentiometer is controlled by an 8-bit register. Therefore, the value of this register can vary from 0 to 255. This register is set during booting from the EEPROM – **BaugruppenData block Id 10300**. The register can be set directly by the USB.

Modify wiper control register

The R&S SM300 reference calibration software allows the user to modify the wiper control register (path **A** in Figure 3-1) with the **Actual Calibration Value** text window.

1. Modify the value directly or by moving the arrows beside the text window. The value is immediately sent to the device after it is changed.
2. Monitor the output frequency of the R&S SM300 (**Ref Out** BNC connector on the rear panel) with the frequency counter.
3. When the desired frequency is reached: You can send the current value to the EEPROM with the button **Store to EEPROM**.

4 Functional Description

4.1 Platform Concept

Components of the modular system platform

The modular system platform consists of the following components:

- Housing with power supply unit
- Front unit with display, keyboard and rotary knob as control elements
- Control PC

With these components, configurations that optimally correspond to the requirements for various types of instruments can be set up.

4.2 Components

4.2.1 Housing

Parts of housing

- Fixed part for the power supply unit
- Variable part for the generator modules

4.2.2 Front Panel with Display

Standard control elements

The front panel, display and keyboard form a mechanical unit. The following control elements are available as standard:

- Numeric keypad + 4 special keys
- 7 vertical function keys
- 3 horizontal function keys
- Rotary knob

Standard display

A 5 ½" TFT colour display with 320×240 pixel resolution is provided as the standard display.

4.2.3 Control PC

Performance

The control PC provides the instrument's control and display functions via the front unit. A "single-chip PC" (STPC from ST) provides an economical solution with acceptable power consumption. The processor (5×86 core) supplies sufficient performance for the operating and display functions. Processes that have high requirements for computing power or short task-switchover times are relocated to more dedicated processors in the generator modules.

Remote control via USB

The control PC contains a USB host that handles communication with the generator modules. This concept allows the instrument to be remotely controlled by an external PC via the USB with software whose core functions are largely identical to the internal control software.

Operating system and interface

The operating system on the control PC is Linux; the visualization and operating interface is a runtime version of LabVIEW™.

4.2.4 Generator module

Two single boards	The generator modules consists of two single boards, each located in a shielded module frame. The backplane is connected to one module only, the digital board. This provides connection to the power supply and the USB.
Internal connection	The internal connection between the boards (operating voltages, signals) is located at the rear of the module in the wiring area.
Front connectors	All generator modules are extended toward the front. The measurement connector mounted to the front of the module is inserted through an opening in the front panel where they are accessible for the user.

4.2.5 Power Supply

Power supplied	<ul style="list-style-type: none">▪ AC voltage from 100 V to 240 V with 50 Hz to 60 Hz
Operating voltages	<ul style="list-style-type: none">▪ 5 V for digital circuits▪ 3.3 V for digital circuits▪ ± 5.5 V for analog modules▪ ± 15 V for analog modules▪ +12 V for display▪ Unregulated voltage in the range from 10.5 V to 17.5 V; Used for generation of individual voltages on the modules▪ The total power consumption in the instrument is limited to <70 W.
USB-compatible microcontroller	<p>The power supply module also contains a USB-compatible microcontroller. It handles</p> <ul style="list-style-type: none">▪ Power management▪ Monitoring of operating voltage and temperature▪ Fan control▪ Instrument identification▪ Recording of operating time, etc.

4.3 Communication

4.3.1 Internal Interface

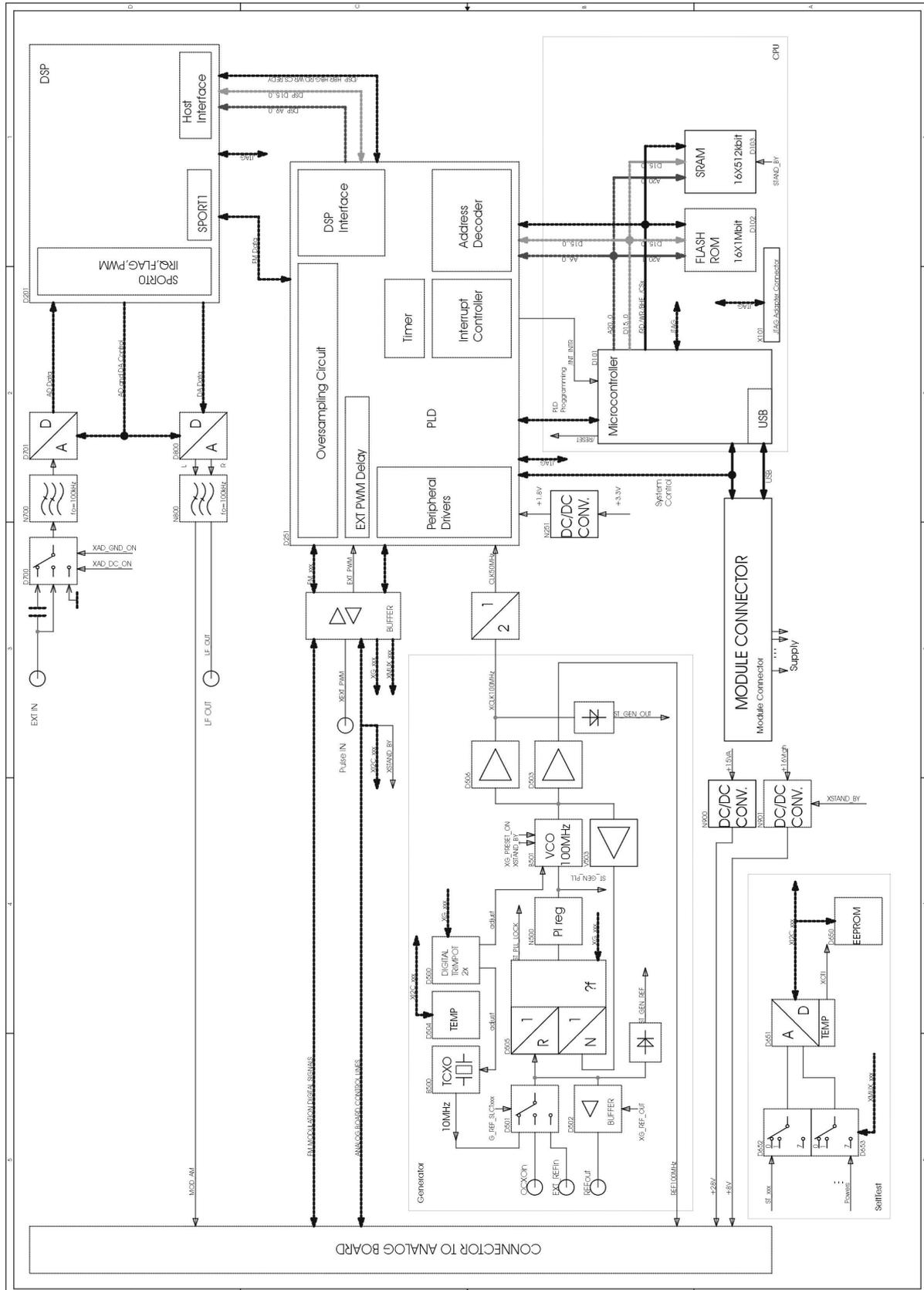
Universal serial bus (USB)	All internal communication (control PC, generator module, power supply) is handled via USB.
USB switch	A switch is used to connect the host to the USB hub, which further splits the USB to the measurement and power supply modules. This allows control of the instrument either by means of the internal control PC or by an external PC.
Bus bandwidths	The bus bandwidths required by current applications are covered by the effective 6 Mbit/s to 8 Mbit/s value of the USB.

4.3.2 External Interfaces

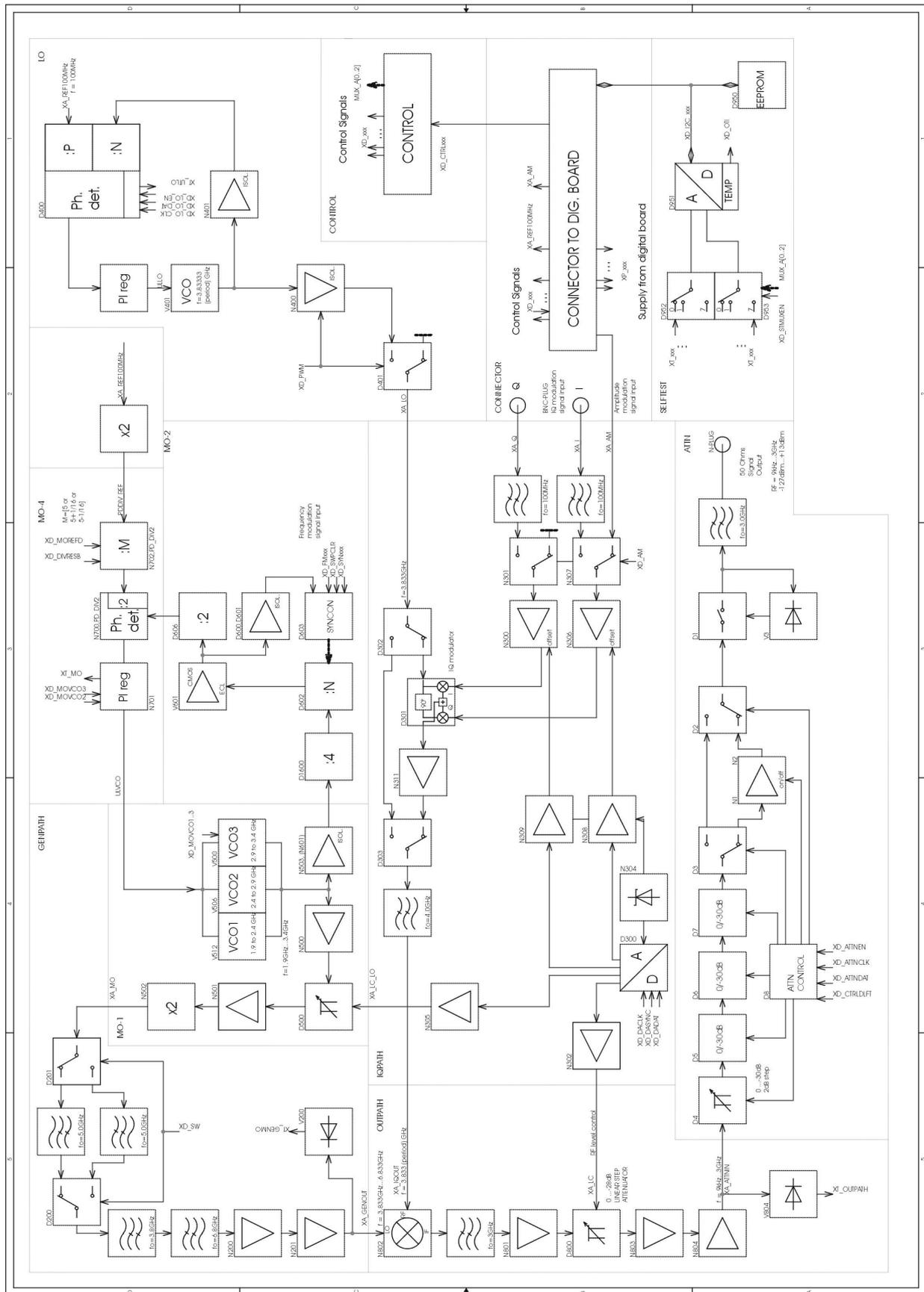
Connect via USB	The instruments of the Smart Instruments Family 300 platform can be remote-controlled by an external PC via USB.
Peripheral devices	An additional USB port serves to connect peripheral devices (external keyboard, storage medium, printer).

4.4 Block Diagrams SM300

4.4.1 Digital Board SM300

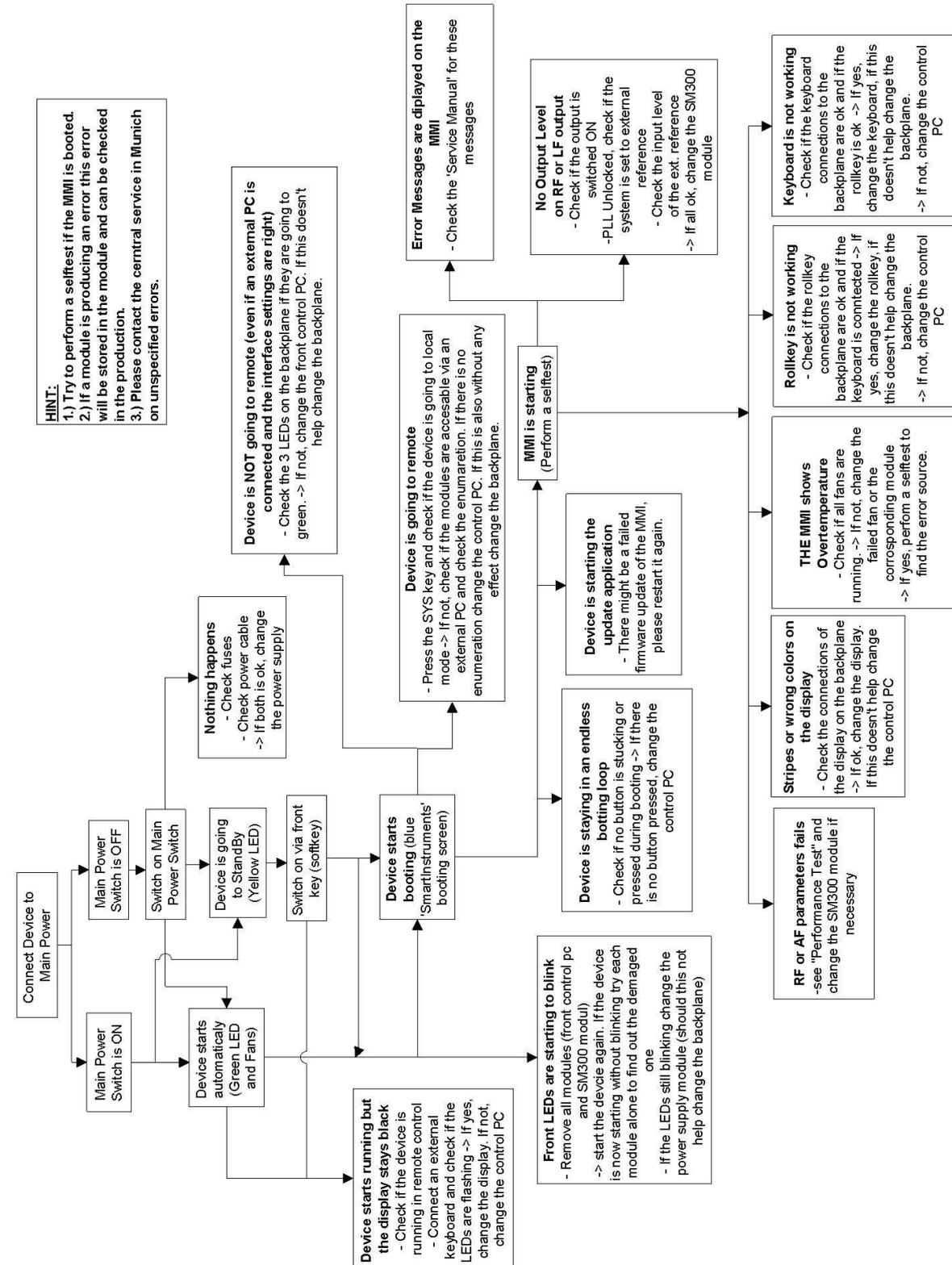


4.4.2 Analog Board SM300



5 Troubleshooting

5.1 Possible Causes of Failure

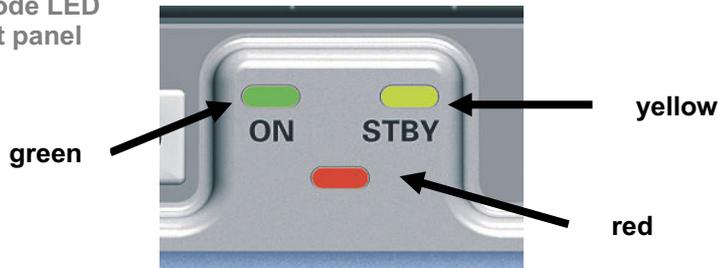


5.2 Error Codes

5.2.1 Blinking Error Codes

Error occurs The power supply uses the LEDs on the SM300 front plate to signal errors which are occurring during a time where no USB communication is possible (e.g. booting time).

Error code LED on front panel



5.2.1.1 Module Overtemperature Error (OVR_TMP_ERROR)

Overtemperature of modules The overtemperature blinking code is executed when there is an overtemperature in the system from the modules while the system is making the power on self test.

Blinking code The green led and the red led will blink inverted.

5.2.1.2 Power Supply Overtemperature Error (BOARDMON_TMP_ERROR)

Overtemperature of power supply The overtemperature blinking code is executed when there is an overtemperature in the power supply measured by the monitor IC while the system is making the power on self test.

Blinking code The green led and the red led will blink together.

5.2.1.3 Digital Voltage Error (BAD_DIGI_VOLTAGES)

Overvoltage or undervoltage of digital voltage The digital voltage blinking code is executed when there is detected over or under voltage in the digital voltages in the power supply measured by the monitor IC while the system is making the power on self test.

Blinking code The green led and the yellow led will blink inverted.

5.2.1.4 Analog Voltage Error (BAD_ANALOG_VOLTAGES)

Overvoltage or undervoltage of analog voltage The analogue voltage blinking code occurs when over or under voltage has been detected in the analogue voltages in the power supply. This is measured by the monitor IC while the system generating power during the self test.

Blinking code The green led and the yellow led will blink together.

5.2.1.5 Main DC Voltage Error (BAD_MAIN_DC_VOLTAGE)

Overvoltage or undervoltage of main DC voltage The main DC voltage blinking code occurs when over or under voltage has been detected in the DC voltages in the power supply. This is measured by the monitor IC while the system is generating power during the self test.

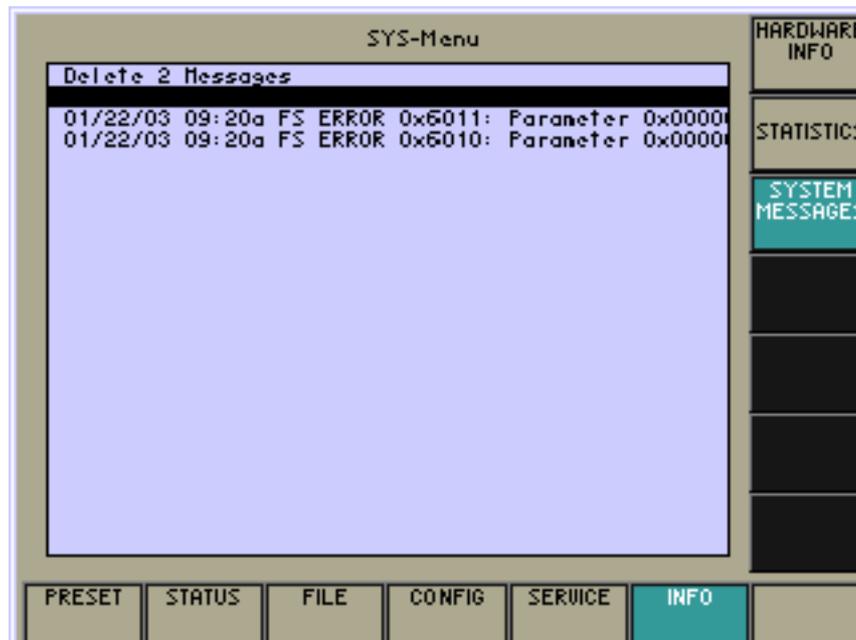
Blinking code The green led and the red led will blink together.

5.2.2 MMI Error Messages

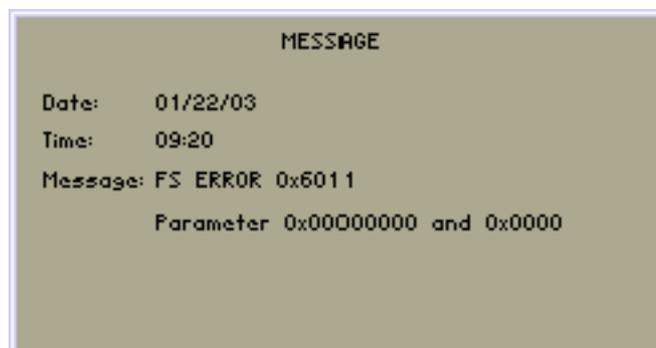
Module errors The MMI will display errors from the modules (SM300 generator module and Power Supply) on the screen embedded in a red window. This window only highlights the fact that an error has occurred on one of the modules.



Read error message The detailed error message can be read out in the SYS menu->INFO->SYSTEM MESSAGES on the MMI.



Get error information To obtain more specific information about an error use the up/down key to select the error and press enter to get the full information store in the MMI. (The detailed information about the errors will be described later in chapter 5.2.3 Device Error Messages (All Messages).)



Delete error messages

After the device has been repaired, it is recommended to delete all errors by selecting the line "Delete x error Messages", type in the password "300" and confirm with ENTER. The errors will be deleted from the MMI but they will still exist inside the module which sent the error.



5.2.3 Device Error Messages (All Messages)

Possible error messages The MMI receives error messages from all installed USB devices (SM300 generator module and the power supply). The following list describes the possible error messages sent from the modules.

5.2.3.1 SM300 Module

EventId	Name	Parameters	Condition
0x6010	OSE Internal Error	wParam ... error code	Operating system internal error
0x6011	Device Error	lParam ... error code	Firmware or hardware error
0x6020	InitDone	(none)	Module initialization is done
0x6031	Single Sweep Finished	wParam = 255	Single Sweep finished
0x6040	PLL Unlocked	(none)	Ref Generator is unlocked
0x6050	Temperature Out Of Limits	wParam: bit 0 = 1 ... AB under limit bit 1 = 1 ... AB over limit bit 8 = 1 ... DB under limit bit 9 = 1 ... DB over limit	Temperature on the boards is out of operational limits
0x6100	Self Test Finished	(none)	Required self test action is finished
0x6200	MO Level Calibration Finished (not implemented)	(none)	Required MO Level Calibration is finished
0x6300	EEPROM Destruct Finished	lParam = 0 ... no error lParam = 1 ... bad EEPROM id lParam = 2 ... I2C error lParam = 3 ... EEPROM error	Destructive EEPROM test is finished
0x67FF	Control Transfer Handshake	wParam ... GDI Identifier lParam = 0 (GDI_NAK) lParam = 1 (GDI_ACK)	GDI identifier associated with the control data transfer GDI_ACK is always sent with the event
0x6F00	Interrupt Data Block	wParam = BlockId	

EventId	Name	Parameters	Condition
		struct {uint16 PartyId uint16 Size uint16[1024] Data}	
0x6F02	Baugruppen Data Block Error	wParam = BlockId IParam = 0 ... no error IParam = 1 ... bad BlockId IParam = 2 ... invalid size IParam = 3 ... invalid checksum IParam = 4 ... AB,DB difference	BlockId – see appendix If error occurred - default values are used
0x7800	Service Ready	(none)	Service Process is not busy

Table 5-1: SM300 Module

Device Specific Error Codes

Block_Name	Value	Description
DEVICE_ERROR_I2C_FAIL	0x00004000	
DEVICE_ERROR_PLD_BOOT_FAIL	0x00004001	
DEVICE_ERROR_DSP_BOOT_FAIL	0x00004002	
DEVICE_ERROR_SRAM_FAIL	0x00004003	
DEVICE_ERROR_BAUBLOCK	0x00004200	/* Error in Baugruppen Data handling */
- follows Baugruppen Data Error Event		

Table 5-2: Device Specific Error Codes

Device Specific Events

Device_Name	Value	Description
DEVICE_EVENT_INIT_DONE	0x6020	/* Initialization of the module is done */
DEVICE_EVENT_SINGLE_SWEEP_FINISHED	0x6031	
DEVICE_EVENT_PLL_UNLOCKED	0x6040	/* PLL loop unlocked */
DEVICE_EVENT_TEMPERATURE_WARNING	0x6050	/* Module temperature out of limits */
TEMPERATURE_AB_UNDER	0x0001	
TEMPERATURE_AB_OVER	0x0002	

Error Codes

Device_Name	Value	Description
TEMPERATURE_DB_UNDER TEMPERATURE_DB_OVER	0x0100 0x0200	
DEVICE_EVENT_SELFTEST _FINISHED	0x6100	
DEVICE_EVENT_EEPROM _DESTRUCT_FINISHED	0x6300	
DEVICE_EVENT_SERVICE _READY	0x7800	

Table 5-3: Device Specific Events

Baugruppen Data Error Codes

Id:		
DEVICE_EVENT_BAUBLOCK _ERROR	0x6F02	
IParam:		
DEVICE_ERROR_BAD _BAUBLOCKID	0x0001	/* Invalid BlockId */
DEVICE_ERROR_BAD _BAUBLOCKSIZE	0x0002	/* Invalid size */
DEVICE_ERROR_CORRUPT _BAUBLOCK	0x0003	/* Corrupt checksum or data */
DEVICE_ERROR_BAUBLOCK _UNKNOWN	0x0004	/* Unknown BlockId */
wParam:		
BlockId of Baugruppen Data block		

Table 5-4: Baugruppen Data Error Codes

Baugruppen Data Blocks

Block_Name	Value	Description
BLOCK_ID_USER_10010	10010	Digital Board Info Block
BLOCK_ID_USER_10011	10011	Analog Board Info Block
BLOCK_ID_USER_10050	10050	IQ Offset setting
BLOCK_ID_USER_10051	10051	IQ path temperature coef
BLOCK_ID_USER_10060	10060	Calibration coefs for DSP
BLOCK_ID_USER_10090	10090	Frequency positions of calibration points
BLOCK_ID_USER_10099	10099	Output level temperature coefs
BLOCK_ID_USER_10100	10100	Output levels for attenuator 0dB
BLOCK_ID_USER_10101	10101	Output levels for attenuator 2dB
BLOCK_ID_USER_10160	10160	Output levels for attenuator 120dB
BLOCK_ID_USER_10200	10200	Amplification for attenuator 0dB
BLOCK_ID_USER_10201	10201	Amplification for attenuator 2dB
...
BLOCK_ID_USER_10235	10235	Amplification for attenuator 70dB
BLOCK_ID_USER_10250	10250	Fine Attenuation D0
BLOCK_ID_USER_10251	10251	Fine Attenuation D50
BLOCK_ID_USER_10252	10252	Fine Attenuation D100
BLOCK_ID_USER_10253	10253	Fine Attenuation D150
BLOCK_ID_USER_10254	10254	Fine Attenuation D250
BLOCK_ID_USER_10255	10255	Fine Attenuation D300
BLOCK_ID_USER_10256	10256	Fine Attenuation D350
BLOCK_ID_USER_10257	10257	Fine Attenuation D400
BLOCK_ID_USER_10258	10258	Fine Attenuation D500
BLOCK_ID_USER_10259	10259	Fine Attenuation D800
BLOCK_ID_USER_10260	10260	Fine Attenuation D1023
BLOCK_ID_USER_10265	10265	Fine Attenuation temperature coefs
BLOCK_ID_USER_10300	10300	TCXO calibration coefs
BLOCK_ID_USER_10301	10301	VCO resonator setting
BLOCK_ID_USER_10400	10400	MO level correction coefs
BLOCK_ID_USER_10500	10500	Temperature Limits
BLOCK_ID_USER_10501	10501	Voltage Limits for Digital Board
BLOCK_ID_USER_10502	10502	Voltage Limits for Analog Board

Table 5-5: Baugruppen Data Blocks

5.2.3.2 Power Supply Module

EventId	Description	Parameters	Parameter Description
0x6150	Event_Monitor		See Table 5-7: Additional information about event monitor (event 0x6050) parameters
0x6130	PASSWORD	int16	0x80 – Good_Pwd 0x81– Bad_Pwd
0x6140	BOOT_EVENT		Transmission of errors at boot time (errors defined in ose_user_errors.h)
0x6160	SHUTDOWN	uint16 SHUTDOWN	Indicates to host that the system is going down (SHUTDOWN=1)
0x6170	SERIAL_TRANSFER_HANDSHAKE	uint16 SERIAL_TRANSFER_HANDSHAKE	Indicates that a serial transfer was cancelled. (ACK=0x33 (acknowledge), NAK=0xCC (not Acknowledge), RST=0x66 (reset) Handshake signals sent from the STPC and transferred via the PS: FS_TOO_BIG=0xC0 (file size too large) FS_DEST_ERR=0xC1 (destination error) FS_PACK_ORD=0xC2 (packet order error) FS_HEAD_ERR=0xC3 (header error) (FS_EX_RDY=0xC4 (execution ready) FS_TIME_OUT=0xC5 (receiver timeout) FS_PS_NOT_RDY=0xC6 (power supply not ready to send serial data) FS_FILE_EXIST=0xC7 (file exists)
0x6180	HW_ERROR_EVENT		
0x6190	USB_CHANGE_EVENT	Enum eUSB_Master	Values are: PC_Master = 0 Display_Master = 1 Interface_Master = 2 No_Master = 3
0x6110	USB_CHANGE_AUTO	0xffff	If this event occurs, the system was in the USB auto mode and the external PC was plugged-in.
0x6120	OVER_TEMPERATURE_PS	–	Overtemperature of the power supply
0x6121	OVER_TEMPERATURE_MODULE	–	Overtemperature of a module
0x6191	BATTERY_NOT_SUPPORTED	–	The command to read the battery was rejected because no battery is installed.

Table 5-6: Power Supply Module

Additional information about event monitor (event 0×6050) parameters

Parameter	Description	Detailed description/error location
0×01	UNKNOWN_USB_CMD	(USB error) USB command is unknown
0×11	SERIAL_COM_ERROR	(Serial line) Error during transmission over serial line
0×12	WRONG_START_BYTE	(Serial line) Invalid start byte for serial communication
0×13	WRONG_STOP_BYTE	Invalid stop byte for serial communication
0×e0	UNKNOWN_SIGNAL	(Firmware error) Signal to process is unknown
0×20	HW_ACCESS_ERROR	(Hardware driver) A module tried to read/write to a read-only/write-only register
0×40	AC_LINE_OK_ERROR	(Interrupt events) AC_LINE error
0×41	PWM_OK_ERROR	(Interrupt events) PWM_OK error
0×42	CHRG_INT_ERROR	(Interrupt events) CHRG_INT error
0×43	PWRGD_DIG_ERROR	(Interrupt events) PWRGD_DIG error
0×44	OVR_TMP_ERROR	(Interrupt events) PWRGD_DIG error
0×45	BOARDMONITOR_ERROR	(Interrupt events) Unspecified board monitor error
0×46	BOARDMONITOR_VOLT_ERROR	(Interrupt events) Board monitor of any voltage error
0×47	BOARDMONITOR_TEMP_ERROR	(Interrupt events) Power supply temperature error
0×60	LM81_READING_ERROR	(I2C/SMBus errors) LM81 reading error → board monitor
0×61	LM81_WRITING_ERROR	(I2C/SMBus errors) LM81 writing error → board monitor
0×62	LM81_ERROR	(I2C/SMBus errors) LM81 error → board monitor not specified
0×65	FRAM_READING_ERROR	(I2C/SMBus errors) FRAM reading error
0×66	FRAM_WRITING_ERROR	(I2C/SMBus errors) FRAM writing error
0×67	FRAM_CHECKSUM_ERROR	(I2C/SMBus errors) FRAM checksum error
0×68	FRAM_ERROR	(I2C/SMBus errors) FRAM error not specified
0×69	AUTO_MODIFIED_FRAM_ON_ERROR	(I2C/SMBus errors) FRAM checksum error found values set to default
0×70	DS1337_READING_ERROR	(I2C/SMBus errors) DSS1337 reading error → RTC
0×71	DS1337_WRITING_ERROR	(I2C/SMBus errors) DSS1337 writing error → RTC
0×72	DS1337_ERROR	(I2C/SMBus errors) DSS1337 error not specified → RTC
0×a0	DIGITAL_VOLT_ERROR_5V	(Board Monitor) Digital 5 V error
0×a1	DIGITAL_VOLT_ERROR_3_3V	(Board Monitor) Digital 5 V error
0×a2	ANALOGUE_VOLT_ERROR_5_5V	(Board Monitor) Analog 5.5 V error
0×a4	ANALOGUE_VOLT_ERROR_15V	(Board Monitor) Analog 15 V error
0×a5	ANALOGUE_VOLT_ERROR_12V	(Board Monitor) Analog 12 V error
0×aa	ANALOGUE_VOLT_ERROR_18V	(Board Monitor) Analog 18 V error
0×a6	MAIN_DC_ERROR	(Board Monitor) Main DC error
0×a7	PS_TEMP_ERROR	(Board Monitor) PS main overtemperature

Error Codes

Parameter	Description	Detailed description/error location
0xa8	PS_TEMP_1_ERROR	(Board Monitor) PS sensor 1 overtemperature
0xa9	PS_TEMP_2_ERROR	(Board Monitor) PS sensor 2 overtemperature
0xb0	USB_HOST_NOT_PRESENT	(USB Error) Selected USB host is not present
0xc0	FIRMWARE_UPDATE	(Firmware info) Indication that the firmware has been updated

Table 5-7: Additional information about event monitor (event 0x6050) parameters