



## Quick Start Guide

# R&S<sup>®</sup> SFE BROADCAST TESTER

The Quick Start Guide describes the following models and options of the TEST TRANSMITTER:

- ◆ R&S SFE 2112.4300.02

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81671 Munich, Germany, 2008

Printed in Germany - Subject to change - Data without tolerance limits is not binding

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The following abbreviations are used throughout this manual:

R&S® SFE is abbreviated with R&S SFE

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This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org>).

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# Grouped Safety Messages









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







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

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

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

## Symbols and safety labels

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

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

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

### Tags and their meaning

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

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

### Basic safety instructions

1. The product may be operated only under the operating conditions and in the positions specified by the manufacturer. Its ventilation must not be obstructed during operation. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products: prescribed operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only in enclosed spaces, max. operation altitude 2000 m above sea level, max. transport altitude 4500 m above sea level.  
A tolerance of  $\pm 10\%$  shall apply to the nominal voltage and of  $\pm 5\%$  to the nominal frequency.
2. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed. The product may be opened only by authorized, specially trained personnel. Prior to performing any work on the product or opening the product, the product must be disconnected from the supply network. Any adjustments, replacements of parts, maintenance or repair must be carried out only by technical personnel authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, PE conductor test, insulation resistance measurement, leakage current measurement, functional test).

## Grouped Safety Messages

3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens, e.g. nickel) such as aluminum cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties), consult a physician immediately to determine the cause.
4. If products/components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled, e.g. for disposal purposes, by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
5. If handling the product yields hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation.
6. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn life requires increased protection, pregnant women should be protected by appropriate measures. Persons with pacemakers may also be endangered by electromagnetic radiation. The employer/operator is required to assess workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the danger.
7. Operating the products requires special training and intense concentration. Make certain that persons who use the products are physically, mentally and emotionally fit enough to handle operating the products; otherwise injuries or material damage may occur. It is the responsibility of the employer to select suitable personnel for operating the products.
8. Prior to switching on the product, it must be ensured that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
9. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with earthing contact and protective earth connection.
10. Intentionally breaking the protective earth connection either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
11. If the product has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases, it must be ensured that the power plug is easily reachable and accessible at all times (corresponding to the length of connecting cable, approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply. If products without power switches are integrated in racks or systems, a disconnecting device must be provided at the system level.

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12. Never use the product if the power cable is damaged. Check the power cable on a regular basis to ensure that it is in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by e.g. tripping over the cable or suffering an electric shock.
13. The product may be operated only from TN/TT supply networks fused with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
14. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, this can result in sparks, fire and/or injuries.
15. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
16. For measurements in circuits with voltages  $V_{\text{rms}} > 30 \text{ V}$ , suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
17. Ensure that the connections with information technology equipment comply with IEC 950/EN 60950.
18. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
19. If a product is to be permanently installed, the connection between the PE terminal on site and the product's PE conductor must be made first before any other connection is made. The product may be installed and connected only by a license electrician.
20. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused in such a way that suitable protection is provided for users and products.
21. Do not insert any objects into the openings in the housing that are not designed for this purpose. Never pour any liquids onto or into the housing. This can cause short circuits inside the product and/or electric shocks, fire or injuries.
22. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a thunderstorm) can reach the product. Otherwise the operating personnel will be endangered by electric shocks.
23. Rohde & Schwarz products are not protected against penetration of liquids, unless otherwise specified (see also safety instruction 1.). If this is not taken into account, there exists the danger of electric shock for the user or damage to the product, which can also lead to personal injury.
24. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product was moved from a cold to a warm environment.
25. Do not close any slots or openings on the product, since they are necessary for ventilation and prevent the product from overheating. Do not place the product on soft surfaces such as sofas or rugs or inside a closed housing, unless this is well ventilated.
26. Do not place the product on heat-generating devices such as radiators or fan heaters. The temperature of the environment must not exceed the maximum temperature specified in the data sheet.
27. Batteries and storage batteries must not be exposed to high temperatures or fire. Keep batteries and storage batteries away from children. Do not short-circuit batteries and storage batteries. If batteries or storage batteries are improperly replaced, this can cause an explosion (warning: lithium cells).

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- Replace the battery or storage battery only with the matching Rohde & Schwarz type (see spare parts list). Batteries and storage batteries must be recycled and kept separate from residual waste. Batteries and storage batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.
28. Please be aware that in the event of a fire, toxic substances (gases, liquids etc.) that may be hazardous to your health may escape from the product.
  29. The product can be very heavy. Be careful when moving it to avoid back or other physical injuries.
  30. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves).
  31. Handles on the products are designed exclusively for personnel to hold or carry the product. It is therefore not permissible to use handles for fastening the product to or on means of transport such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport and for observing the safety regulations of the manufacturer of the means of transport. Noncompliance can result in personal injury or material damage.
  32. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. The driver is always responsible for the safety of the vehicle. The manufacturer assumes no responsibility for accidents or collisions.
  33. If a laser product (e.g. a CD/DVD drive) is integrated in a Rohde & Schwarz product, do not use any other settings or functions than those described in the product documentation. Otherwise this may be hazardous to your health, since the laser beam can cause irreversible damage to your eyes. Never try to take such products apart, and never look into the laser beam.
  34. Prior to cleaning, disconnect the product from the AC supply. Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluent for cellulose lacquers.

# Informaciones elementales de seguridad

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

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







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

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

## Símbolos y definiciones de seguridad

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



					
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

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

### Palabras de señal y su significado

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

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

## Informaciones de seguridad elementales

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 por principio la posición con el suelo de la caja para abajo, modo de protección IP 2X, grado de suciedad 2, categoría de sobrecarga eléctrica 2, utilizar solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4.500 m sobre el nivel del mar. Se aplicará una tolerancia de  $\pm 10\%$  sobre el voltaje nominal y de  $\pm 5\%$  sobre la frecuencia nominal.
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 especializado autorizado. Antes de efectuar trabajos en el producto o abrirlo deberá este ser desconectado de la corriente. El ajuste, el cambio de partes, la manutención y la reparación deberán ser solamente efectuadas por electricistas autorizados por R&S. Si se reponen partes con importancia para los aspectos de seguridad (por ejemplo el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada recambio de partes elementales para la seguridad deberá ser efectuado un control de seguridad (control a primera vista, control de conductor protector, medición de resistencia de aislamiento, medición de la corriente conductora, control de funcionamiento).
3. Como en todo producto de fabricación industrial no puede ser excluido en general de que se produzcan al usarlo elementos que puedan generar alergias, los llamados elementos alergénicos (por ejemplo el níquel). Si se produjeran en el trato con productos R&S reacciones alérgicas, como por ejemplo urticaria, estornudos frecuentes, irritación de la conjuntiva o dificultades al respirar, se deberá consultar inmediatamente a un médico para averiguar los motivos de estas reacciones.
4. Si productos / elementos de construcción son tratados fuera del funcionamiento definido de forma mecánica o térmica, pueden generarse elementos peligrosos (polvos de sustancia de metales pesados como por ejemplo plomo, berilio, níquel). La partición elemental del producto, como por ejemplo sucede en el tratamiento de materias residuales, debe de ser efectuada solamente por personal especializado para estos tratamientos. La partición elemental efectuada inadecuadamente puede generar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes al tratamiento de materias residuales.
5. En el caso de que se produjeran agentes de peligro o combustibles en la aplicación del producto que debieran de ser transferidos a un tratamiento de materias residuales, como por ejemplo agentes refrigerantes que deben ser repuestos en periodos definidos, o aceites para motores, deberán ser tenidas en cuenta las prescripciones de seguridad del fabricante de estos agentes de peligro o combustibles y las regulaciones regionales para el tratamiento de materias residuales. Cuiden también de tener en cuenta en caso dado las prescripciones de seguridad especiales en la descripción del producto.

6. Ciertos productos, como por ejemplo las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. En vista a la protección de la vida en desarrollo deberían ser protegidas personas embarazadas debidamente. También las personas con un bypass pueden correr peligro a causa de la radiación electromagnética. El empresario/usuario está comprometido a valorar y señalar áreas de trabajo en las que se corra un riesgo aumentado de exposición a radiaciones para evitar riesgos.
7. La utilización de los productos requiere instrucciones especiales y una alta concentración en el manejo. Debe de ponerse por seguro de que las personas que manejen los productos estén a la altura de los requerimientos necesarios referente a sus aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario lleva la responsabilidad de seleccionar el personal usuario apto para el manejo de los productos.
8. Antes de la puesta en marcha del producto se deberá tener por seguro de que la tensión preseleccionada en el producto equivalga a la 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 producto.
9. Productos de la clase de seguridad I con alimentación móvil y enchufe individual de producto solamente deberán ser conectados para el funcionamiento a tomas de corriente de contacto de seguridad y con conductor protector conectado.
10. Queda prohibida toda clase de interrupción intencionada del conductor protector, tanto en la toma de corriente como en el mismo producto. Puede tener como consecuencia el peligro de golpe de corriente por el producto. Si se utilizaran cables o enchufes de extensión se deberá poner al seguro que es controlado su estado técnico de seguridad.
11. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de distribución como interruptor. En estos casos deberá asegurar de que el enchufe sea de fácil acceso y nabejo (según la medida del cable de distribución, aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para el corte de la red eléctrica. Si los productos sin interruptor están integrados en bastidores o instalaciones, se deberá instalar el interruptor al nivel de la instalación.
12. No utilice nunca el producto si está dañado el cable eléctrico. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegure a través de las medidas de protección y de instalación adecuadas de que el cable de eléctrico no pueda ser dañado o de que nadie pueda ser dañado por él, por ejemplo al tropezar o por un golpe de corriente.
13. Solamente está permitido el funcionamiento en redes de distribución TN/TT aseguradas con fusibles de como máximo 16 A (utilización de fusibles de mayor amperaje sólo previa consulta con el grupo de empresas Rohde & Schwarz).
14. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. Si no tiene en consideración estas indicaciones se arriesga a que se originen chispas, fuego y/o heridas.
15. No sobrecargue las tomas de corriente, los cables de extensión o los enchufes de extensión ya que esto pudiera causar fuego o golpes de corriente.

16. En las mediciones en circuitos de corriente con una tensión de entrada de  $U_{eff} > 30 \text{ V}$  se deberá tomar las precauciones debidas para impedir cualquier peligro (por ejemplo medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
17. En caso de conexión con aparatos de la técnica informática se deberá tener en cuenta que estos cumplan los requisitos del estándar IEC950/EN60950.
18. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar heridas, fuego o daños en el producto.
19. Si un producto es instalado fijamente en un lugar, se deberá primero conectar el conductor protector fijo con el conductor protector del aparato antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
20. En caso de que los productos que son instalados fijamente en un lugar sean sin protector implementado, autointerruptor o similares objetos de protección, el circuito de suministro de corriente deberá estar protegido de manera que usuarios y productos estén suficientemente protegidos.
21. Por favor, no introduzca ningún objeto que no esté destinado a ello en los orificios de la caja del aparato. No vierta nunca ninguna clase de líquidos sobre o en la caja. Esto puede producir cortocircuitos en el producto y/o puede causar golpes de corriente, fuego o heridas.
22. Asegúrese con la protección adecuada de que no pueda originarse en el producto una sobrecarga por ejemplo a causa de una tormenta. Si no se verá el personal que lo utilice expuesto al peligro de un golpe de corriente.
23. Los productos R&S no están protegidos contra líquidos si no es que exista otra indicación, ver también punto 1. Si no se tiene en cuenta esto se arriesga el peligro de golpe de corriente para el usuario o de daños en el producto lo cual también puede llevar al peligro de personas.
24. No utilice el producto bajo condiciones en las que pueda producirse y se hayan producido líquidos de condensación en o dentro del producto como por ejemplo cuando se desplaza el producto de un lugar frío a un lugar caliente.
25. Por favor no cierre ninguna ranura u orificio del producto, ya que estas son necesarias para la ventilación e impiden que el producto se caliente demasiado. No pongan el producto encima de materiales blandos como por ejemplo sofás o alfombras o dentro de una caja cerrada, si esta no está suficientemente ventilada.
26. No ponga el producto sobre aparatos que produzcan calor, como por ejemplo radiadores o calentadores. La temperatura ambiental no debe superar la temperatura máxima especificada en la hoja de datos.
27. Baterías y acumuladores no deben de ser expuestos a temperaturas altas o al fuego. Guardar baterías y acumuladores fuera del alcance de los niños. No cortocircuitar baterías ni acumuladores. Si las baterías o los acumuladores no son cambiados con la debida atención existirá peligro de explosión (atención células de litio). Cambiar las baterías o los acumuladores solamente por los del tipo R&S correspondiente (ver lista de piezas de recambio). Las baterías y acumuladores deben reutilizarse y no deben acceder a los vertederos. Las baterías y acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de evacuación y reciclaje.
28. Por favor tengan en cuenta que en caso de un incendio pueden desprenderse del producto agentes venenosos (gases, líquidos etc.) que pueden generar daños a la salud.

29. El producto puede poseer un peso elevado. Muévelo con cuidado para evitar lesiones en la espalda u otras partes corporales.
30. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptas para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (por ejemplo paredes y estantes).
31. Las asas instaladas en los productos sirven solamente de ayuda para el manejo que solamente está previsto para personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como por ejemplo grúas, carretillas elevadoras de horquilla, carros etc. El usuario es responsable de que los productos sean sujetados de forma segura a los medios de transporte y de que las prescripciones de seguridad del fabricante de los medios de transporte sean observadas. En caso de que no se tengan en cuenta pueden causarse daños en personas y objetos.
32. Si llega a utilizar el producto dentro de un vehículo, queda en la responsabilidad absoluta del conductor que conducir el vehículo de manera segura. Asegure el producto dentro del vehículo debidamente para evitar en caso de un accidente las lesiones u otra clase de daños. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Siempre queda en la responsabilidad absoluta del conductor la seguridad del vehículo. El fabricante no asumirá ninguna clase de responsabilidad por accidentes o colisiones.
33. Dado el caso de que esté integrado un producto de láser en un producto R&S (por ejemplo CD/DVD-ROM) no utilice otras instalaciones o funciones que las descritas en la documentación de producto. De otra manera pondrá en peligro su salud, ya que el rayo láser puede dañar irreversiblemente sus ojos. Nunca trate de descomponer estos productos. Nunca mire dentro del rayo láser.
34. Antes de proceder a la limpieza, desconecte el producto de la red. Realice la limpieza con un paño suave, que no se deshilache. No utilice de ninguna manera agentes limpiadores químicos como, por ejemplo, alcohol, acetona o nitrodiluyente.

## Safety Instructions for Instruments with Fold-Out Feet



### WARNING

Danger of injury

The feet may fold in if they are not folded out completely or if the instrument is shifted. The feet may break if they are overloaded.

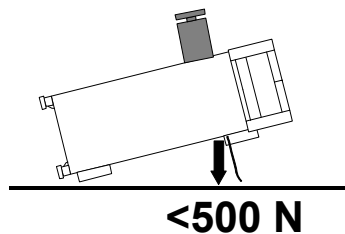
Fold the feet completely in or completely out to ensure stability of the instrument and personal safety.

To avoid injuries, never shift the instrument when its feet are folded out.

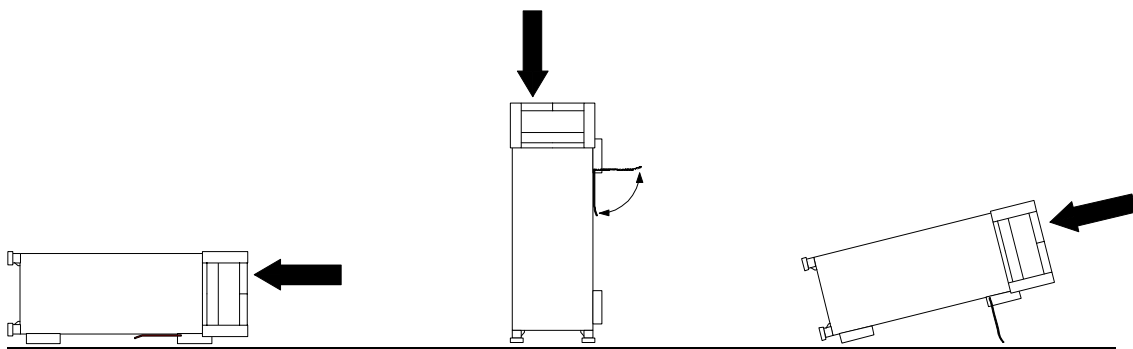
The overall load (the instrument's own weight plus that of the instruments stacked on top of it) on the folded-out feet must not exceed 500 N.

Place the instrument on a stable surface. Secure the instruments stacked on top of it against slipping (e.g. by locking their feet on the top front frame).

When the instrument is standing on its folded-out feet, do not work under the instrument and do not put anything under it, otherwise injuries or material damage could occur.



The instrument can be used in each of the positions shown here.



## Informaciones de seguridad para aparatos con telepiés



### ADVERTENCIA

Peligro de heridas

Los telepiés pueden doblarse hacia adentro si no han sido desdoblados por completo o si el aparato es movido. Los telepiés pueden romperse si son sobrecargados.

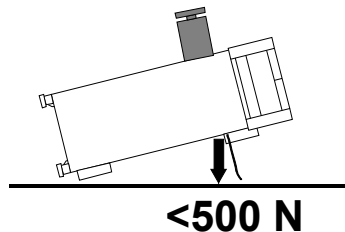
Doblar los telepiés por completo hacia afuera o hacia adentro. De esta manera se puede asegurar la estabilidad del aparato y a la vez la seguridad de las personas.

No mover nunca el aparato con los telepiés desdoblados, para evitar heridas.

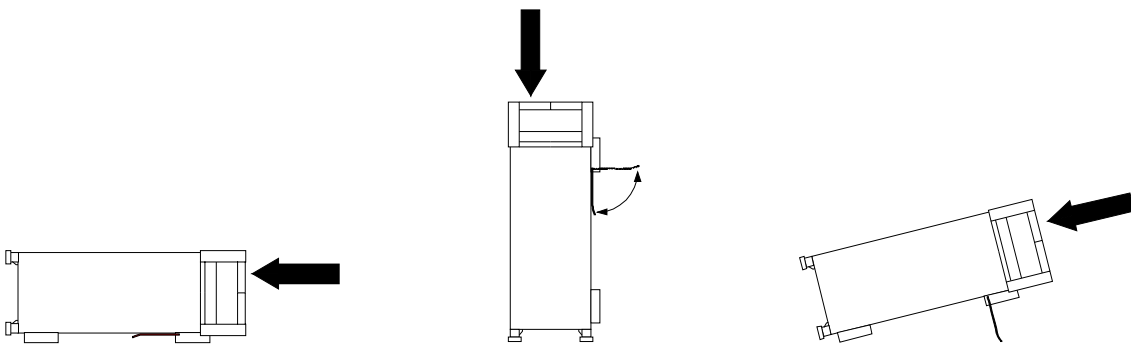
El peso total equilibrado (peso propio más el de los aparatos posicionados sobre este) ejercido sobre los telepiés no deberá exceder a los 500N.

Posicionar el aparato sobre una superficie estable. Los aparatos puestos encima de éste deben estar asegurados para que no resbalen (por ejemplo fijando los pies del aparato en el listón del marco de delante arriba).

Por favor no manipulen debajo del aparato y no pongan nada debajo de este cuando esté posicionado sobre los telepiés desdoblados, ya que si no pueden originarse heridas o daños en objetos.



El aparato puede ser puesto en funcionamiento en cualquiera de las posiciones aquí descritas.



## Safety Instructions for Stacking Instruments

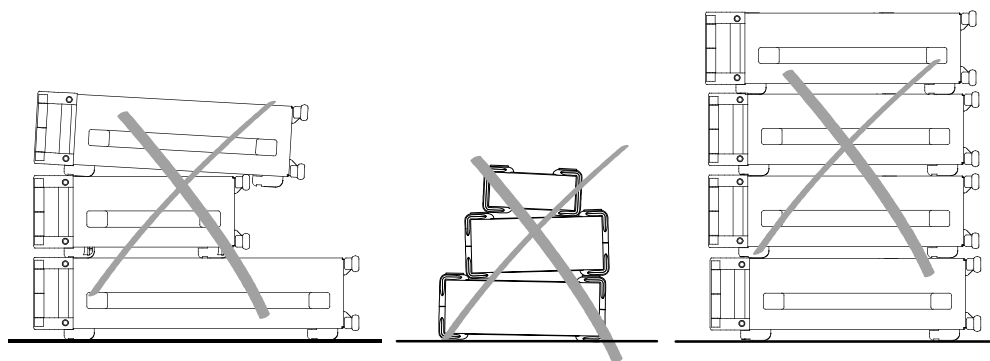
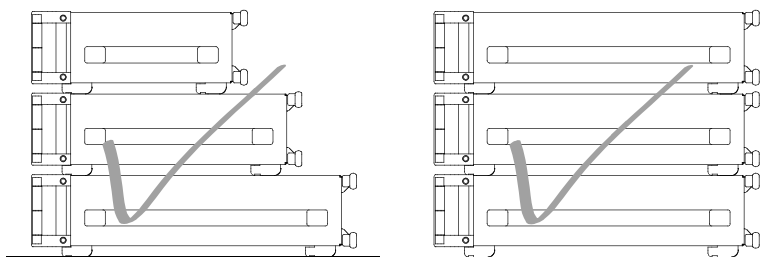


### WARNING

Danger of injury

Instruments may slip if they are stacked on top of each other.

Place the instrument on a stable, even surface. Stack the instruments according to their size, with the largest instrument on the bottom. Do not stack more than three instruments directly on top of each other. Instruments may only be stacked if their feet and housing allow horizontal stacking. If these conditions are not met, the instruments must be installed in a rack in order to avoid the risk of personal injury and material damage.



Incorrect order

Incompatible feet

Too many instruments stacked



## Informaciones de seguridad para el amontonamiento de aparatos

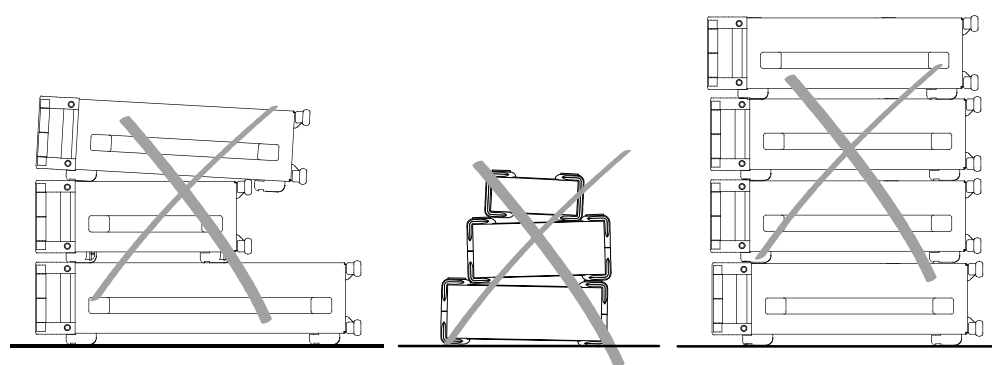
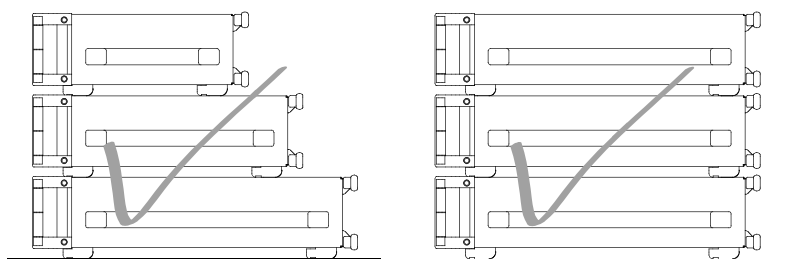


### ADVERTENCIA

Peligro de heridas

Los aparatos pueden desplazarse al ser amontonados.

Posicionar los aparatos sobre una superficie estable y lisa. Amontonar los aparatos por orden de su tamaño. No amontonar nunca más de tres aparatos uno sobre el otro. Los aparatos solamente deberán ser amontonados, si los pies y la caja del aparato correspondiente hacen posible amontonarlos de forma horizontal. Si no se cumplen estas condiciones, deberán ser montados los aparatos en una caja apta para este propósito. De esta manera evitarán el riesgo de daños en personas y daños en el aparato.



orden no permitido

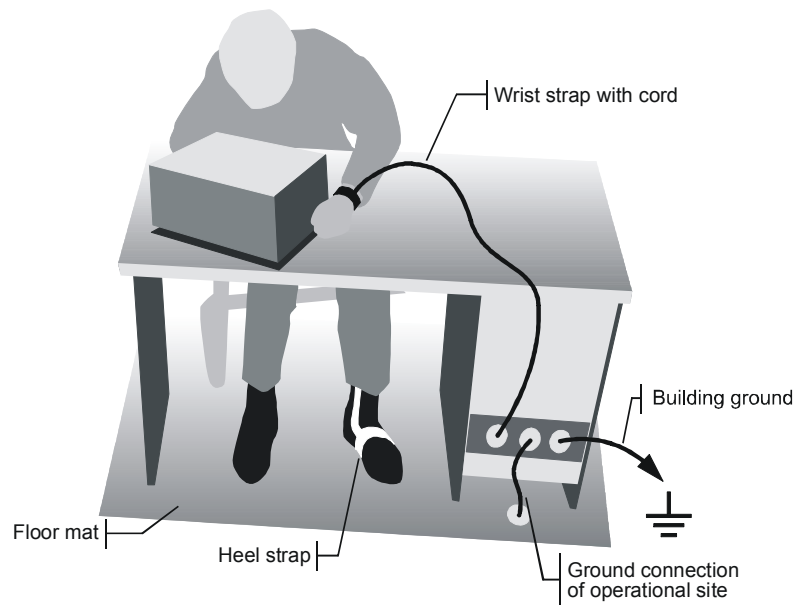
piés incompatibles

demasiados aparatos amontonados

## Instructions for Electrostatic Discharge Protection

### NOTICE

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



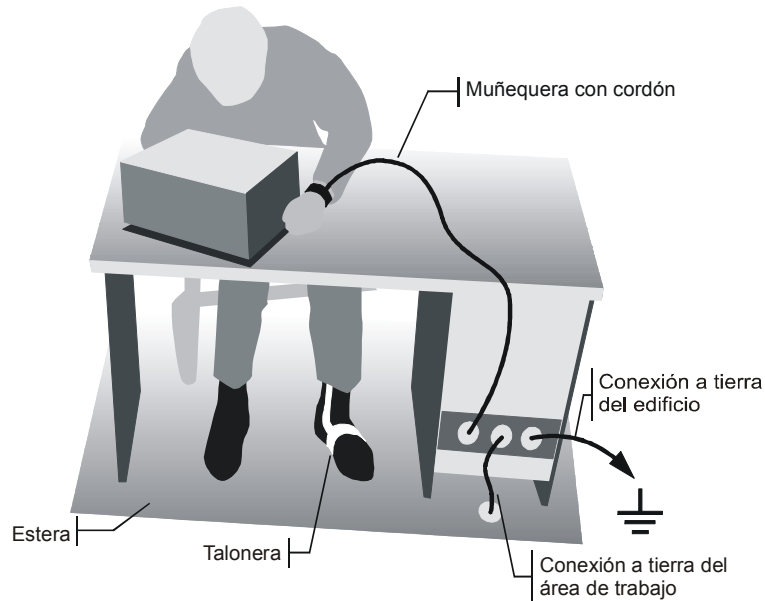
The following two methods of ESD protection may be used together or separately:

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

## Instrucciones para la protección contra descargas electrostáticas

### AVISO

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



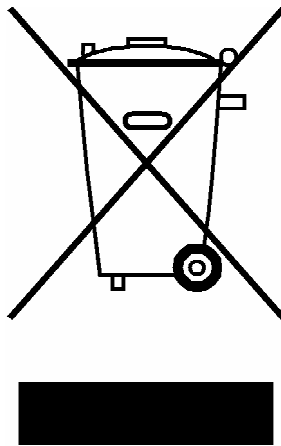
Los siguientes dos métodos de protección ESD pueden ser usados juntos o separados:

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

# Customer Information Regarding Product Disposal

The German Electrical and Electronic Equipment (ElektroG) Act is an implementation of the following EC directives:

- 2002/96/EC on waste electrical and electronic equipment (WEEE) and
- 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).



Product labeling in accordance with EN 50419

Once the lifetime of a product has ended, this product must not be disposed of in the standard domestic refuse. Even disposal via the municipal collection points for waste electrical and electronic equipment is not permitted.

Rohde & Schwarz GmbH & Co. KG has developed a disposal concept for the environmental-friendly disposal or recycling of waste material and fully assumes its obligation as a producer to take back and dispose of electrical and electronic waste in accordance with the ElektroG Act.

Please contact your local service representative to dispose of the product.



## Certified Quality System

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

DQS REG. NO 001954 QM UM

### QUALITÄTSZERTIFIKAT

*Sehr geehrter Kunde,*  
Sie haben sich für den Kauf eines Rohde & Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Managementsystems entwickelt, gefertigt und geprüft. Das Rohde & Schwarz Managementsystem ist zertifiziert nach:

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

### CERTIFICATE OF QUALITY

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

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

### CERTIFICAT DE QUALITÉ

*Cher Client,*  
vous avez choisi d'acheter un produit Rohde & Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité. Le système de gestion qualité de Rohde & Schwarz a été homologué conformément aux normes:

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





Certificate No.: 2007-26

This is to certify that:

Equipment type	Stock No.	Designation
SFE	2112.4300.02	Broadcast Tester
SFE-B3	2112.4500.02	Memory Extension

complies with the provisions of the Directive of the Council of the European Union on the approximation of the laws of the Member States

- relating to electrical equipment for use within defined voltage limits (2006/95/EC)
- relating to electromagnetic compatibility (2004/108/EC)

Conformity is proven by compliance with the following standards:

EN 61010-1 : 2001  
EN 61326 : 1997 + A1 : 1998 + A2 : 2001 + A3 : 2003  
EN 55011 : 1998 + A1 : 1999 + A2 : 2002, Class B  
EN 61000-3-2 : 2000 + A2 : 2005  
EN 61000-3-3 : 1995 + A1 : 2001

For the assessment of electromagnetic compatibility, the limits of radio interference for Class B equipment as well as the immunity to interference for operation in industry have been used as a basis.

Affixing the EC conformity mark as from 2007

**ROHDE & SCHWARZ GmbH & Co. KG**  
Mühldorfstr. 15, D-81671 München

Munich, 2007-07-31

Central Quality Management MF-QZ / Radde

# Customer Support

## Technical support – where and when you need it

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

## Up-to-date information and upgrades

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

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

### USA & Canada

Monday to Friday	(except US public holidays)
8:00 AM – 8:00 PM	Eastern Standard Time (EST)
Tel. from USA	888-test-rsa (888-837-8772) (opt 2)
From outside USA	+1 410 910 7800 (opt 2)
Fax	+1 410 910 7801
E-mail	<a href="mailto:CustomerSupport@rohde-schwarz.com">CustomerSupport@rohde-schwarz.com</a>

### 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	<a href="mailto:CustomerSupport@rohde-schwarz.com">CustomerSupport@rohde-schwarz.com</a>

### 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	<a href="mailto:CustomerSupport@rohde-schwarz.com">CustomerSupport@rohde-schwarz.com</a>

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



**ROHDE & SCHWARZ**

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Fax +49 (50 42) 9 98-105  
[info.bick@rohde-schwarz.com](mailto:info.bick@rohde-schwarz.com)

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Fax +49 (61 82) 800-100  
[info@hameg.de](mailto:info@hameg.de)

### Locations Worldwide

Please refer to our homepage: [www.rohde-schwarz.com](http://www.rohde-schwarz.com)

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



## The following values have changed since the data sheet was printed

### Level

Level uncertainty	"auto" attenuator mode, temperature range +18 °C to +33 °C <b>level ≥-90 dBm</b>	<±1.0 dB
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### Operating data

Electromagnetic compatibility	power factor correction	in line with EN 55011 class <b>A</b> , EN 61326 in line with EN 61000-3-2
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### Note regarding the use of the instrument

The instrument complies with the emission requirements stipulated by EN 55011 class A. This means that the instrument is suitable for use in industrial environments. According to EN 61000-6-4 operation neither in residential, commercial, business areas nor in small-size companies is covered.

The instrument must not be operated in residential, commercial, business areas or in small-size companies, except that additional measures are taken, so that EN 61000-6-3 is met.

## Nach Drucklegung des Datenblattes änderten sich folgende Werte

### Pegel

Pegelunsicherheit	Eichleitungsbetriebsart "Auto", Temperaturbereich +18 °C bis +33 °C <b>Pegel ≥-90 dBm</b>	<±1,0 dB
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### Betriebsdaten

Elektromagnetische Verträglichkeit	Leistungskorrekturfaktor	gemäß EN 55011 Klasse <b>A</b> , EN 61326 gemäß EN 61000-3-2
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### Hinweis für die Benutzung des Gerätes

Das Gerät erfüllt die Emissionsvorschriften nach EN 55011 Klasse A. Damit ist das Gerät für den Einsatz im industriellen Umfeld geeignet. Gemäss EN 61000-6-4 umfasst dies nicht den Betrieb im Wohnbereich, in Geschäfts- und Gewerbebereichen sowie in Kleinbetrieben.

Das Gerät darf im Wohnbereich, in Geschäfts- und Gewerbebereichen sowie in Kleinbetrieben nicht betrieben werden, ausser es werden zusätzliche Massnahmen getroffen, so dass EN 61000-6-3 erfüllt wird.



# 0 Overview of Manual

- Chapter 1** This chapter describes the instrument's controls and the connectors using front- and rear-panel views. How to prepare the instrument for operation is also described. The procedure for connecting external devices such as a printer, keyboard, mouse, and monitor is also explained. Specifications for the interfaces are contained in the data sheet.
- Chapter 2** Provides an overview of the instrument's functions and operating concept.
- Chapter 3** Provides a much more detailed description of how to operate the instrument and includes an overview of the menus.

## CD-ROM

The CD-ROM contains the complete manual with additional chapters in a format you can print (PDF).

- Chapter 4** Explains the instrument's individual menus and functions.
- Chapter 5** Describes the basic principles of remote control.
- Chapter 6** Describes how to use the remote operation commands.
- Chapter 7** Describes the instrument's interfaces.
- Chapter 8** Describes how to maintain the instrument.
- Chapter 9** Contains an overview of the error messages that the instrument may produce.



# 1 Putting the Instrument into Operation

## 1.1 Explanation of the Front Panel

This section provides an overview of the controls and connectors on the instrument's front panel. Each control or connector is briefly described along with a reference to the chapter(s) containing detailed information about its usage.

Figure 1.1-1 Explanation of the front panel



The ON/OFF button switches the instrument from standby mode to ready mode.

The AC power switch on the back of the instrument must be switched on.

The yellow LED to the right is illuminated in standby mode.

The green LED to the left is illuminated in ready mode (see Chapter Switching the Instrument On).



### Caution!

In standby mode, AC line voltage is still present on the instrument!



Sets a defined instrument state. (See Chapter 4).



Switches from REMOTE mode (remote control) to LOCAL mode (manual operation). (See Chapter 4).



Used to manage the favorites and the user fields in the information area of the display. (See Chapter 4).



Button for accessing context-sensitive help. (See Chapter 4).



Used to save and reload instrument states and manage files.



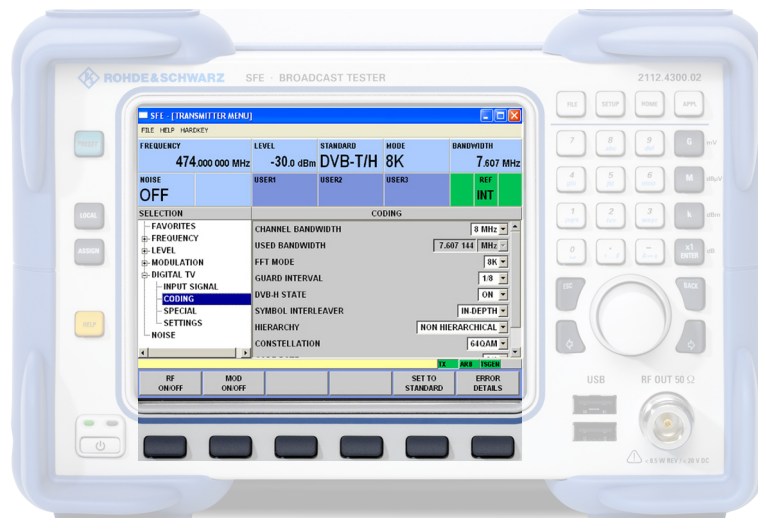
Used for instrument configuration.



Resets the navigation.



Button for selecting/switching to another application (TX, BER, TSGEN,...). (See Chapter 4).



### Menu bar

The menu bar provides additional access to the hardkeys on the front panel (used primarily for remote operation).

### Information area

Displays the main parameters for the selected application.

### Tree

Navigates within the main areas of the active application.

### Workview

Displays the parameters for the active application. Parameters can be modified here.

### Error / status display

Current error messages and warnings for the application that is running. Overview of other active applications.

### Softkey labels

Display for the executable commands.

### Softkeys

Keys for execution of commands.



Keypad for entering data.



Used to enter zero.  
Used to enter a space.



Used to enter a decimal point.  
Used to enter a special character.



Used to enter the sign.  
Switches between uppercase and lowercase letters.



Input of the unit.

- ◆ Calls up the next menu level.
- ◆ Activates editing mode for the marked numeric and alphanumeric parameters.
- ◆ Data entry is completed and the new value is accepted. For numeric parameters, the unit is displayed in the menu next to the value.
- ◆ Switches the marked status parameters on/off (State On/Off). Confirms (OK) and closes message windows (see Chapter 3).





Deletes the character to the left of the cursor.



Changes between the insert and overwrite modes.



### Rotary knob

- ◆ Varies the input value at the cursor position. You can set and activate a fixed step size for the frequency and the level.
- ◆ Navigation within the tree and the workview.
- ◆ Moves the cursor in the tables and drop-down lists.
- ◆ To complete your entry, press the rotary knob (click = Enter). Editing mode is terminated and the value is accepted.

(See Chapter 3).



### Cursor keys

- ◆ Moves the cursor in the input fields in editing mode.
- ◆ Marks the parameters in the menus and in the tables (left/right).

(See Chapter 3).



USB interfaces (USB = Universal Serial Bus) type A (host USB).

- ◆ Connection of external devices such as a mouse, keyboard.
- ◆ Connection of the memory stick for transferring files.

Another USB interface type A (host USB) is available on the rear panel. (See Chapter 7).



**RF OUT** 50  $\Omega$  BNC output for the RF signal.  
(See Chapter 7).



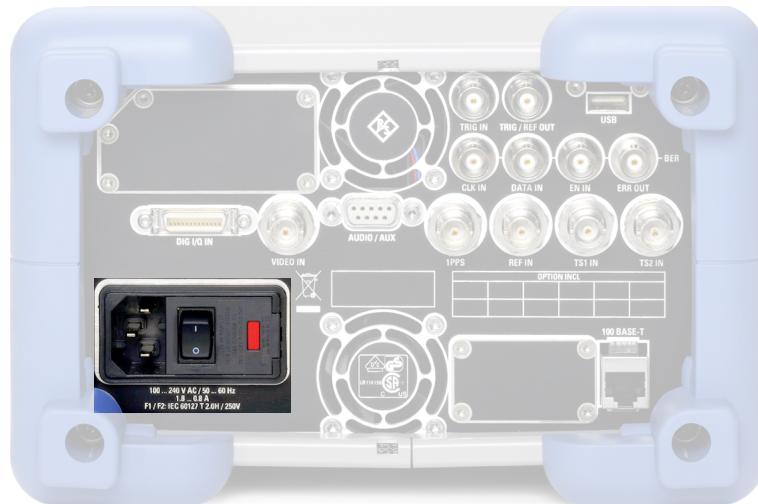
### Important:

Do not overload the RF outputs. See the data sheet for the maximum permissible reverse power.

## 1.2 Explanation of the Rear Panel

This section provides an overview of the connectors on the instrument's rear panel. Each connector is briefly described along with a reference to the chapter(s) containing detailed information about its usage. Specifications for the connectors are contained in the data sheet.

Figure 1.2-1 Rear-panel view



### AC power connector

The R&S® SFE is equipped with AC voltage detection. The instrument will automatically set itself to the AC voltage it detects (range: see the type label). No external switching or modification of the fuses is necessary.



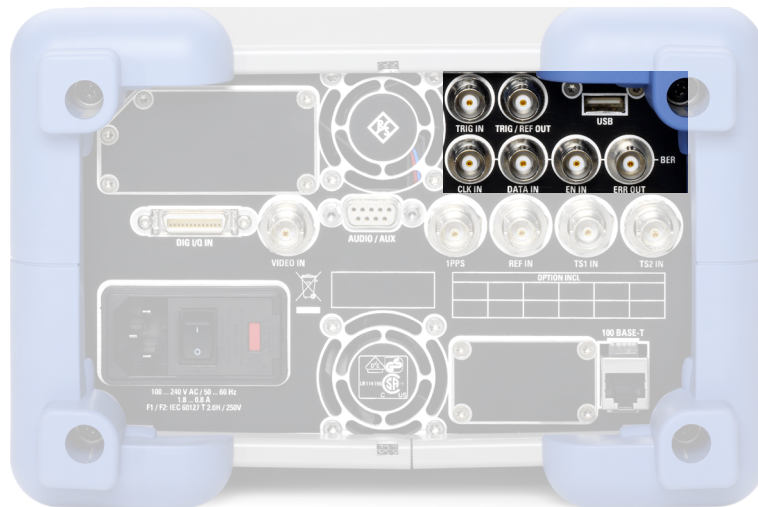
### AC power switch

The AC power switch is located below the AC power connector.



### AC power fuse

See Chapter AC Power Fuses and the data sheet



Input for external triggering of digital modulations and standards and ARB.



Output of internal reference signal.

Output for user-programmable marker signal for triggering and control of external devices.



USB interfaces (USB = Universal Serial Bus) type A (host USB).

- ◆ Connection of external devices such as mouse, keyboard, printer.
- ◆ Connection of the memory stick for transferring files.

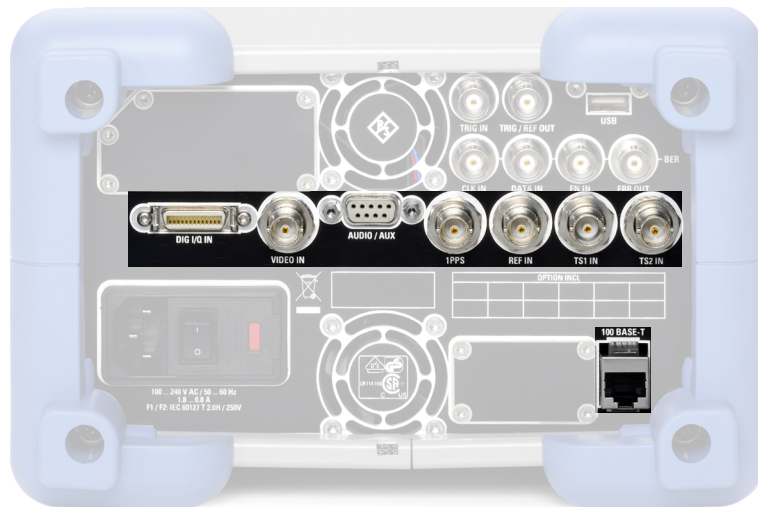
Further USB interfaces type A (host USB) are located on the front panel of the instrument.

See Chapters 1 and 7.



These four BNC female connectors are associated with the bit error ratio tester application (BER® SFE-K60) provided by the R&S® SFE. They are used for serial bit error ratio (BER) measurements.

For details, see Chapter 4.



Input for the digital I/Q signal (option R&S® SFE-K80).



Video input for the ATV transmission standards.



Multipurpose input:

- ◆ Audio IN
- ◆ BTSC IN
- ◆ NICAM IN



Input for the one pulse per second signal used in SFN modes.



Input for external reference signal.



### TS1 IN / TS2 IN

TS1 IN and TS2 IN are used to feed in a serial MPEG2 transport stream.

In T-DMB / DAB mode TS2 IN is used as external **ETI input** (ETI: ensemble transport interface).

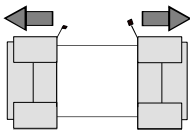


LAN interface.

## 1.3 Preparing for Operation

The following section describes how to prepare the instrument for operation and how to connect external devices. Please observe the general safety instructions for operating the instrument. For information on installing options and updating the software, refer to the service manual.

### 1.3.1 Unpacking the Instrument



Remove  
protective  
covers

- ◆ After unpacking the instrument, check the supplied equipment against the delivery note and the lists of accessories to make sure that everything is present.
- ◆ Remove the two protective covers at the front and the rear of the broadcast tester and carefully check the instrument for possible damage.
- ◆ If you find any damage, inform the carrier immediately. Keep the packaging material to support your claim.
- ◆ The original packaging is also useful for transporting or shipping the broadcast tester later on. Retain at least the two protective covers for the front and rear panel to keep the controls and connectors from being damaged during subsequent shipping..

### 1.3.2 Positioning the Instrument or Installing It in a 19" Rack

The instrument is designed for interior use only. You can set it up individually or install it in a 19" rack.

To install it in a 19" rack, you must use a rack mounting adapter (see data sheet for order number). Instructions are included with the adapter.



## 1.3.3 Safety Instructions

### 1.3.3.1 General Safety Instructions



**Important:**

Prior to putting the instrument into operation, check the following:

- ◆ The instrument cover is in place and screwed on.
- ◆ Vent holes are not obstructed, and air flow is not blocked on the rear panel and the lateral vent. The spacing from the wall should be at least 10 cm.
- ◆ The signal levels at the inputs do not exceed permissible limits.
- ◆ The outputs of the instrument are not overloaded or incorrectly connected.  
In particular, observe the maximum permissible reverse power allowed on the RF outputs (see data sheet).
- ◆ The instrument may be operated only in a horizontal position and the surface on which it is placed must be level.
- ◆ The ambient temperature must be in the range specified in the data sheet.

Any noncompliance with these instructions can damage the instrument..

### 1.3.3.2 Protective Measures Against Electrostatic Discharge

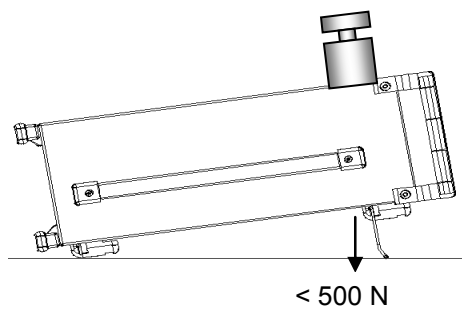


To avoid damage to the electronic components of the equipment under test (EUT) due to electrostatic discharge when touched, always use the appropriate protective equipment.

### 1.3.3.3 Positioning the Instrument

**Warning!**

The feet must be fully folded in or folded out. Only then can a stable position of the instrument and reliable operation be ensured. When the feet are folded out, the total uniformly distributed weight on the feet must not exceed 500 N (instrument's own weight plus any other instruments arranged on top). These units must be secured against slipping (e.g. by locking the feet to the top front of the housing).

**Caution:**

When the instrument is shifted with the feet out, the feet might fold in. To avoid injuries, the unit must therefore not be shifted with the feet out.



### 1.3.3.4 EMC Safety Precautions

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**Caution:**

To prevent electromagnetic interference, the instrument must be operated only when closed and with all shielding covers fitted. Only suitable and shielded signal and control cables may be used.

- ◆ This applies particularly to cables that are connected to the ASI/BER/TRIGGER inputs and outputs. Regardless of the data rate and the packet timing of the transport stream, high signal levels can occur at individual points in the signal spectrum. To avoid EMC problems, the cables should have at least 80 dB shielding protection up to 1 GHz. This generally requires the use of cables with double shielding.
  - ◆ When connecting the USB interfaces, use only peripheral equipment that does not cause limit violations.
  - ◆ When wiring the LAN interface (100BaseT), be sure to use a suitable cable (e.g. Category 6).
- 

### 1.3.4 Connecting the Instrument to AC Power

The R&S® SFE is equipped with AC voltage detection. The instrument will automatically set itself to the AC voltage it detects (see rear). No external switching or modification of the fuses is necessary. The AC power connector is at the rear of the instrument.

## 1.3.5 Switching the Instrument On



### Instruments with an AC power switch

- ◆ Use the supplied AC power cable to connect the instrument to the AC power mains.
- ◆ Since the instrument is in compliance with safety class EN61010-1, it should only be connected to a socket with a ground contact.
- ◆ Change the AC switch on the rear of the instrument to the **I** position.

Once the instrument is switched on, it will be in the STANDBY state or in the ON state depending on the position of the ON/STANDBY switch on the front of the instrument..



### Important:

The AC power switch can be left permanently switched on. You need to switch off the instrument only if it is to be completely disconnected from the AC power line



- ◆ Press the ON/STANDBY switch on the front of the instrument; the green LED should illuminate.

The instrument is now ready for operation. All of the subassemblies in the instrument are now live.

### 1.3.6 AC Power Fuses



Before replacing fuses, switch off the instrument and disconnect it from the power supply.

The instrument is equipped with two fuses of type F1/F2: IEC127-T2.0H/250 V. The fuses are located under the AC power switch on the rear panel of the instrument.

#### Replacing the fuses:

- ◆ Open the cover on the fuse box and remove the fuse holder.
- ◆ Replace defective fuses and put fuse holder back into place.
- ◆ Close the fuse box cover.

### 1.3.7 Startup Screen and Booting the R&S® SFE

Once the instrument is powered on, the installed BIOS version and some of the computer features are displayed on the screen for a few seconds.

The Windows XP® Embedded operating system will then be booted, followed by the instrument firmware. During bootup, the instrument firmware is subjected to a selftest. Once bootup is complete, the main screen of the broadcast tester will appear and the instrument can be operated. The settings that were active before the instrument was last switched off are used unless another instrument setting was selected in the **File** menu.



#### Important:

If the software freezes unexpectedly, you can reboot the instrument by pressing the Standby key for about 5 seconds.

### 1.3.8 Switching the Instrument Off



- ◆ Press the ON/STANDBY switch on the front of the instrument.

The R&S® SFE saves the current settings to the hard disk and then shuts down the Windows operating system. The power supply is then switched to STANDBY.

Only the power supply has the operating voltage supplied to it, and the crystal oven is maintained at its operating temperature.

The yellow LED should be illuminated.



#### Warning!

In standby mode, AC line voltage is still present on the instrument.

#### Only in case of complete disconnection from the AC line



- ◆ Change the AC switch on the rear of the instrument to the **O** position. None of the LEDs on the front panel should be illuminated.



#### Important:

Always switch to standby prior to complete disconnection from the AC line. If you set the power switch to the **O** position before the instrument is switched to standby mode, the current settings will be lost.

### 1.3.9 Functional Check

The broadcast tester automatically monitors the main instrument functions during power-on and continuously during operation. If an error is detected, an ERROR indication will appear in the error/warnings line of the display along with a brief description of the error.

To obtain more information about the error, press the **ERROR** **DETAILS** softkey. A description of the error(s) will be shown in the display (see Chapter 9, Error Messages).

Besides automatic monitoring of instrument functions, the R&S® SFE also offers other ways of ensuring proper operation:

- ◆ **System error correction (“internal adjustment”)**  
Internal adjustment can be carried out in the **Setup Adjustments** menu. This is a way to obtain the best possible level accuracy, for example.
- ◆ **Self checks**  
If necessary, self checks can be defined. Also see Service Manual Equipment, Chapter 3, Section "Self Check".
- ◆ **Test points**  
You can also query certain internal measurement points and display the results. See Chapter 4.

### 1.3.10 Presets

Press the **PRESET** button to reach a defined state for the instrument.

RF frequency	1 GHz
RF level	OFF
Reference frequency	Internal, adjustment off
Modulation	Switched off
Interruption-free level setting	Switched off: Level Attenuator mode: AUTO
Internal level control	Level ALC: AUTO
IP address	Unchanged

PRESET sets all parameters and switching states to specific values (even for operating modes that are not currently enabled).

The presettings that go beyond what is shown in the above list can be obtained from the \*RST values.

### 1.3.11 Connecting an External Keyboard



The R&S® SFE allows you to connect a standard external keyboard with a USB interface. A keyboard will make it easier to enter comments, file names, etc. A keyboard is necessary if you want to have easy access to the power of Windows XP®.

The keyboard is connected to one of the USB interfaces (type A) on the instrument's front or rear panel.

The keyboard will be automatically detected once you connect it. The default language setting is for a UK keyboard. You can change the language and modify other settings such as the repetition rate in Windows XP® under **Start - Control Panel - Keyboard** or **Regional and Language Options**. Access this menu by pressing the **Windows** key on an external keyboard.

### 1.3.12 Connecting a Mouse



The R&S® SFE allows you to connect a standard mouse with a USB interface. The mouse will make it easier to use the block diagram with the associated menus. It is necessary if you want to have easy access to the power of Windows XP®.

The keyboard is connected to one of the USB interfaces on the instrument's front or rear panel.

The mouse will be automatically detected once you connect it. Some settings such as the speed of the mouse cursor can be modified in the Windows XP® menu **Start - Control Panel - Mouse**. You can access this menu by pressing the **Windows** key on an external keyboard.

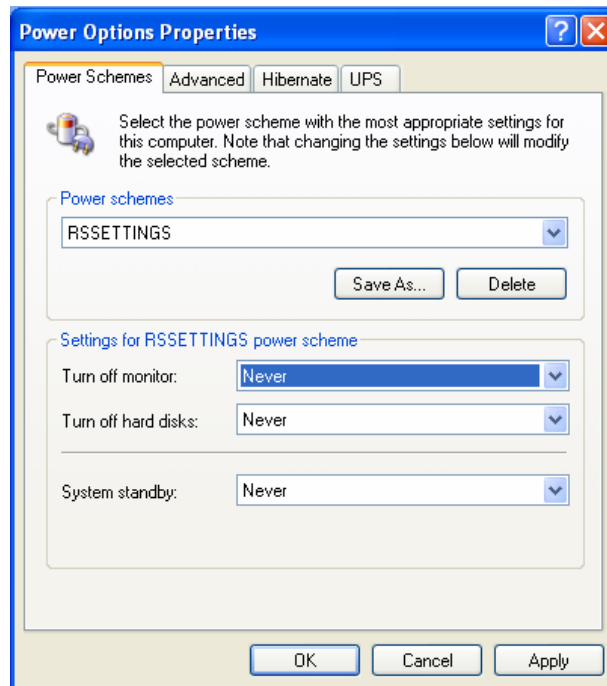
### 1.3.13 Displaying the Screen on an External Monitor

The R&S® SFE does not have a connector for connecting an external monitor with an analog interface. However, it is possible to display the screen on external monitors by launching manual remote operation on an external computer (using the Windows program Remote Desktop Connection).

### 1.3.14 Activating Power Saver Mode:

Power Saver mode is not set by default for the R&S® SFE.

If the display is not needed, the monitor can be switched off in Windows XP® under **Start - Control Panel – Power Options** after a specific amount of time.







## 1.4 Notes on the Operating System and Firmware Update

### 1.4.1 Installation of the Software

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**Caution:**

- ◆ Only software authorized by Rohde & Schwarz for use in the instrument may be installed. In case of doubt, please contact your local Rohde & Schwarz representative.
  - ◆ Changes to the system are only permissible in agreement with Rohde & Schwarz.
  - ◆ Updating the operating system, e.g. installing a service pack, is not allowed without permission.
- 

Otherwise, the stability and performance of the system may be impaired. Rohde & Schwarz shall not assume any liability for faults caused by impermissible manipulations of the system.

## 1.4.2 Windows® XP Embedded



### Caution:

The drivers and programs that are used with Windows® XP have been modified to suit the broadcast tester. To avoid disrupting the operation of the instrument, do not change any settings unless they are mentioned in the following section. The existing software may be modified only by using update software approved by Rohde & Schwarz. Likewise, only run programs on the instrument that have been approved by Rohde & Schwarz for such purposes..

The broadcast tester is equipped with the Windows XP Embedded operating system. When the instrument is delivered, the configuration of this operating system has been set to permit the optimum operation of the broadcast tester and test transmitter. Changes to the system settings are required only if you install peripherals such as a keyboard and printer or if you configure the network and the settings do not conform to the default settings (see the following sections). When you power on the broadcast tester or the test transmitter, the operating system will boot up and then automatically launch the instrument firmware without asking for a password (“autologin”).



### Important:

Autologin uses the user name and the password “Instrument”. This standard user has administrator rights so that it is possible to install printers and networks.

Access to the operating system requires the connection of an external keyboard. Use the **Windows** key on the external keyboard (next to the CTRL key) to open the Windows XP start menu so that you can run Windows XP programs. You should connect a mouse if you want more convenient access to Windows XP.

The instrument screen will be brought to the foreground if you double-click the Windows button **SFE [xxx]** in the taskbar.

You can modify the system settings under Windows XP in the **Start - Control Panel** menu (see the documentation for Windows XP and for the hardware for the required settings).

The instrument does not have a disk drive. Data can be exchanged using a memory stick which you plug into one of the USB interfaces. The memory stick is automatically assigned a free drive letter and you can use Windows Explorer to transfer data.

### 1.4.3 Firmware Update

Update instructions for the firmware are provided together with the new firmware. Be sure to follow these instructions carefully.

Your instrument is delivered with the latest firmware version available. Firmware updates are provided via Rohde & Schwarz service centers or sales offices.

The installation of a new firmware version can be performed either via the USB or the LAN interface.

The downloaded update files have to be stored on the memory stick for an update via the USB interface or on a network directory for an update via the LAN interface (due to the speed recommended).

## 1.5 Connecting the instrument to a Network (LAN)

The instrument is equipped with a network connection and can be connected to an Ethernet LAN (local area network).

Provided the appropriate rights have been granted by the network administrator, files can be transferred via the network, and network resources, e.g. network directories, can be used. The instrument can also be remote-controlled and manually operated in the network.

Manual remote control allows someone to operate the instrument from an external computer situated anywhere in the world. For example, a user working in one part of a building can operate one or more instrument units that are part of a test setup situated in another part of the building.

Remote control of the instrument via the LAN interface is described in Chapter 5 of the operating manual, and firmware updates are described in Chapter 4 of the service manual (on the supplied CD-ROM).

### 1.5.1 Connecting to the Network



**Caution:**

Always coordinate the connection of the instrument to the network with the network administrator. Any errors that occur during the connection process can affect the entire network.

Make sure that the instrument is switched off (standby mode) when you connect and disconnect the network cable. This is the only way to ensure that the network connection is reliably detected and any disruptions during the operation of the instrument are avoided.



The instrument is connected to the LAN using a standard RJ-45 cable via the LAN interface on the rear of the instrument.

Chapter 7 contains a description of the connector.

## Configuring the instrument for network operation

The network interface functions with 100 MHz Ethernet IEEE 802.3u. The TCP/IP network protocol and the associated network services are preconfigured.

To exchange data within a LAN, every computer or instrument that is connected must have a unique IP address or a unique computer name. Access between different users is managed with access authorizations. These access authorizations determine which of the available network resources such as file storage systems are available for the instrument, for example.

### Networks with DHCP

The instrument is preconfigured for networks using the dynamic host configuration protocol (DHCP). In such networks, the instrument is automatically assigned a free IP address. In this case, identification in the network is based on the use of a unique computer name.

Every instrument is assigned an individual computer name at the factory. You can view and modify this name in the Windows XP **Start - My Computer** menu (see under [Querying the Computer Name](#)).

### Networks that assign fixed IP addresses

In networks that assign fixed IP addresses, the network administrator usually handles this process. The fixed IP address must be entered under Windows XP **Start - Control Panel** (see below [“Entering the IP address”](#)).

### Point-to-point connections

To set up a single network (a LAN connection between an instrument and a single computer without integration into a larger network), an IP address needs to be assigned to the instrument and the computer. The IP addresses 192.168.xxx.yyy are available for use here, where xxx and yyy can assume values of 1 to 254, and the value for the subnet mask is 255.255.255.0.

In this case, a standard RJ-45 crossover cable is required for the connection.

### User parameters

For the instrument, the standard user name is **Instrument**. The user name is used for autologin when the instrument is started up and for manual remote control. The password is also **Instrument**. The network administrator must grant authorization to this user to determine what network directories and resources can be accessed by the instrument.

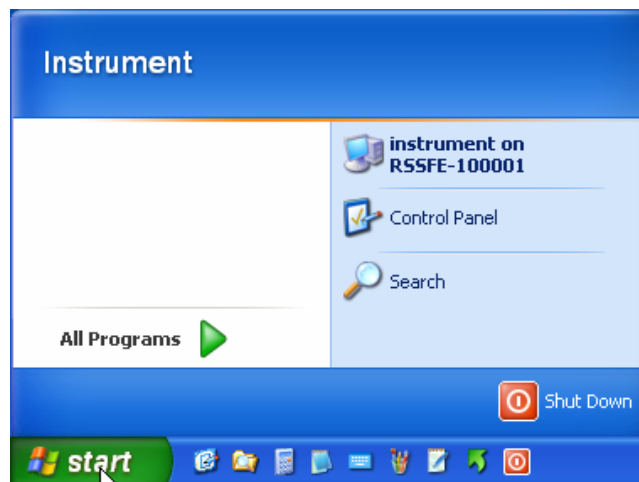
## Preparations

The instrument is configured for network operation in the menus of the Windows XP Embedded operating system. The operating system can be accessed only when an external keyboard is connected. The use of a mouse makes operation more convenient. Power down the instrument prior to connecting the keyboard and mouse so that the operating system will properly recognize them.

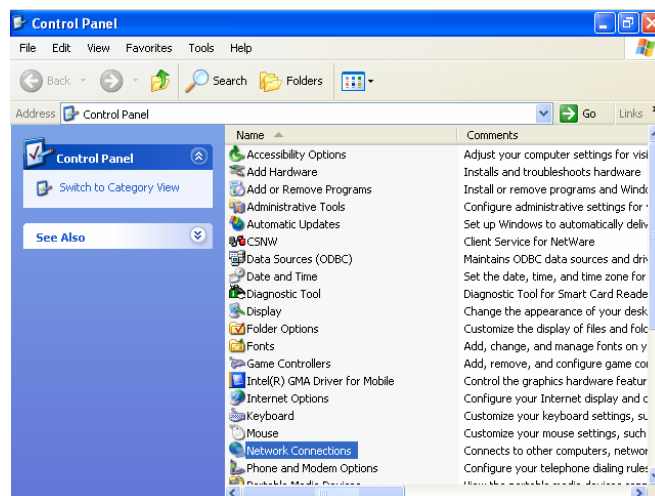
1. Switch off the instrument.
2. Connect the external keyboard and mouse to the USB interface.
3. Switch on the instrument.

## Entering the IP address

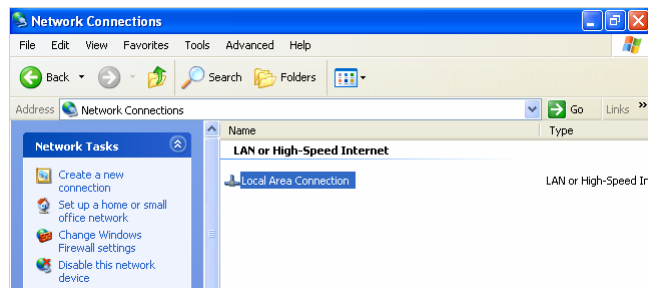
1. Press the **Windows** key on the external keyboard (next to the CTRL key) to call up the start menu.



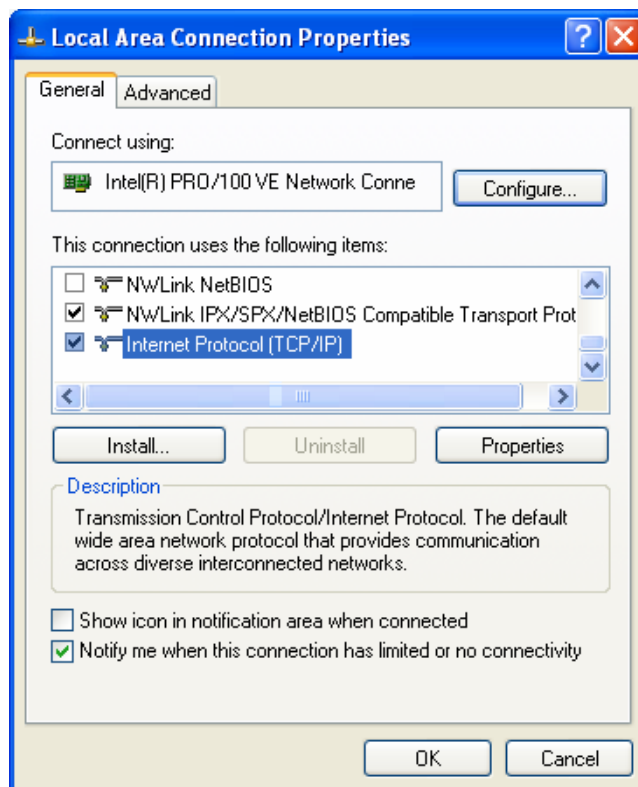
2. Click **Control Panel** and then **Network**



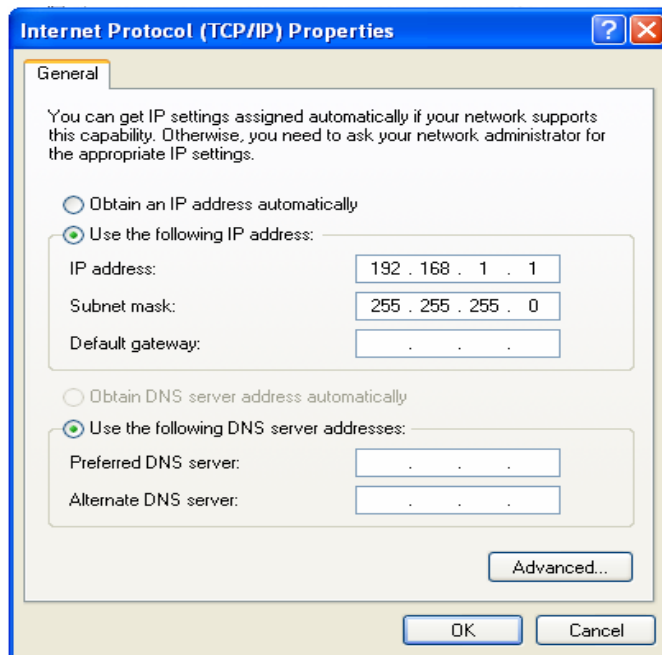
3. In the **Network Connections** menu, click **Local Area Connection** on the right.



4. In the **General** tab, activate Properties. In the field that reads **This connection uses the following items:**, mark the **Internet Protocol (TCP/IP)** item and then click the **Properties** button.



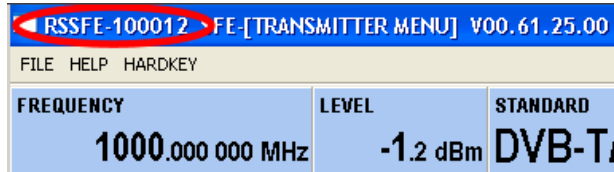
5. In the **Internet Protocol (TCP/IP) Properties** menu, enter the IP address in the field **Use the following IP address** (ask your network administrator if you need more information). Finish by clicking OK in all of the menus.  
The default setting will be **Obtain an IP address automatically** (DHCP = Dynamic Host Configuration Protocol).





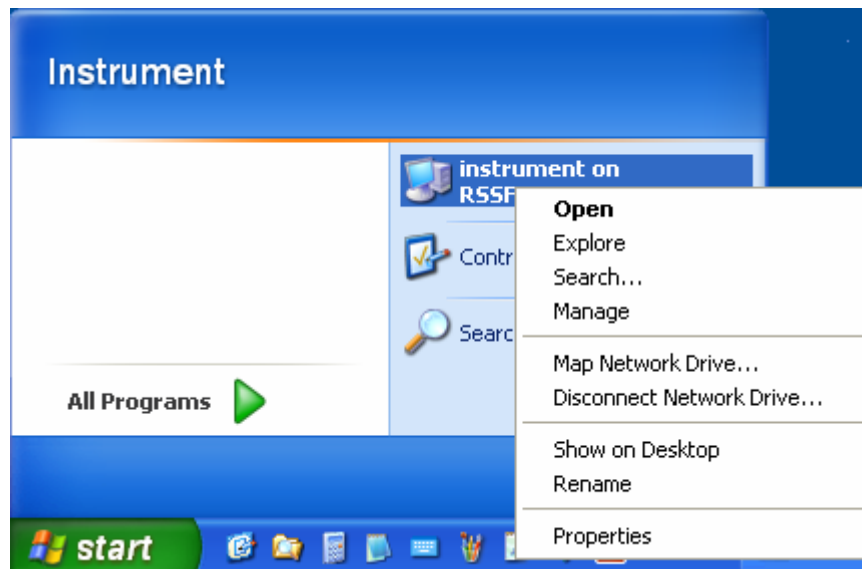
## Querying the Computer Name

1. If the instrument has its DEFAULT COMPUTER NAME the computer name is displayed as part of the window title of the application:

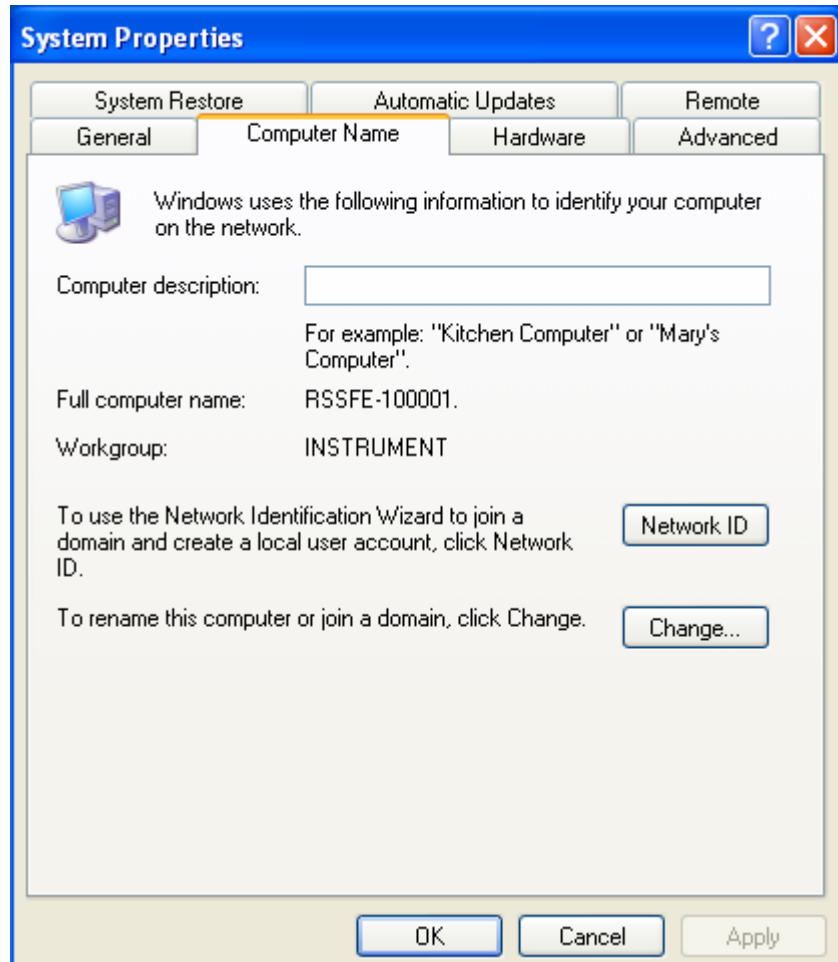


Otherwise follow the next steps:

2. Press the **Windows** key on the external keyboard (next to the CTRL key) to call up the start menu. Select **instrument on RSSFE-xxxxxx** and call up the context-sensitive menu with the right mouse button



3. Click **Properties** and select the **Computer Name** tab in the menu.  
The computer name is shown under **Full Computer Name**.

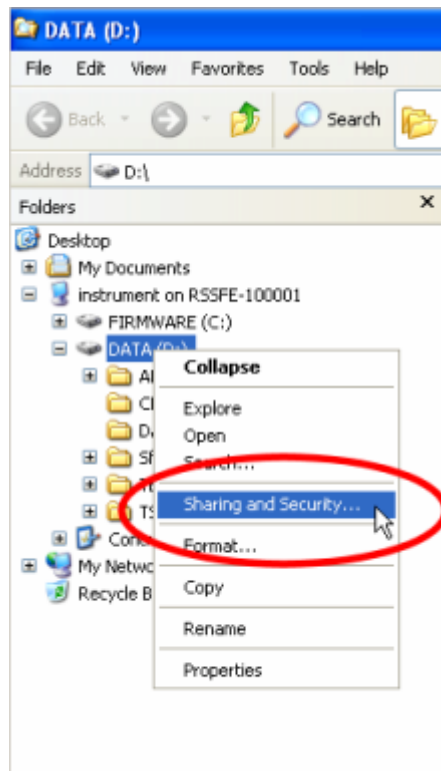


## 1.5.2 Sharing and Accessing Instrument Drives

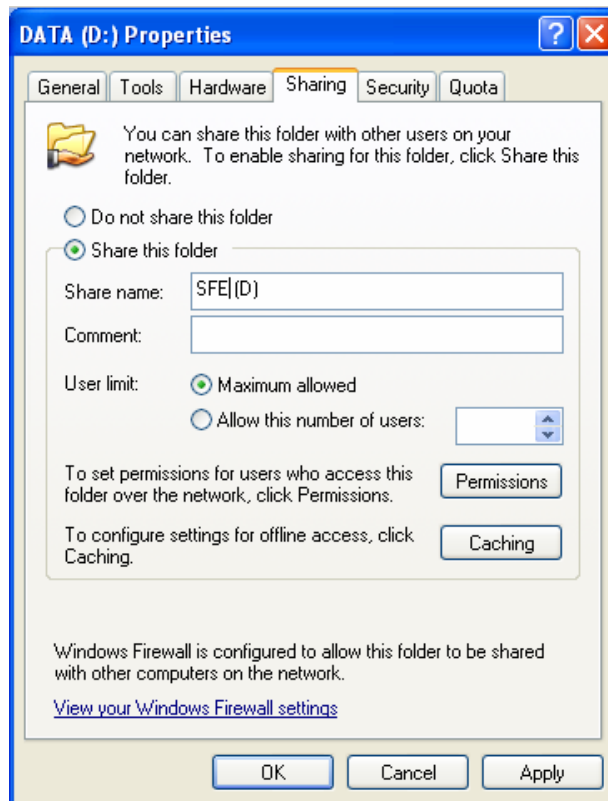
Access to Instrument drives is managed using a system of access authorizations. Complete integration of the instrument into a larger network is complex due to the access authorizations involved and is normally performed by a network administrator.

However, access to the instrument hard drives is relatively simple.

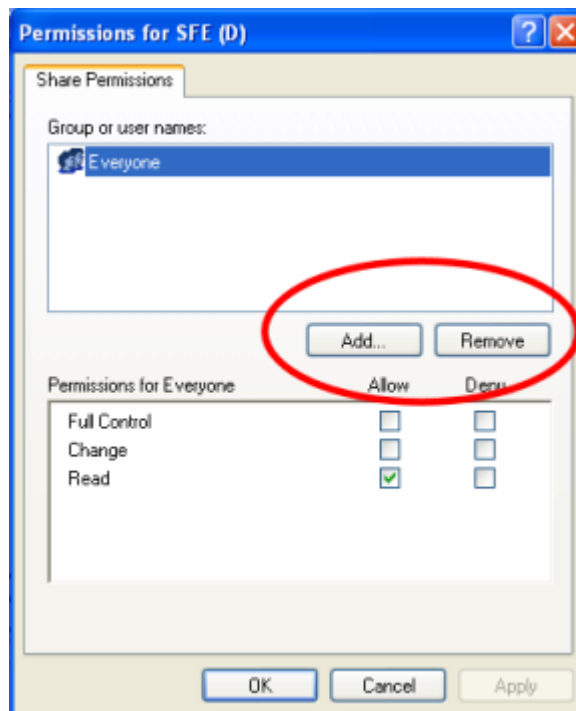
1. Select drive D: on the instrument using Windows Explorer and use the right mouse button to call up the **Sharing and Security** menu.



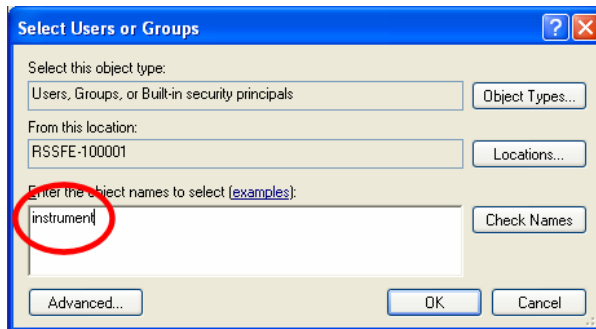
2. In the **Sharing** panel, activate the **Share this folder** checkbox.



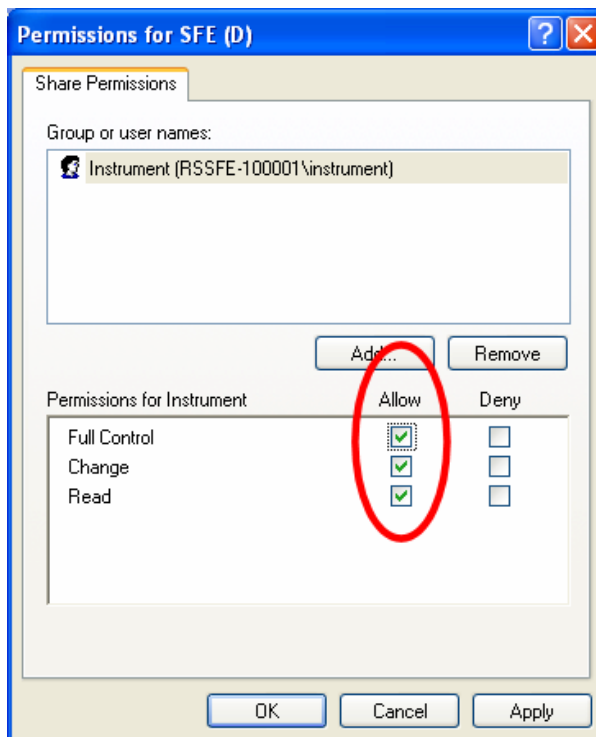
3. Select **Permissions** and remove user Everyone.



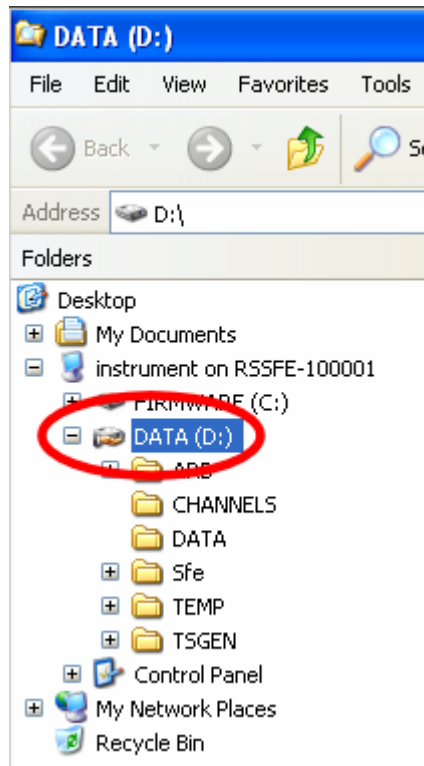
4. **Add the user instrument.**



5. **Allow Full Control / Change and Read.**

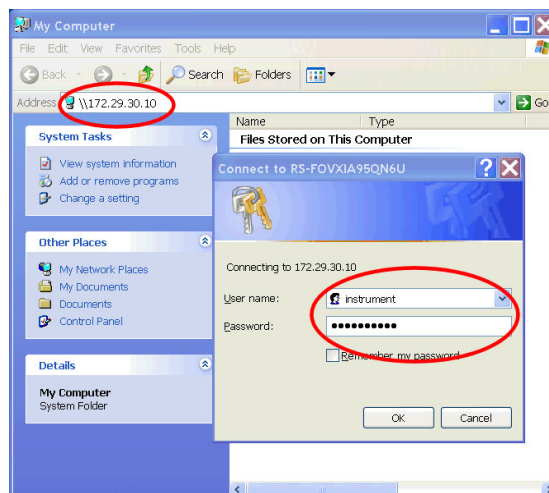


6. Shared drives are marked now.



7. On your PC, open Windows Explorer and enter the IP address of the instrument in the form \\xx.xx.xx.xx.

Enter User name **instrument** and Password **instrument**.



8. The shared directories should appear, and you can access the files.

### 1.5.3 Accessing Network Directories from Instrument

Access to network drives is managed using a system of access authorizations. Complete integration of the instrument into a larger network is complex due to the access authorizations involved and is normally performed by a network administrator.

However, access by the instrument to the hard drive of another computer in the network is relatively simple. The desired directory that the instrument will access just needs to be enabled on the other computer. The instrument can then use the Windows XP search function to access this directory.

This procedure is also relevant to a point-to-point connection, e.g. for launching a firmware update for which the files are stored on the hard drive of another computer.

**Important:**

The computer and the broadcast tester or test transmitter must both have a computer name and an IP address (see section [“Configuring the instrument for network operation”](#)).

---

**Enable the desired directory on the other computer.**

---

**Important:**

Depending on the operating system and language used on the other computer, the names of the menus can vary from those shown below.

---

1. Select the directory in question on the computer using Windows Explorer and use the right mouse button to call up the **Properties** menu.
2. In the **Sharing** panel, activate the **Share this folder** checkbox.
3. Note the computer name (see section [“Querying the Computer Name”](#)).

**On the instrument , now access the shared directory.**

1. Use the **Windows** key to call up the **Start** menu.
2. In the **Search Computers or People** menu, select **A Computer on the Network**.
3. In the input window for the query **Which Computer you are looking for?**, enter the computer name in question and press Enter to start the search.  
The computer should be listed along with its name in the search results.
4. Click the computer name. The shared directory should appear, and you can access the files stored there from the instrument.

**Important:**

If you are prompted for a user name and password when accessing the computer, you will have to enter the login name and password for that computer.



### 1.5.4 Configuration for Manual Remote Control (“Remote Desktop”)

It is possible to manually operate the instrument via a network connection from a remote computer. Such operation is based on the Windows program **Remote Desktop Connection**. Manual remote control is described in Chapter 3, section “[Manual Remote Control](#)”. The following requirements must be met for manual remote control of the broadcast tester or the test transmitter:

- ◆ On the external computer, Windows 95 or later must be installed along with the **Remote Desktop Connection** program and a LAN interface must be configured for the network.
- ◆ The broadcast tester or the test transmitter and the computer must be connected via the LAN (see “[Configuring the instrument for network operation](#)”).
- ◆ On the broadcast tester or test transmitter, the **Remote Desktop Connection** program must be activated (see “[Activation of the Remote Desktop Connection Program on the Instrument](#)”).
- ◆ The instrument data must be entered on the external computer in the program **Remote Desktop Connection** (IP address or computer name of the instrument in the network; see “[Querying the Computer Name](#)”).
- ◆ Login must have been computed on the external computer for the instrument with the proper user name (**Instrument**) and password (also **Instrument**) (see “[Launching Remote Desktop on the External Computer](#)”).

### 1.5.5 Activation of the Remote Desktop Connection Program on the Instrument

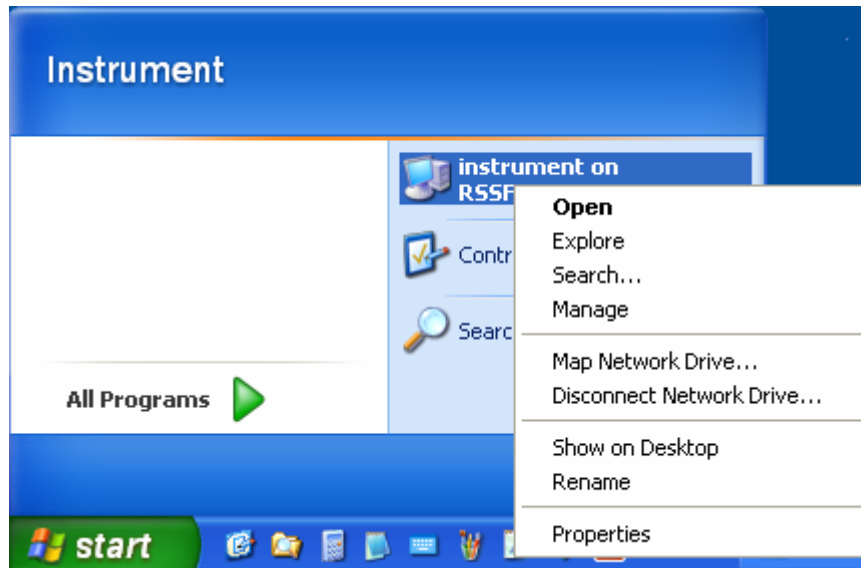


#### Caution:

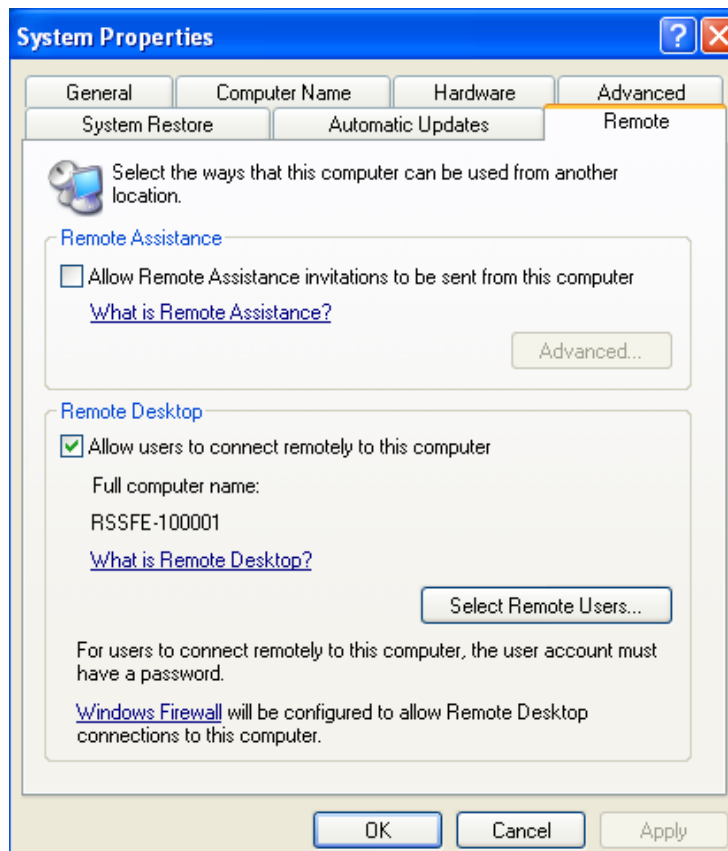
Following activation of Remote Desktop, any user in the network can access this instrument if they know the computer name and login data for the broadcast tester or test transmitter.

---

1. Press the **Windows** key on the external keyboard (next to the CTRL key) to call up the **Start** menu. Select **My Computer** and call up the context-sensitive menu with the right mouse button.



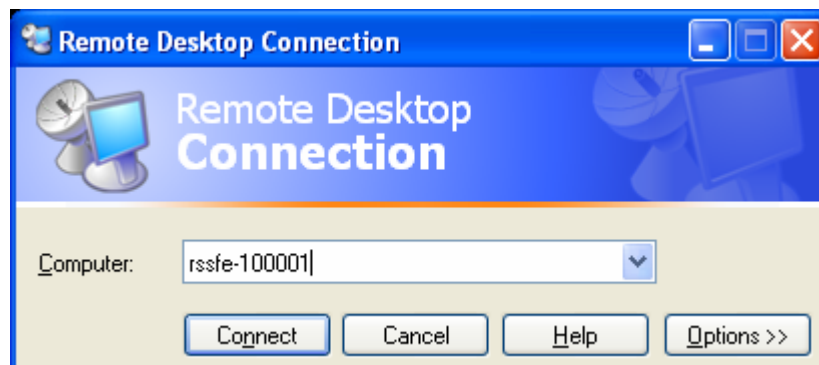
2. Click **Properties** and select the **Remote** tab in the menu.
3. Enable the checkbox that reads **Allow users to connect remotely to this computer**.



## Launching Remote Desktop on the External Computer

The **Remote Desktop Connection** program is already installed in the Windows XP operating system. For all other Windows operating systems starting with Windows 95™, the program is available as a free download at (<http://www.microsoft.com>). It can be loaded onto any external computer as described in the instructions (also available on the Internet).

1. If necessary, install the **Remote Desktop Connection** program on the external computer.
2. Launch the program from the Windows menu **Start - All Programs - Accessories - Communications**.

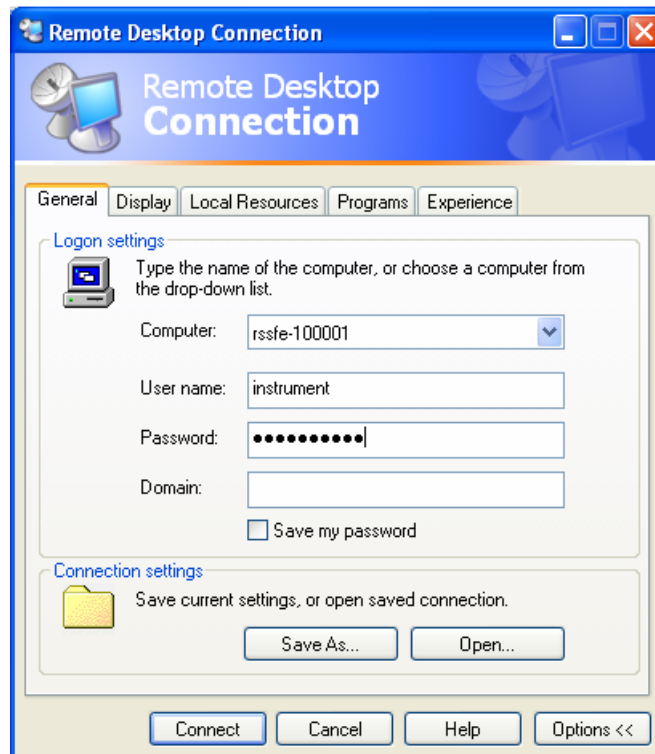



Prior to the initial use, you will need to enter the instrument and user data for the instrument on the external computer. The instrument data (the computer name of the instrument) identifies the instrument in the network. Every instrument is delivered with a computer name that is suitable for use with manual remote desktop. For information on querying the computer name, see the section "[Querying the Computer Name](#)".

In this dialog, the IP address of the instrument can also be used.

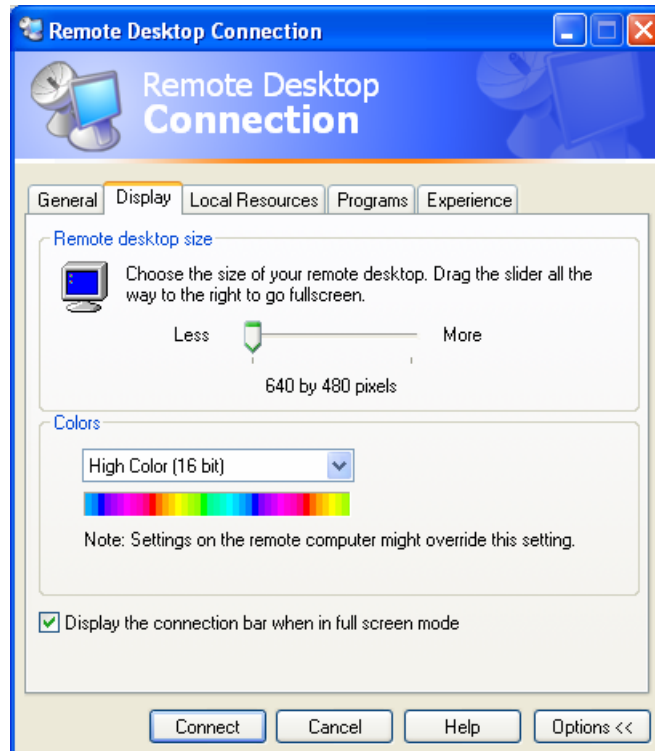
The user data is necessary in order to obtain access authorization for the instrument. This data is preset on the instrument. The user name and the password are both set to **Instrument**. Nothing is required in the **Domain** input field.

3. The instrument and user data are entered in the **General** tab of the **Remote Desktop Connection** extended menu. You can access this data with the **Options>>** button.



4. You can save the login data using the **Save as** button. If this is saved in the file **default.rdp**, the connection to the instrument will be the default when the program is launched. If you save the data under another name, the settings for connecting to the instrument will be shown in the selection list which is called up by pressing the  button in the **Computer:** input line.

5. Set the resolution for display of the instrument screen in the **Display** tab to 640 x 480 pixels.



6. Establish the connection by clicking the **Connect** button. Once the connection is established, the generator screen will appear on the external computer. You can operate the instrument with the mouse and/or keyboard. Keys on the front panel that do not have a direct match on the keyboard can be replaced using key combinations (see the table in Chapter 3, section “[Key overview](#)”).

If you want to manually operate several instrument units from a remote computer, you will need to open a separate **Remote Desktop Control** window for each instrument. This is possible by relaunching the program on the external computer as many times as necessary.

## 1.5.6 Configuration for Manual Remote Control (VNC)

As an alternative, the instrument can be operated by using VNC. The following requirements must be met for manual remote control of the broadcast tester or test transmitter:

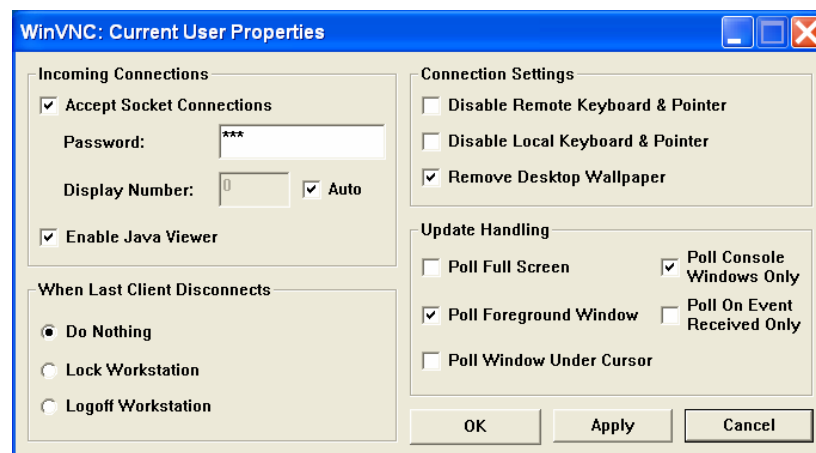
- ◆ On the external computer, Windows 95 or later must be installed along with the **VNC Viewer** program, and a LAN interface must be configured for the network
- ◆ The broadcast tester or test transmitter and the computer must be connected via the LAN (see "[Configuring the instrument for network operation](#)")
- ◆ The program **VNC Server** must be installed and activated on the broadcast tester or test transmitter.
- ◆ The instrument data must be entered on the external computer in the program **VNC Viewer** (IP address or computer name of the instrument in the network; see "[Querying the Computer Name](#)")
- ◆ The instrument must be logged on to the external computer with the proper session password.

### Installing the VNC Server Program on the Instrument

The setup program is already on the hard disk of the instrument (C:\Program Files\VNC). It can be started from there .

Install VNC server as described in the enclosed documentation on the broadcast tester or test transmitter.

Configure VNC as shown in the following figure:



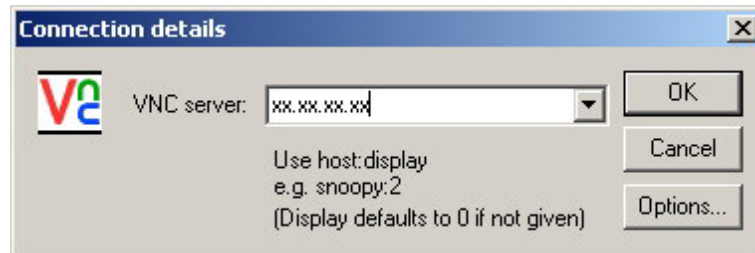
The recommended password is **SFE**.

## Launching Remote Desktop on the External Computer

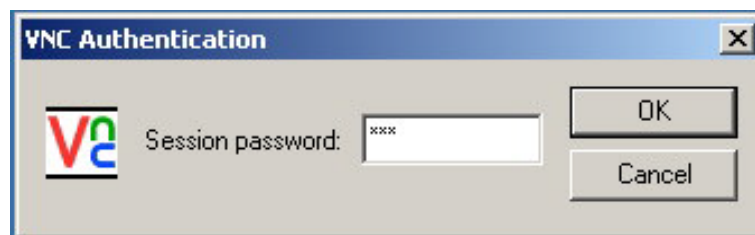
If necessary, install the **VNC Server** program on the external computer.

Launch the program from the Windows menu **Start - All Programs - RealVNC – VNC-Viewer**.

The instrument must be selected as the instrument for manual remote control, i.e. its IP address or its computer name must be entered in the **Connection details** window (**VNC server**).



Click the OK button to establish the connection. You will be prompted for the session password.



After you enter the password **SFE**, the screen of the test system will appear on the external computer.

If you need to directly operate the instrument, it is not necessary to log off the external user.

The external user can end manual remote control on the external window by closing the VNC application.





## 2 Brief Introduction

### 2.1 Introduction

The R&S® SFE is a broadcast signal generator that supports all common TV standards and a number of sound broadcasting standards. Whether analog or digital terrestrial TV, cable, satellite, and mobile TV, or digital sound broadcasting – all these signals can be modulated in realtime. The R&S® SFE can do this because it combines a high-quality RF modulator, a universal realtime coder, and baseband signal sources in one instrument.

Owing to its modular concept, the R&S® SFE can be optimally adapted to the requirements at hand – for example, with an integrated noise generator or a BER tester. And also after purchase, the R&S® SFE can be quickly and easily expanded to include new modulation modes by installing software options.

The versatile baseband signal sources for digital TV standards allow the generation of test signals from Rohde&Schwarz libraries as well as the replay of proprietary transport streams. For analog TV, the R&S® SFE offers an integrated video/audio test signal generator. Alternatively, the user can feed transport streams as well as analog A/V signals from external baseband generators. Irrespective of the realtime coders used, it is possible to generate user-defined modulation signals by means of an optional arbitrary waveform generator and to replay waveform files of the customer.

Although the R&S® SFE has a compact design and does not require much space, it offers the same convenient graphical user interface as the high-end R&S® SFU as well as extensive remote control functions.

## 2.2 Sample Applications

The multistandard capability and the flexible option concept make the R&S® SFE an extremely versatile instrument for many lab applications. However, due to its excellent price/performance ratio, the R&S® SFE is also ideally suited for service and quality assurance applications. In addition, the optional ARB generator in combination with the compact design make the R&S® SFE a cost-efficient solution for production - applications.

### 2.2.1 Broadcast Multistandard Platform

The R&S® SFE broadcast tester is a multistandard instrument that supports all common broadcasting standards. Whether analog or digital, terrestrial, satellite or cable, mobile TV or digital sound broadcasting – all these standards can be generated by using only one instrument. Switching between different standards is quick and easy – a press of a button is enough. Additional and future standards can be added by means of a software update at any time. Up to three standards can be installed simultaneously.

#### **Digital terrestrial TV standards**

- DVB-T
- ISDB-T
- 8VSB/ATSC
- DTMB (GB20600-2006)

#### **Cable TV standards**

- DVB-C
- J.83/B

#### **Mobile TV standards**

- DVB-H
- T-DMB
- MediaFLO™
- ISDB-T 1-segment (partial reception)
- DMB-TH

#### **Standards for satellite TV**

- DVB-S, DVB-S/DSNG
- DVB-S2
- DirecTV

**Analog TV standards**

B/G, D/K, M/N, L, and I analog standards with the PAL, NTSC, and SECAM color transmission systems

**Sound broadcasting standards**

DAB  
DRM (ARB waveform)  
ISDB-Tsb

**Open for future standards**

New transmission standards are provided from Rohde & Schwarz as software updates. These updates can be installed on the R&S® SFE and enabled by keycode at any time. The R&S® SFE can thus always be used for the latest standards.

### 2.2.1.1 Realtime Signal Generation for Digital and Analog Transmission Standards

The generation of modulated signals for various transmission standards in realtime is the key function of the R&S® SFE broadcast tester. The R&S® SFE can do this because it has a universal coder that, in a similar form, has already proven itself in the high-end R&S® SFU broadcast test system.

**Universal coder for realtime signal generation**

The R&S® SFE has a powerful universal hardware platform for baseband signal processing. This platform provides the I and Q bit streams for the broadband vector modulator. Switching between the different transmission standards is performed by reloading the firmware. Thus, a highly accurate spectrum is produced for all modulation modes.

**Settable modulation parameters**

Depending on the selected transmission standard, different modulation parameters such as constellation, code rate, and FFT mode must be defined. These parameters can be varied irrespective of the transport stream or A/V signal to be transmitted. All conceivable versions of a standard can thus be tested. The required signaling information for the receiver is automatically adapted by the realtime coder.

**Additional modulation modes as software options**

The various modulation modes for the realtime coder of the R&S® SFE have been completely implemented as firmware. This allows you to quickly and easily add further transmission standards. Many standards have already been preinstalled and can be enabled by entering a keycode.

### 2.2.1.2 Wide frequency range with excellent signal quality

From IF, VHF, and UHF up to the L band – the R&S® SFE covers the entire frequency range that is relevant for broadcasting applications. Despite its favorable price, the R&S® SFE makes no compromise when it comes to signal quality.

#### **Frequency range 100 kHz to 2.5 GHz**

The frequency can be set in 1 Hz steps. Either the center frequency or the channel number is entered, which is especially useful in analog TV.

#### **Signal level –100 dBm to +15 dBm**

The signal level can be set in 0.1 dB steps. The wear-free electronic attenuator permits a virtually unlimited number of switching cycles with excellent reproducibility. This is a significant advantage, especially in production applications.

#### **SSB phase noise at 300 MHz typ. <–115 dBc at 20 kHz**

Advanced COFDM modulation methods place high requirements on the stability and spectral purity of the oscillator signal. In this respect, the RF synthesizer of the R&S® SFE sets new standards in its class. The R&S® SFE excels not only in terms of its low SSB phase noise but also due to its low broadband noise and good harmonic suppression.

### 2.2.2 Integrated Transport Stream Player and Video/Audio Generator

Digital transmission methods require video or audio transport streams as a baseband signal, whereas the ATV modulator requires an analog CCVS signal. With its optional integrated transport stream player and video/audio generator, the R&S® SFE can generate both. External baseband generators are thus no longer required. This significantly - reduces the number of instruments, especially in complex production systems.

#### **TS generator (R&S® SFE-K20)**

An optional transport stream generator in the baseband internally provides test streams for the realtime coder and allows you to generate endless and seamless high bit-rate MPEG-2 transport streams. An external MPEG-2 generator is thus no longer necessary. The SDTV transport stream library integrated as standard includes ATSC and DVB test streams. The numerous Rohde & Schwarz transport streams cover a wide variety of applications and test scenarios.

### **Transport stream libraries**

A large number of additional libraries can be integrated. They make development faster and easier and allow new products to be tested.

SDTV – test streams for DVB and ATSC (included in the

R&S® SFE-K20 option)

HDTV – tests of HDTV receivers

DVB-H – tests of mobile receivers

ISDB-T – test streams

H.264 – test streams

TCM – STB tests

The range of transport stream libraries is constantly being expanded.

TRP player (R&S® SFE-K22)

The optional TRP player ideally complements the TS generator and permits users to replay their own transport streams in TRP format. The transport streams can be copied via the USB or LAN interface to the R&S® SFE file system and be replayed from there. In addition, the TRP player is used to replay T-DMB and DAB ETI streams. For this purpose, the TRP player can replay predefined ETI test streams for T-DMB and DAB from an optional T-DMB/DAB library (R&S® SFU-K221).

### **Compatible with the advanced stream combiner from Rohde&Schwarz**

The DV-ASC advanced stream combiner provides full flexibility when generating your own streams, which can be used with the R&S® SFE-K20 TS generator. It allows you to generate your own transport streams, also for DVB-H.

### **ATV video generator (R&S® SFE-K23)**

By means of the ATV video generator, test patterns and audio signals for analog TV can be generated. The ATV video generator includes FuBK and color bar test patterns for PAL, SECAM, and NTSC.

ATV video library from Rohde & Schwarz

The ATV video library provides a broad range of test patterns for analog TV that far exceeds the scope of the basic equipment of the ATV video generator. It also includes Cross Hatch, Color Bar, Philips, and Monoscope/Reteoma.

### 2.2.3 Arbitrary Waveform Generator

The optional integrated arbitrary waveform (ARB) generator of the R&S® SFE can replay proprietary I/Q waveforms as well as waveform libraries from Rohde&Schwarz for various transmission standards and thus opens up a wide range of additional applications. It is thus possible to generate any externally computed RF signals – from complex modulation signals to special interferers as, for example, notched noise. In particular, modulation signals can be generated irrespective of the realtime coders installed. Externally generated I/Q waveform files can be loaded into the R&S® SFE via one of the computer interfaces (USB or LAN) and read out from the internal memory.

#### **At least 128 Msamples memory space**

A hardware resampler and the resulting large sequence length reduce the memory space needed to store I/Q waveforms on the hard disk. This allows you to store a large number of I/Q waveforms directly on the hard disk.

#### **Sample rate up to 100 Msamples/s**

Due to its high sample rate, the ARB generator can generate signals with a baseband bandwidth up to 30 MHz.

#### **Compatible with R&S® WinIQSIM™**

The R&S® SFE allows the use of the R&S® WinIQSIM™ simulation software. Waveforms generated with R&S® WinIQSim™ can be loaded in the ARB generator of the R&S® SFE and be replayed.

#### **Waveform libraries from Rohde&Schwarz**

Additional waveform libraries allow quick evaluation of new modulation modes. I/Q waveform libraries are available for the following signals: T-DMB/DAB (R&S® SFU-K351), DVB-H (R&S® SFU-K352), DRM (R&S® SFU-K353), and MediaFLO™ (R&S® SFU-K355). The range of waveform libraries is constantly being expanded.

## 2.2.4 Integrated Noise Generator and BER Tester

In addition to generating signals, the R&S® SFE offers a number of additional functions for special measurements and for simulating interference in real transmission channels.

### **Broadband AWGN generator (R&S® SFE-K40)**

The optional digital additive white Gaussian noise (AWGN) generator is used as a source for generating a pure noise signal modulated onto the carrier and for influencing the actual useful signal. Realistic noise in the transmission path – via satellite, cable, or antenna – can be simulated by generating a 96 MHz AWGN signal with Gaussian amplitude distribution and user-definable S/N ratio in the digital baseband processing unit of the R&S® SFE.

### **BER measurement at transport stream or bit level (R&S® SFE-K60)**

The optional BER measurement is used to check the transmission quality in the channel and the reception quality in the device under test (DUT). To do this, the R&S® SFE generates a baseband signal with a pseudo random binary sequence (PRBS) as useful data. Either the bit stream received from the DUT or the decoded transport stream can be looped back to the R&S® SFE. The R&S® SFE uses this information to determine the bit error ratio by comparing the sent and received data.

## 2.2.5 General Features

Compact design and convenient operation need not be mutually exclusive: Although the R&S® SFE is only half as wide as the R&S® SFU, it provides the same controls and user interfaces – both locally on the front panel and by means of remote control.

### **½ 19" × 3 height units**

The cabinet of the R&S® SFE, which is only ½ 19" in width, makes it an extremely compact instrument. This is an advantage particularly in production applications, when many instruments have to be installed in racks without much space.

### **Large VGA color display with 640 × 480 pixels**

The R&S® SFE has a 5.7" easy-to-read VGA color display. Together with the straightforward graphical user interface, the display allows quick, easy, and reliable operation of the instrument. The most important operating parameters are always clearly visible.

**Intuitive user interface under Windows XP Embedded**

The R&S® SFE has the same graphical user interface that is already successfully used in the R&S® SFU. The user interface is straightforward, with a tree on the left side and a work view on the right side. The instrument is operated via a keypad and a rotary knob. Additionally, a keyboard and mouse can be connected to the USB interfaces.

**Context-sensitive help system**

Even during ongoing operation, the R&S® SFE allows you to access the extensive help system, which includes all information from the user manual. The help system always starts with the context-sensitive feature enabled, i.e. with information on the currently selected operating parameter.

**User-definable favorites for quick access**

Parameters that are often used can be copied to the Favorites menu, which makes operation even quicker and easier. This function is particularly useful when you have to change parameters from different submenus on a frequent basis.

**Easy software updates via LAN or USB 2.0**

Owing to USB 2.0 and LAN interfaces, software updates for the R&S® SFE can be performed quickly and easily. You merely need to copy the new software to the R&S® SFE by means of a USB memory stick or via FTP and start the fully automatic installation.

**Remote operation via Remote Desktop or VNC**

The R&S® SFE can be easily remote-operated via an Ethernet connection or in a LAN network over IP and preconfigured for DHCP use by means of the preinstalled Remote Desktop software or the VNC software that comes with the instrument.

**Remote control via LAN**

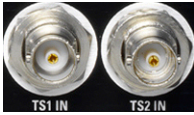
Remote control is possible by means of SCPI control commands via LAN (VXI11). The R&S® SFE can thus be integrated into existing test programs very easily.

Remote control commands are compatible with those of the R&S® SFU.



## 2.3 Sample Settings

### 2.3.1 Transmitter Application



An MPEG-2 transport stream is fed to the R&S® SFE via the serial interface (TS1 IN) on the rear panel.



This MPEG-2 transport stream undergoes channel encoding and modulation in the instrument for transmission in compliance with the DVB-C specification and is output as an RF signal on the RF output jack.

**The communications parameters are as follows:**

Center frequency =	330 MHz
Level =	-20.0 dBm
Transmission standard =	DVB-C
Constellation =	64QAM
Symbol rate =	6.9 MS/s
Roll off =	0.15
Transport stream input =	TS 1

### 2.3.1.1 Selecting the Transmitter Application (TX)

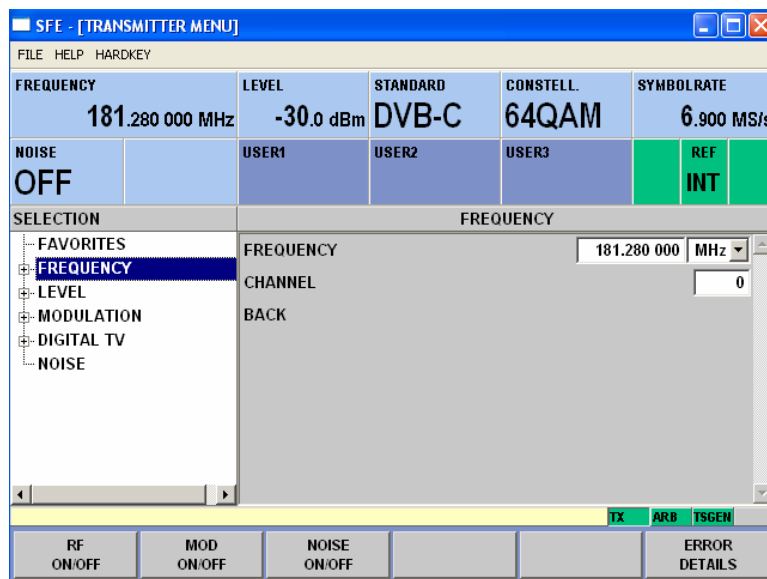


Press the APPL button to choose an application.

Select the TX application using the softkeys.

DVB-C transmission is configured in the transmitter application.

Figure 2.3-1 TX application



The TX application appears with the TX **information area** in the upper third of the display, the **TX Tree** on the left side of the display, and the associated **Workview**.

### 2.3.1.2 Setting the Output Frequency


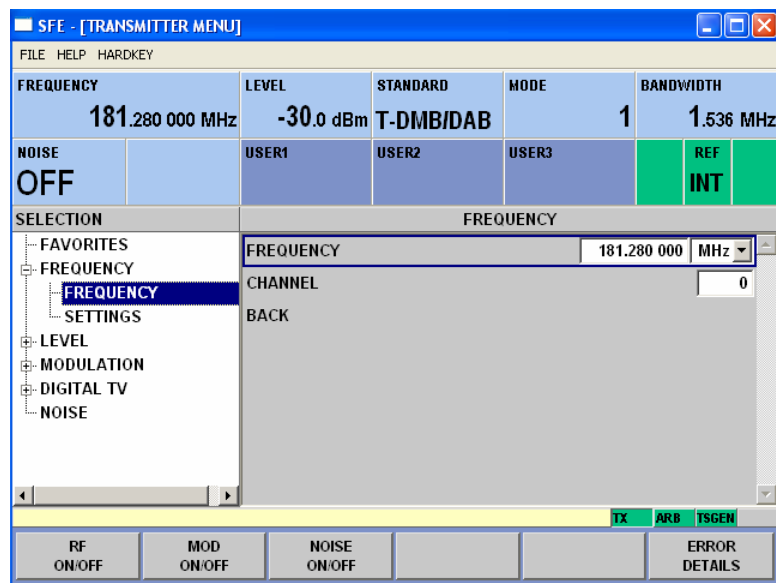
Use the rotary knob in the tree (left side) to select the FREQUENCY line. If you press the  key or the rotary knob while the FREQUENCY line is selected, the tree is expanded and the lower level of the FREQUENCY menu will appear.




Figure 2.3-2 FREQUENCY menu



In the FREQUENCY menu, select the **FREQUENCY** line again (cursor keys or rotary knob) and confirm your entry with ENTER (or press the rotary knob). This will activate the Workview on the right side.

Use the cursor keys or the rotary knob to select the **FREQUENCY** field in the Workview.

The output frequency of 330 MHz can then be set:

- ◆ Input "330" using the digit keys and press the unit key  to the right next to the digit keys.
- ◆ The frequency you entered will now be displayed in the INFO area in the FREQUENCY field.
- ◆ Exit by pressing the  key and the  key (or by selecting and confirming the BACK field in the Workview).

### 2.3.1.3 Setting the Output LEVEL

Use the rotary knob in the tree (left side) to select the LEVEL line. If


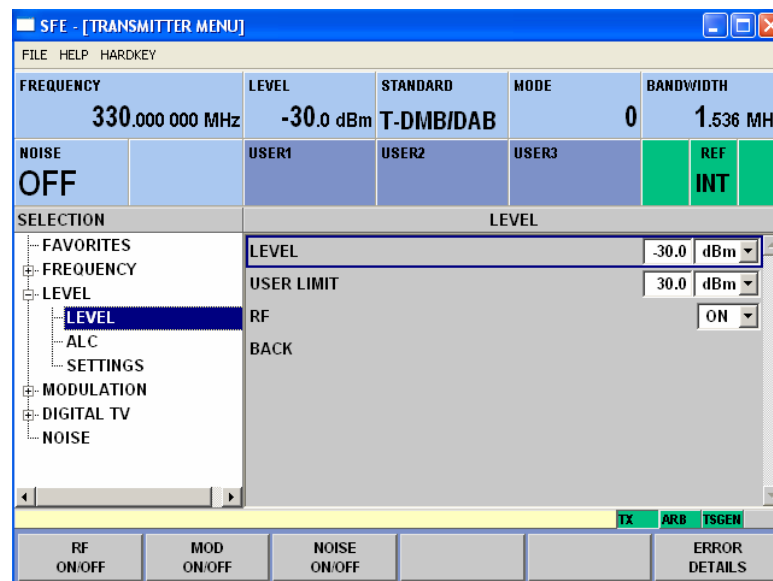

you press the  key or the rotary knob while the LEVEL line is selected, the tree is expanded and the lower level of the LEVEL menu will appear.





Figure 2.3-3 LEVEL menu



In the LEVEL menu, use the  key (or press the rotary knob) to select the LEVEL line again (rotary knob) and confirm your entry. This will activate the Workview on the right side.

Use the cursor keys or the rotary knob to select the **LEVEL** field in the Workview.

The output level of –20 dBm can then be set:

- ◆ Input "–20" using the sign key and the digit keys and then press the unit key  to the right next to the digit keys. The level you entered will now be displayed in the **LEVEL** field. You can select and confirm a different unit in the LEVEL menu and the SETTINGS tree line. The **LEVEL UNIT** field is selected in the corresponding Workview on the right side. After you press the  key (or press the rotary knob), you can select one of several possible units.
- ◆ Exit the menu by pressing the  key and the  key (or by selecting and confirming the **BACK** field in the Workview).

### 2.3.1.4 Modulation Settings and Selection of the Transmission Standard


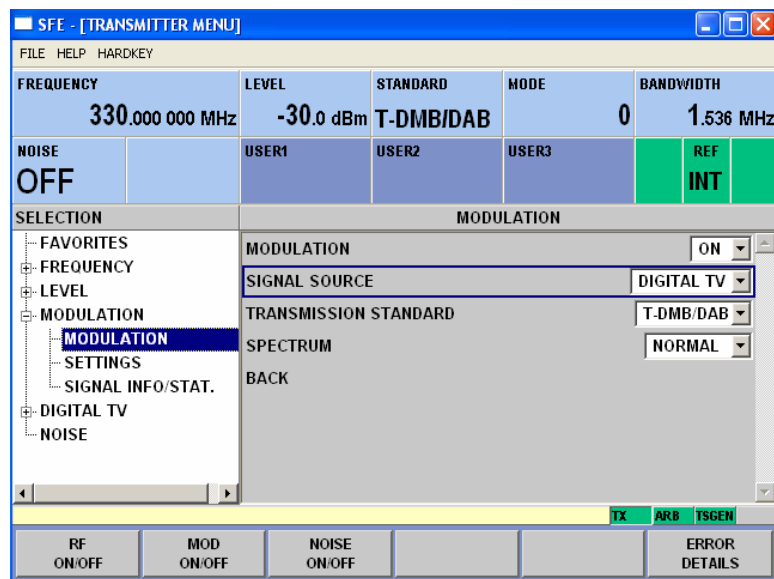


Use the rotary knob in the tree (left side) to select the MODULATION line. If you press the  key or the rotary knob while the MODULATION line is selected, the tree is expanded and the lower level of the MODULATION menu will appear.


Figure 2.3-4 TRANSMISSION STANDARD menu




In the MODULATION menu, select the MODULATION line again (rotary knob) and confirm your entry with  (or press the rotary knob). This will activate the Workview on the right side. Use the rotary knob to select the MODULATION field in the Workview.

Press the  key (or the rotary knob) to select ON and OFF. Use the rotary knob to select and confirm ON.



Use the cursor keys or the rotary knob to select the SIGNAL SOURCE field in the Workview.

After you press the  key (or the rotary knob), the selection ATV, DTV, ARB, I/Q DIGITAL, etc, will be displayed. Use the rotary knob to select and confirm DTV.

Use the cursor keys or the rotary knob to select the TRANSMISSION STANDARD field in the Workview.

After you press the  key (or the rotary knob), the available transmission standards will be shown.

Use the rotary knob to select and confirm DVB-C.  
I/Q Modulation is now switched on, the internal coder is selected as the signal source, and the DVB-C transmission standard is set.  
**DVB-C** will now be displayed in the **STANDARD** field in the INFO area.

Use the  key or the  key to display the Workview in the MODULATION menu. After you confirm the field BACK in the Workview, you can exit the menu.

### 2.3.1.5 Selection of the Transport Stream Input and Setting the DVB-C Transmission Parameters

Use the rotary knob in the tree (left side) to select the DIGITAL TV line.


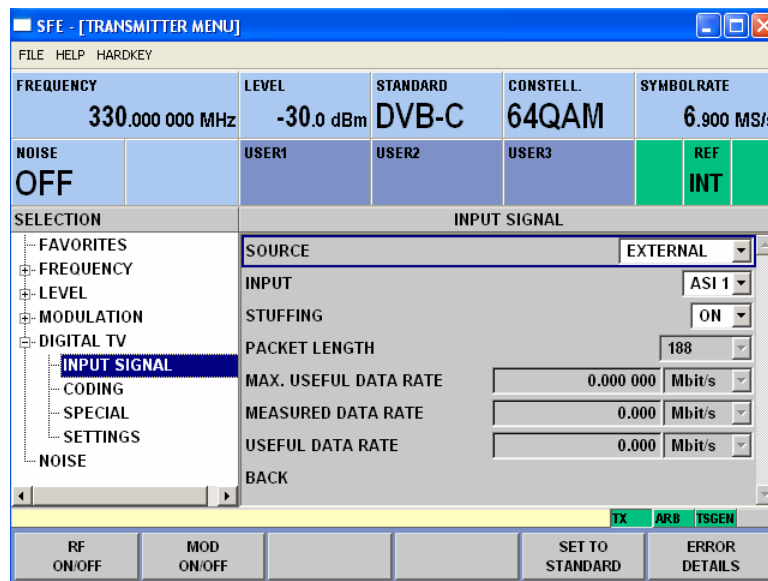
By pressing the  key or the rotary knob with the DIGITAL TV line selected, the tree is expanded and the lower level of the DIGITAL TV menu is displayed.

Figure 2.3-5 DIGITAL TV menu



In the DIGITAL TV menu, select the **INPUT SIGNAL** line (rotary knob) and confirm your entry with ENTER (or press the rotary knob). This will activate the Workview on the right side.

Use the cursor keys or the rotary knob to select the **SOURCE** field in the Workview.

When you press the ENTER key (or the rotary knob), the selection EXTERNAL, TS PLAYER, TEST SIGNAL will be displayed.

Use the rotary knob to select and confirm EXTERNAL.

Use the cursor keys or the rotary knob to select the **INPUT** field in the Workview.



When you press the ENTER key (or the rotary knob), the selection ASI FRONT, ASI REAR, SPI FRONT, etc. will be displayed.

Use the rotary knob to select and confirm ASI FRONT.

The **STUFFING** field in the Workview must be set to ON. This ensures that the incoming transport stream will be adapted to the proper data rate of the coder. The data rate of the coder will depend on the




transmission parameters. The data stream is padded with NULL PACKETS to allow adaptation to the transmission parameters.

Press the  and the  key (or select and confirm the BACK field) to exit the Workview.


In the CODING menu, select the CODING line (cursor keys or rotary knob) and confirm your entry with ENTER (or press the rotary knob). The Workview on the right side of the display will be activated.

Use the cursor keys or the rotary knob to select the **SYMBOL RATE** field in the Workview.

The symbol rate of 6.9 MS/s can then be set in several different ways:

- ◆ Input "6.9" using the digit keys and the decimal point and confirm your entry with the  key (assuming the units field to the right already shows "MS/s" as the unit).  
If the units field indicates another unit, you can select this field with the cursor keys. After you confirm, you can select the unit. Once you have selected and confirmed "MS/s", you can enter the appropriate symbol rate.  
The symbol rate you entered will now be displayed in the INFO area in the SYMBOL RATE field.



- ◆ Use the cursor keys or the rotary knob to select the CONSTELLATION field in the Workview.

Use the  key (or press the rotary knob) to make your selection:

16QAM, 32QAM, 64QAM, 128QAM or 256QAM

Use the rotary knob to select and confirm 64QAM.

The constellation you entered will now be displayed in the INFO area in the CONSTELLATION field.

Press the  and the  key (or select and confirm the BACK field) to exit the Workview.


All of the parameters listed earlier are now set (unless you made special settings in the previous settings).

## 2.3.2 Bit Error Ratio Meter

### 2.3.2.1 Selecting the Bit Error Ratio Meter Application (BER)



Press the APPL button to choose an application.

Use the rotary knob to select the BER application. Press the  key or the rotary knob to confirm your entry. Alternatively, you can use the softkeys.

### 2.3.2.2 Configuration

Some sample settings for using the bit error ratio meter are given in this section. This examples makes use of the serial inputs. A suitable data source is required which must provide a serial pseudo random bit sequence (PRBS) and the related clock. This function can be handled by a digital transmission analyzer.

First, connect the clock and data output of the BER generator to the corresponding inputs of the R&S® SFE and configure the BER generator to provide a suitable PRBS in compliance with ITU-T O.151 (e.g.  $2^{23} - 1$ ). The data rate should be 10 Mbit/s.

After you launch the BER application on the R&S® SFE (APPL key), the BER menu will appear on the screen. In the tree, you must first select the BER/SETTINGS entry.

Figure 2.3-6 BER settings

Picture not yet available.

Set the following values:

Menu item	Value	Remarks
PAYLOAD	PRBS	The data content of the BER generator consists of a PRBS.
PRBS	$2^{23}-1$ (ITU-T O.151)	Here, the type of PRBS is specified in greater detail. You should select the same sequence that is set on the BER generator.

Now, select the main window of the bit error ratio meter in the tree (BER / BER).

**Figure 2.3-7 BER main window**

Picture not yet available.

Set the following values:

Menu item	Value	Remarks
INPUT	SERIAL CLK DATA EN	The serial data input is used for the bit error ratio measurement.
CLOCK	NORMAL	The rising edge of the input clock is used for data timing.
DATA	NORMAL	Normal setting. The polarity of the data is not inverted.
ENABLE	ALWAYS	In this example, the ENABLE input is not used.
MEASUREMENT	ON	The measurement is initiated.

### 2.3.2.3 Initiating a Measurement

Menu item	Value	Remarks
MEASUREMENT	ON	The measurement is initiated.

The bit error ratio measurement has now been activated. Display of the measurement results is illustrated in the following table.

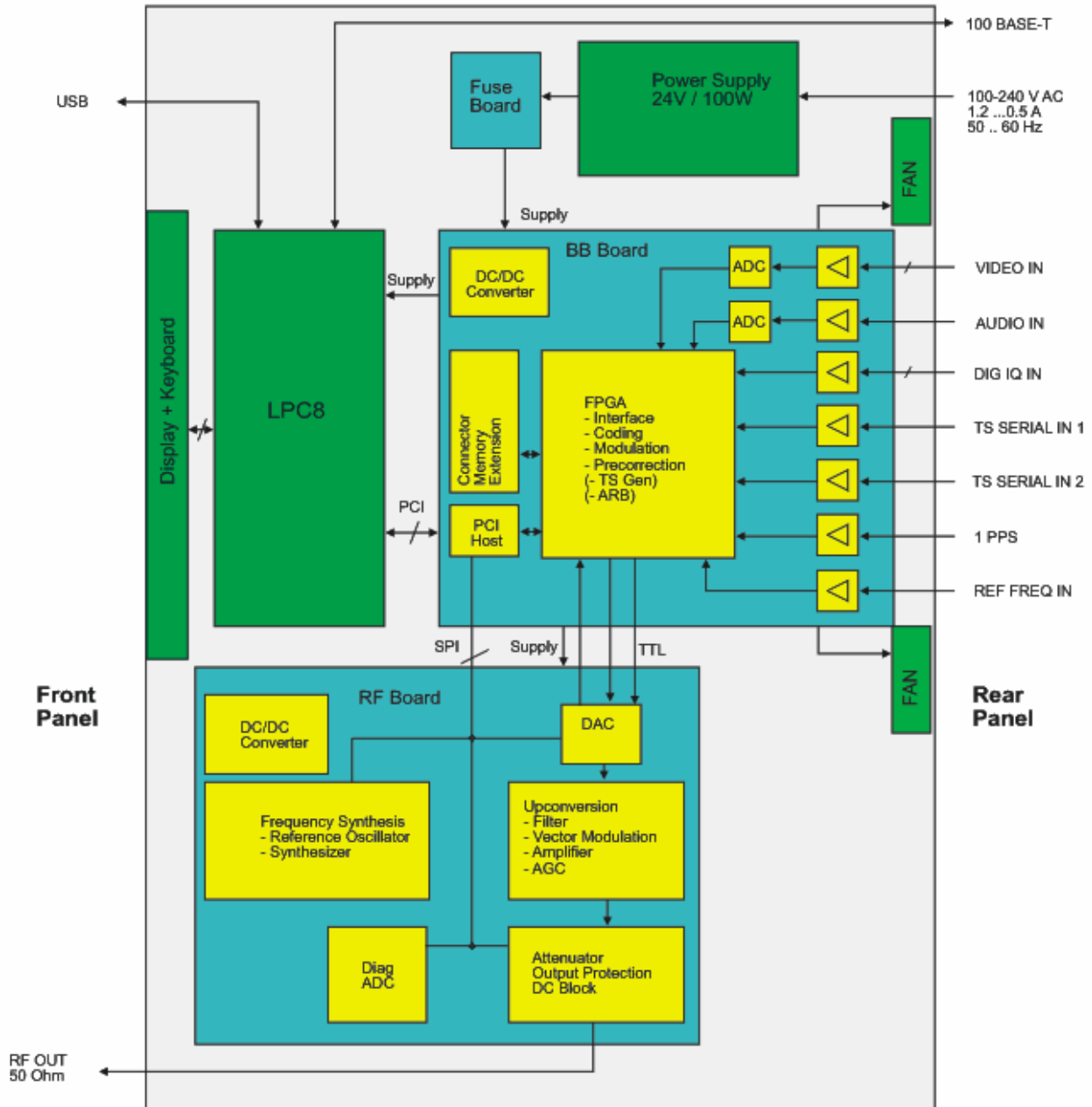
Menu item	Display (example)	Remarks
BER	0.00E-07	Display of the measured bit error ratio. The BER generator might be able to generate intentional bit errors in certain cases. The BER display should then change accordingly.
EVALUATION	6.3E9/1E10	For details, please see Chapter 4 (BER / EVALUATION).
STATE	SYNC	The bit error ratio measurement is synchronized to the PRBS.
ERROR COUNT	0	Total number of bit errors detected during the measurement.
MEASUREMENT TIME	00:31:15	The measurement has been running for this amount of time (here: 31 minutes and 15 seconds).

You can restart the measurement by pressing the **RESTART MEASUREMENT** button.

You can also use the **START**, **STOP**, and **RESTART** softkeys to control the measurement.

## 2.4 Basic Instrument Concept

Figure 2.4-1 The R&S® SFE is a flexible hardware platform



## 2.4.1 The Instrument's Baseband Section

The instrument's baseband section contains the hardware for generating and processing I/Q signals. It is entirely digital in design.

It provides all of the transport stream (TS) interfaces and handles the processing of the transport streams. It also includes all of the interfaces needed for BER measurement and the inputs for digital I/Q signals. The TS generator option is also found here. The ARB hardware option can also be installed on this subassembly.

The coder part of the FPGA receives the processed transport stream signals and performs the FEC for the selected digital TV standard. Using the AWGN software option (R&S® SFE-K40 noise generator), additive Gaussian white noise can be generated. The subassembly generates digital I/Q signals which are forwarded to the RF section.

## 2.4.2 The Instrument's RF Section

The D/A converter converts the digital signal into an analog I/Q signal. This analog I/Q signal feeds the I/Q modulator. The following part contains the synthesizer, output section with I/Q modulator, and attenuator.

The frequency range is 100 kHz to 2.5 GHz.

## 3 Manual Operation




### Introduction

The instrument can be operated manually in several different ways:

- ◆ **Controls on the front panel:**  
The instrument is operated using the buttons on the front panel and the rotary knob. Pressing the rotary knob has the same function as pressing the Enter key.
- ◆ **External keyboard and mouse:**  
A USB keyboard and also a USB mouse can be connected to the USB jacks on the front panel or the rear panel.  
The hardkeys of the R&S® SFE can be selected using the mouse in the HARDKEY SELECTION of the menu line.
- ◆ **Remote operation:**  
The R&S® SFE can be operated if so desired using remote operation (e.g. with Remote Desktop or VNC).  
The instrument has to be connected to an Ethernet network. The Ethernet address is used to connect the PC and R&S® SFE. The screen of the R&S® SFE is then displayed on the PC monitor. The R&S® SFE can now be operated with the PC keyboard and mouse. The hardkeys of the R&S® SFE can be selected using the mouse in the HARDKEY SELECTION of the menu line.

### Equal access rights for manual operation

The access rights are the same whether the instrument is operated using the front-panel controls or the keyboard and mouse.

Use the rotary knob and the buttons on the front panel ( ) to navigate in the tree. Each entry is terminated with the  key. The rotary knob and its Enter function (press the rotary knob) can be used for navigation purposes too.


Navigation in the tree is possible using the USB keyboard and the cursor keys (or the USB mouse and the mouse buttons).

Local operation and remote operation also have equal access rights during VNC operation. In “Remote Desktop” mode, remote operation is the only choice.

### All operating modes are possible simultaneously

#### Example:

During VNC operation using a connected PC, a user selects the FREQUENCY menu item in the R&S® SFE’s tree using the USB mouse. At the same time, another user can change the value using the rotary knob and the numerical keys on the instrument’s front panel.

The entry can be terminated using the  key on the instrument or the Enter key with the USB mouse that is connected.




## 3.1 Operating Concept

### 3.1.1 Different Applications in the R&S® SFE

The R&S® SFE is an instrument platform that is designed for diverse applications (e.g. TX, BER, TSGEN, and ARB). Most of the applications are a separate unit and are operated independently of the other applications (more or less like two separate instruments). If links between the applications are required, you can switch to additional applications.

### 3.1.2 Selecting the Application

When you press the  key, the applications available in the instrument will be displayed above the soft keys. Select the application to appear in the foreground.

To change the settings or to read off the measured values, navigate in the application's tree. The main parameters of each application are shown in the INFO area. The softkey assignments will change when you change applications. All of the other applications will be in the background. They are displayed when you switch to them.

### 3.1.3 Information About the Different Applications

To obtain details about settings or measured values for a specific application, you must select the application in question (i.e. bring it to the foreground).

In each application, there is a different number of user fields available in the INFO area. A setting or a measured value from another application can be shown in these user fields.

**Example** In the TX application, there are three free user fields in the INFO area. In one of these user fields, the current bit error ratio status in the BER application can be shown.

### 3.1.4 Possible Actions Within an Application


In a given application, different selections, settings, or entries can be made. Different measured values can also be displayed.

#### 3.1.4.1 Navigating in the TREE

The menu TREE is used to navigate in the application's menus. The TREE consists of main items and subitems (where necessary). The position in the TREE of the currently selected application is marked accordingly.


Use the rotary knob to navigate in the vertical direction or place the mouse pointer on a TREE element and mark it by means of a mouse click.

The marker will appear at the location where the cursor is currently located. This marker will move appropriately. Any subitems present in the branches of the TREE can be opened and closed for a given main item.

Open and close the subitems with the  button or by pressing the rotary knob.

Double-clicking the mouse will have the same effect.

When navigating with the rotary knob in the opened tree, you will automatically branch to the subtree. After passing through the subtree, you will reach the next main item in the TREE.

Each WORKVIEW has a corresponding TREE element that is always displayed in relation to the marking in the TREE. The WORKVIEW changes dynamically based on how you navigate in the TREE. If the marker is on a subitem in the TREE or on a main item without any subitems, the WORKVIEW can be activated by pressing the  key.


Double-clicking the mouse will have the same effect.


The TREE will stay marked at the place that you switched to in the WORKVIEW.

### 3.1.4.2 Navigating in the WORKVIEW

You can use the rotary knob and the cursor keys to navigate in the WORKVIEW. The marker in the WORKVIEW will follow the cursor commands. Using the rotary knob, you can mark all of the selectable items in the WORKVIEW one after the other. When using the mouse, you can place the mouse pointer on a selected item.

Use the  key (ESCAPE) or the  button to exit the WORKVIEW. The BACK menu item in the WORKVIEW has the same function.

If you exit a given WORKVIEW, you can press the  key to reactivate it.

The  key does not have the same effect.

### 3.1.4.3 Measured Value Displays or Settings in the WORKVIEW

If all of the measured values and settings in the WORKVIEW are visible at once without scrolling, then you do not need to activate the WORKVIEW.

If an item is marked in the TREE, the corresponding WORKVIEW is continually updated and displayed along with the associated measured values and settings.


### 3.1.4.4 Actions in the Workview




You can switch a parameter (toggle function), e.g. ON/OFF.


You can make a selection, e.g. 1 out of n selection.

You can enter values, e.g. a frequency value.

However, the relevant parameter must be marked in the WORKVIEW to perform such actions.

Pressing the  key, pressing the rotary knob, or double-clicking the mouse immediately executes a toggle function. A selection or value input is now activated.

A window will open after you make your selection. Use the cursor or rotary knob to make your selection and terminate your entry with the  key. Use the  key to exit the window without changing the values. The input area is activated in case you need to input values. A value that is already present can be modified using the cursor keys and/or the rotary knob. The change will take effect immediately. Use the digit keys on the front panel or the external keyboard (if present) to enter a new numerical value. Terminate your entry with the  key. When entering frequencies or levels, you can also use the unit keys on the front panel.

If you want to exit the input area without making a change, press the  key.

As soon as the action is terminated in the WORKVIEW and then executed, the parameter will be updated (assuming it is used in an INFO field).

### 3.1.4.5 Fast Access to Commonly Used Menu Items With Softkeys

In order to clearly structure the operation of the instrument and its front panel, no application-specific hardkeys have been used in the R&S® SFE. This helps to maintain clarity.

Important menu items are accessed using the softkeys.

The softkeys have fixed assignments that are independent of the application.

**Example** In the TX application, the following commonly used menu items are implemented as softkeys: RF ON/OFF, MODULATION ON/OFF, C/N ON/OFF, FADING ON/OFF.

### 3.1.4.6 Fast Access to Commonly Used Menu Items With FAVORITES

To allow fast access to commonly used menu items, you can add any of the menu items to your FAVORITES. (You can also delete them from the FAVORITES if you need to.)

The list of FAVORITES can be accessed from every application. Menu items can be added to the list of FAVORITES from any application.

This allows fast operation that goes beyond individual applications.

Press the HOME hardkey to call up the FAVORITES in the TREE of the application in question. Since the FAVORITES can contain menu items from all of the applications, the operating speed will be significantly higher with the HOME hardkey.

**Example** In the TX application, the FREQUENCY and LEVEL menu items are very commonly used. The FREQUENCY and LEVEL menu items have been saved in the list of FAVORITES.

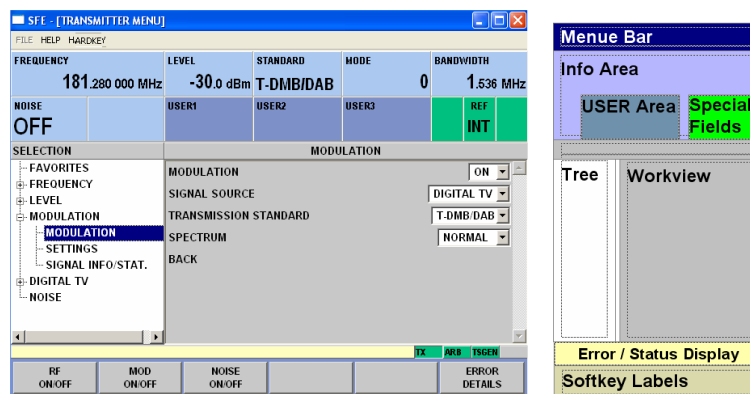
If the BER application is in the foreground (e.g. when bit errors are measured at the receiver), you can use the HOME hardkey to make a level change in the TX application by means of the LEVEL, FAVORITES selection.

## 3.2 Display

### 3.2.1 Applications

The display content depends on the current application and the selected operating mode:

Figure 3.2-1 Display areas



#### Menu Bar

The current application is displayed in the menu bar. Here, you can use the FILE, HELP, and HARDKEY commands. During remote operation of the instrument, it is also possible to access the hardkeys on the front panel.

#### Information Area

The information area shows the most important parameters. Some of the INFO fields have fixed assignments for each application.

#### USER Area

Free INFO fields are known as USER fields. You can enter your preferred display parameters in these fields.

### Special Fields

Besides the INFO fields and the USER fields, there are three further special fields:

- LEFT** The special field on the left indicates whether the instrument is being remotely controlled (and if so, how).
- CENTER** The special field in the center shows what reference has been selected. The instrument reference is supplied externally (REF EXT) or the internal instrument reference is used (REF INT). The green colour means: Reference OK. The red colour means that problems have occurred with the reference.
- RIGHT** The special field on the right indicates the status of the output signal or the modulation in the TX application: MOD OFF, RF OFF (or empty field if both are switched on).

### Tree and Workview

The TREE is arranged on the left side. You can use the TREE to navigate the menus. You can open and close the existing branches of the TREE. If the TREE is longer than the TREE field, only a portion of the TREE will appear, but you can scroll through all of it. Located to the right of the TREE is the WORKVIEW which corresponds to the selected TREE element. Use the WORKVIEW to input data, make selections and turn parameters ON and OFF.

### Error / Status Display

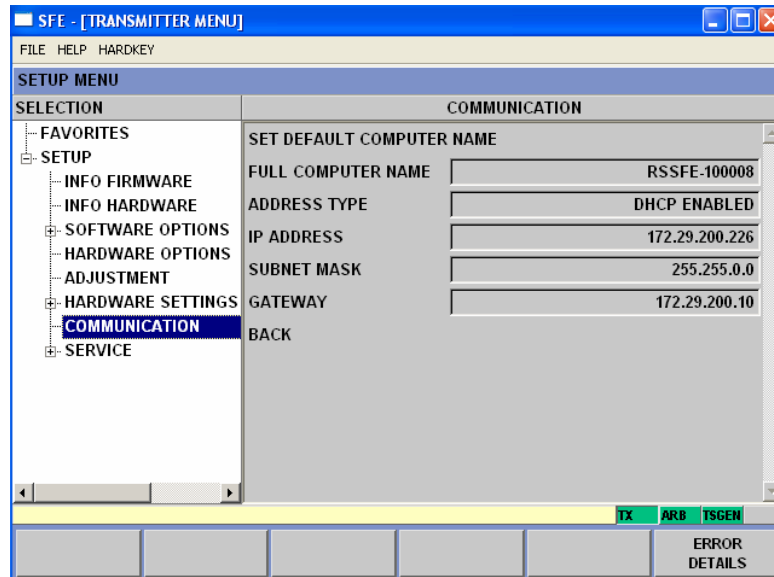
Error messages for the current application are shown in the upper line. Warnings for the current application are shown in the lower line. The right part of the two lines contain fields which show all of the active applications. If the field for an application is green, this means that no errors or warnings are present. Yellow indicates that there is a warning for the application in question. Red indicates that there is an error for the application in question.

### Softkey Labels

There are eight softkeys. The labelling for the softkeys will vary from application to application.

## 3.2.2 Setup

Figure 3.2-2 Screen layout for SETUP



### Menu Bar

The menu bar shows all of the information that is relevant for the SETUP menu.

In this menu line, you can operate the instrument's front-panel hardkeys from the screen using the mouse. This is also necessary in the case of remote operation (e.g. VNC).

### Tree and Workview

The TREE is arranged on the left side. You can use the TREE to navigate the SETUP menus. You can open and close the existing branches of the TREE.

Located to the right of the TREE is the WORKVIEW, which corresponds to the selected TREE element. In the WORKVIEW for SETUP, you can input data and make settings that apply to the whole instrument (i.e. all applications).

The user can also get information about the software version used in the instrument.

Calibration routines and software updates are also activated here.



**Error / Status Display**

Error messages for the current application are shown in the upper line. Warnings are displayed in the lower line. The right part of the two lines contains fields that show all of the active applications.

**Softkey Labels**

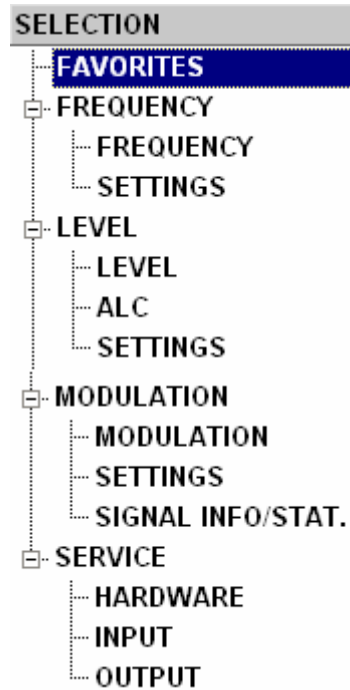
There are six softkeys. The labeling for the softkeys can vary from TREE element to TREE element.

### 3.3 Menu and Tree Overview

The menu, setup, and trees for various applications are shown below:

#### TX Tree Overview

Figure 3.3-1 The TX menu

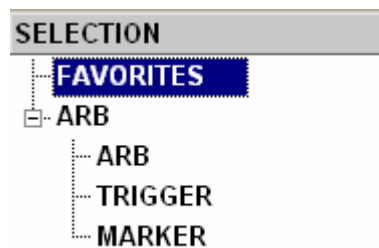


#### BER Tree Overview

Figure 3.3-2 The BER menu

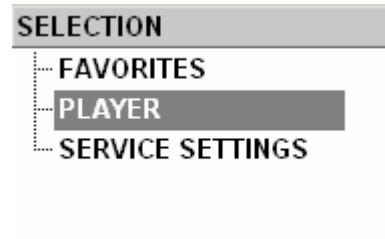
#### ARB Tree Overview

Figure 3.3-3 The ARB menu



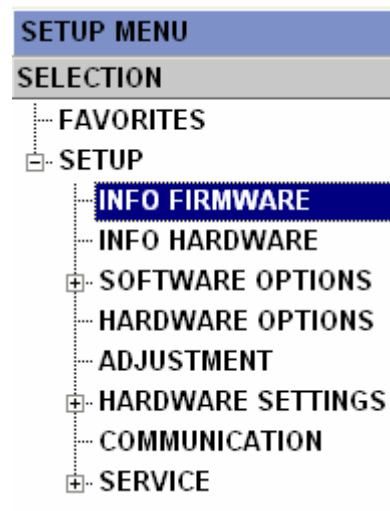
## TSGEN Tree Overview

Figure 3.3-4 The TSGEN menu













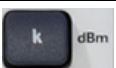

## Setup Tree Overview










Figure 3.3-5 The Setup menu



### 3.4 Overview of Keys

The table lists all key functions available on the front panel. The table also provides the PC keyboard key combinations that can be used to trigger the functions of the keys on the front of the instrument.

Key on front panel	With PC keyboard	Function
	Tab key (move left) Shift + Tab (move right)	The rotary knob moves the input point.
	Shift + Enter	The rotary knob is used to terminate an entry (corresponds to using the ENTER key).
	Cursor keys	Moves the input point.
	. / *...#	Enters a period/decimal point. Enters a special character.
	CTRL - / (shift+) A - a	Enters the sign. Switches between uppercase and lowercase letters.
	0-9 / a...z	Enters numbers/letters.
	Backspace	Deletes the last entry (digit, sign, or decimal point)
	ESC	Changes to the next higher menu/selection level. When you leave edit mode with ESC, the previous value is restored.
	ALT + F9	Selects unit of GHz or mV for the RF level.
	ALT + F10	Selects unit of MHz or dBµV for the RF level.
	ALT + F11	Selects unit of kHz or dBm for the RF level.
	Enter	Terminates entries in the basic unit and unitless entries. Selects Hz as the unit. Selects dB for the level offset and level step size.

Key on front panel	With PC keyboard	Function
	CTRL + 1 – 8	Triggers the function assigned to the softkey.
	F4	Sets a defined state for the instrument.
	F3	Switches the instrument from remote operation to manual operation.
	F2	Starts management of FAVORITES.
	F1	Opens and closes the context-sensitive help function.
	F5	Activates the menu for saving instrument settings.
	F6	Opens the SETUP menu for general instrument settings.
	F8	Resets tree navigation.
	F9	Selects another application.

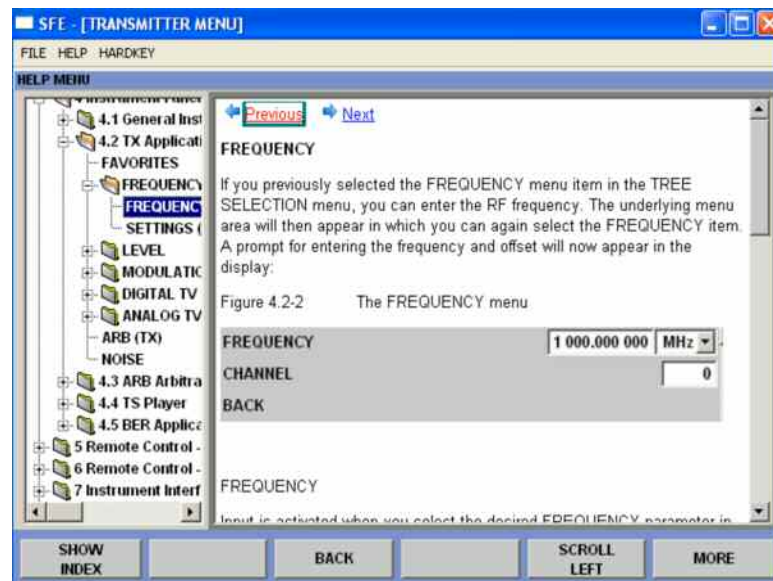


## 3.5 Help System

The instrument has a context-sensitive help system. The help system provides a help page for every parameter and can be called up at any time while the instrument is being operated.

The help system has a navigation bar, i.e. starting from the context-sensitive page, you can navigate to other help pages by using the contents list, the index, scroll arrows, and page-internal links.

Figure 3.5-1 Help menu



In addition to the context-sensitive help, online help for all functions of the instrument is compiled on the supplied CD-ROM. This help can be called up on any computer using the Internet Explorer (version 4.0 and higher).

## Operating context-sensitive help

Function	Front panel	Mouse
<p>Open help</p> <p><b>Help page for selected parameter is displayed.</b></p>	Press <b>HELP</b> key.	Click HELP/CONTENTS
<p><b>Close help</b></p>	Press <b>HELP</b> key again.	Click HELP/CONTENTS
<p><b>Activate link</b></p> <p>Help opens linked page.</p>	Highlight link using rotary knob or arrow keys and activate with rotary-knob click or <b>ENTER</b> key.	Click link.
<p>Scroll through help</p>	Highlight <b>Previous</b> or <b>Next</b> in help window using cursor keys and activate with rotary-knob click or <b>ENTER</b> key.	Click <b>Previous</b> or <b>Next</b> .
<p><b>Select item from contents list</b></p> <p>Help page for selected item is displayed.</p>	Press <b>Show Contents</b> button below index list. Highlight item you want using rotary knob or cursor keys and then press rotary knob or <b>ENTER</b> key.	Click <b>Show Contents</b> Click item.
<p><b>Select index item</b></p> <p>Help page for selected item is displayed.</p>	Press <b>Show Index</b> button below contents. Type desired term in entry field and then press rotary knob or <b>ENTER</b> key or highlight item using rotary knob or cursor keys and then press rotary knob or <b>ENTER</b> key.	Click <b>Show Index</b> Click item.



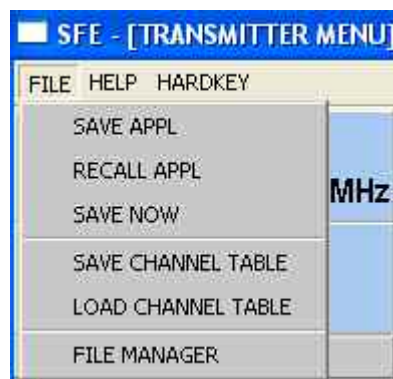
## 3.6 File Management

The instrument uses files to store all instrument data, i.e. system and user data. User data includes saved instrument settings, fading profiles for the fading option, transport streams for the TS generator option, and curve shapes for the arbitrary waveform generator.

The files are stored on the instrument's hard disk. The D: drive is available for storing user-defined data and can have any number of directory structures. Various default directories are preconfigured; however, you can change them at any time.

The C: drive is a protected system drive. The files on this drive contain data that must not be changed. Therefore, this drive should not be accessed since reconstruction of the system partition will lead to data loss. To prevent system files from being deleted or overwritten inadvertently, the C: drive is not displayed in the File menu. It can be accessed by disabling a protection level (see Protection Level in the Setup menu).

Figure 3.6-1 File management



Files can be exchanged either via a memory stick or a connected network.

A memory stick is connected to the USB interface and is assigned the E:\ drive.

When the instrument is connected to a network, you will also see all of the network drives for which you have access rights.

You can access the File menu via the File key or the menu bar.

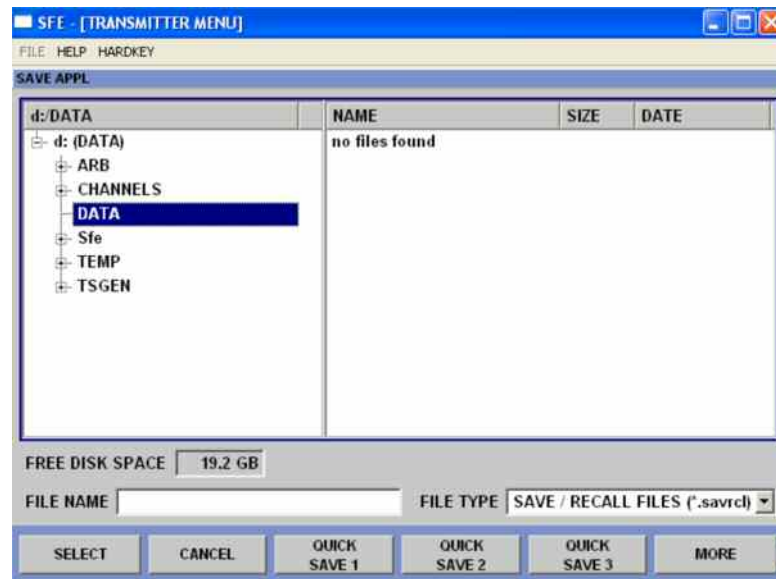
### 3.6.1 SAVE /RECALL APPL

The available drives and directories are shown on the left-hand side, and the files in the selected directory are shown on the right-hand side. Only the relevant files (without file extensions) are shown.

Any file name can be used when saving and creating files; the file extension, however, is assigned automatically and cannot be entered. The file is saved on the selected path.

**SAVE APPL...** Calls the menu for storing the current instrument setting.

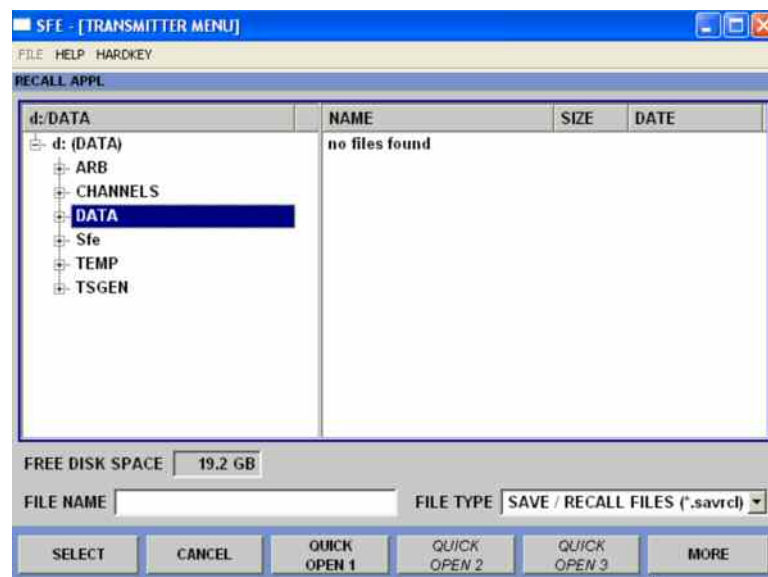
Figure 3.6-2 The SAVE APPL menu



The available drives and directories are shown on the left-hand side, and the files in the selected directory are shown on the right-hand side.

- ◆ **"Directory"** Selects the directory in which the file is to be stored.
- ◆ **DISK FREE SPACE** Displays the available disk space.
- ◆ **FILE NAME** For entering the file name of the file without file extension. This file is then created.
- ◆ **FILE TYPE** For selecting the file extension.
- ◆ **SELECT** Stores the current instrument settings under the specified path.
- ◆ **QUICK SAVE 1-5** Stores the current instrument settings in one of the five intermediate memories. These instrument settings are retained until a different instrument setting is stored in the intermediate memory. When the instrument is switched off, the contents of the intermediate memories are retained.
- ◆ **FILE MANAGER** Calls the **File Management** menu.
- ◆ **RECALL APPL...** Calls the menu for calling up a stored instrument setting.

Figure 3.6-3 The RECALL APPL menu



The existing modes of operation and listings are indicated on the left side. The files in the selected listing are seen on the right side.

- ◆ **"Directory"** Selects the directory in which the file is to be stored.
- ◆ **DISK FREE SPACE** Displays the available disk space.
- ◆ **FILE NAME** For entering the file name of the file without file extension. This file is then created.
- ◆ **FILE TYPE** For selecting the file extension.
- ◆ **SELECT** Stores the current instrument settings under the specified path.
- ◆ **QUICK SAVE 1-5** Stores the current instrument settings in one of the five intermediate memories. These instrument settings are retained until a different instrument setting is stored in the intermediate memory. When the instrument is switched off, the contents of the intermediate memories are retained.
- ◆ **FILE MANAGER** Calls the **File Management** menu.

#### Remote control commands:

##### SAVE APPL

\*SAV 1; MMEMoRY:STORe:STATe 1, <string>

Example for <string>: "D:\DATA\SaveApplExample.savrc1"

##### RECALL APPL

MMEMoRY:LOAD:STATe 1, <string>; \*RCL 1

Example for <string>: "D:\DATA\SaveApplExample.savrc1"

##### SAVE NOW

No remote command available

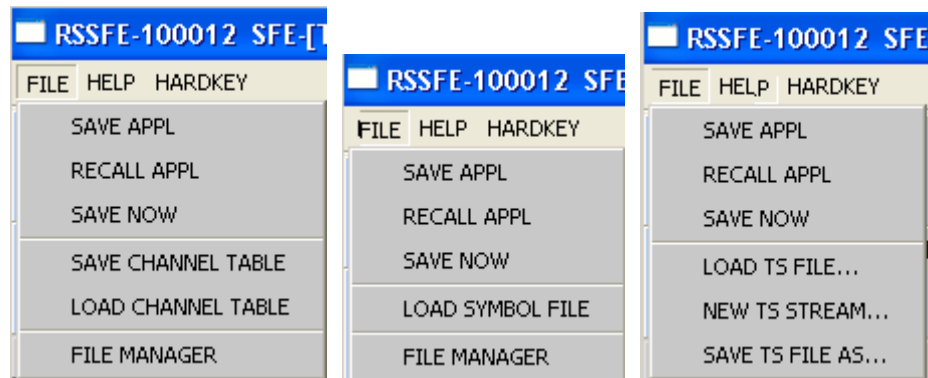
### 3.6.2 Save Now

For storing the current instrument setting immediately.

### 3.6.3 Application-Specific Entries

Depending on the installed application, additional SAVE/RECALL menu items will be offered.

Figure 3.6-4 The SAVE/RECALL menu



There are application-specific file dialogs for channel, TS files and ARB files, for example.

The file dialog is carried out as in the case of SAVE/RECALL APPL; the only dialogs not available are the QUICK SAVE/OPEN dialogs.

Depending on the application, the respective FILE TYPE is already specified.

A directory structure that facilitates file sorting has already been created on the D: partition of the hard disk.

#### Remote control commands:

##### SAVE CHANNEL TABLE

```
[SOURCE]:FREQUENCY:CHANNEL:TABLE:SELECT <string>
Example for <string>: "D:\CHANNELS\ChannelTableExample.chan"
```

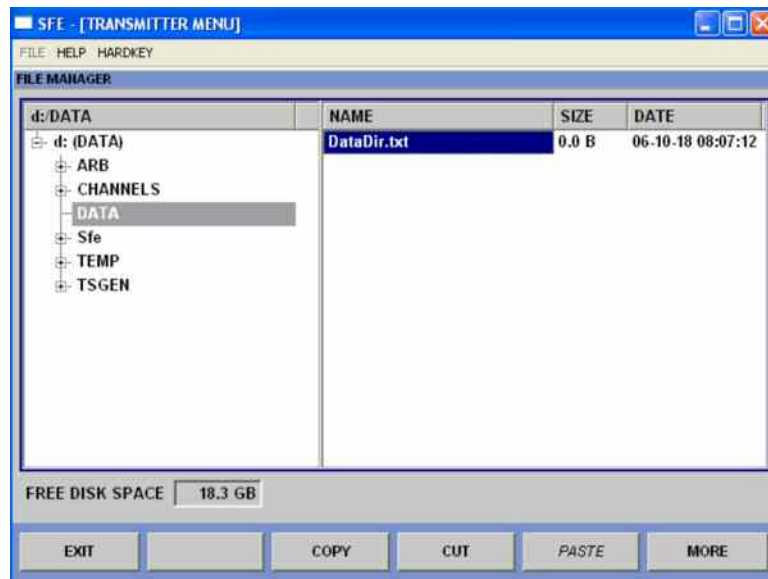
##### LOAD CHANNEL TABLE

```
[SOURCE]:FREQUENCY:CHANNEL:TABLE:STORE <string>
Example for <string>: "D:\CHANNELS\ChannelTableExample.chan"
or
MEMORY:LOAD:STATE 1, "D:\CHANNELS\ChannelTableExample.chan";
*RCL 1
```

### 3.6.4 File Manager

The **File Management** menu provides all the functions required for file management. Directories can be created, and files copied, deleted, and moved between the directories on the drives (hard disk, memory stick, and network drives).

Figure 3.6-5 File manager



The available drives and directories are shown on the left-hand side, and the files in the selected directory are shown on the right-hand side. The buttons/softkeys trigger the assigned action, e.g. copying, moving, or deleting the highlighted file.

In addition, it is possible to create a new directory in the level below the highlighted directory.

- ◆ **Moving file:**  
Highlight the file and then use the **CUT** button/softkey. Highlight the directory to which the file is to be moved and then use the **PASTE** button/softkey. If a file with the same name already exists in the target directory, a confirmation query appears which the user must acknowledge before the file will be overwritten.
- ◆ **Copying file:**  
Highlight the file and then use the **COPY** button/softkey. Highlight the directory to which the file is to be copied and then use the **PASTE** button/softkey. If a file with the same name already exists in the target directory, a confirmation query appears which the user must acknowledge before the file is overwritten.
- ◆ **Renaming file:**  
Highlight the file and then use the **RENAME** button/softkey. A window opens in which the new file name can be entered. Enter the name and press the Enter key. If a file with the same name already exists, a confirmation query appears which the user must acknowledge before the file is overwritten.
- ◆ **Deleting file:**  
Highlight the file and then use the **DELETE** button/softkey. A confirmation query then appears which the user must acknowledge before the file is deleted.
- ◆ **Creating a new directory:**  
Highlight the drive or directory level under which the new directory is to be created, and then use the **NEW FOLDER** button/softkey. A window opens in which the new directory name can be entered. Enter the name and press the Enter key.

**Table 3.6-1 List of user-file extensions that are assigned automatically in the instrument**

List type	Content	File extension
Instrument state	Instrument settings	*.savrc1
Transport stream	MPEG data files	*.trp *.gts
Arbitrary waveforms	ARB waveforms	*.wv
Phase noise	Phase noise shapes	*.noise
Channel table	User-defined channel tables	*.chan

**Remote control commands:****FILE MANAGER**

MMEMemory:ATTRibute  
MMEMemory:CATalog:LENGth?/qonly/  
MMEMemory:CATalog?/qonly/  
MMEMemory:CDIRectory  
MMEMemory:COPI/nquery/  
MMEMemory:DATA  
MMEMemory:DCATalog:LENGth?/qonly/  
MMEMemory:DCATalog?/qonly/  
MMEMemory:DELeTe/nquery/  
MMEMemory:DRIVes?/qonly/  
MMEMemory:LOAD:STATe/nquery/  
MMEMemory:MDIRectory/nquery/  
MMEMemory:MOVE/nquery/  
MMEMemory:MSIS  
MMEMemory:RDIRectory/nquery/  
MMEMemory:STORe:STATe/nquery/



## 3.7 Manual Remote Operation

The instrument can be remote-controlled from an external PC. This allows the convenient operation of the broadcast tester or test transmitter from the desktop although the instrument is integrated in a rack in the next room.

**Manual remote control** (in contrast to **remote control**) does not use remote-control commands but separate Windows software, which is installed on the external PC.

There are two choices: use of VNC or Remote Desktop.

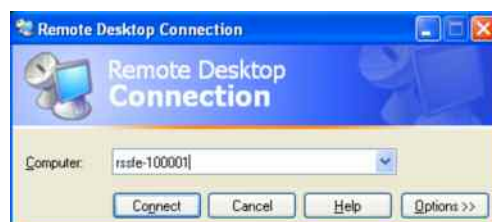
### 3.7.1 Remote Desktop

When launched, the Windows XP **Remote Desktop Connection** software simulates the instrument user interface. This allows the instrument to be manually operated from the external computer in the same way as from the instrument itself.

Two preconditions for manual remote control are a connection between the broadcast tester or test transmitter and the PC via a LAN network and the installation of the software on the PC.

The procedures for setting up a connection and installing the remote operation software on the external computer are described in Chapter 1.

Manual remote operation is started on the external computer by calling up the **Remote Desktop Connection** program and clicking the **Connect** button. The instrument must be selected for remote control, i.e. its computer name must be displayed in the **Computer:** window.



If the PC is configured for the remote-control of multiple instruments, the instruments are in the list selected with the  button. The user ID and password (**instrument** in both cases) can be stored when the software is first installed. The entries are made in the extended menu "Options>>".



After login, the instrument firmware of the instrument boots on the external PC. After booting is completed, the instrument's screen appears and the instrument is ready for manual remote operation from the external computer. The start settings that were active before the connection was established are used unless another start setting is explicitly selected in the **File** menu. The individual functions are operated using the mouse and keyboard. Front-panel keys that are not directly available on the keyboard can be substituted by key combinations (see table in the section below).

The device GUI of the instrument is disabled when the connection is set up. Operation from the instrument itself is not possible during manual remote operation. Access by an external computer and the identity of the remote user is indicated on the login display of Windows XP Embedded.

For return to direct operation on the instrument, the external user must be logged off and the local user logged on.

The external user can log off in the **Start** menu on the external controller by clicking **Disconnect** in the lower right-hand corner of menu.

Figure 3.7-1



This logoff is also possible in the remote-control message window on the instrument.

Login of the local user is possible only in the remote-control display on the instrument. In the instrument, the local user can log in with the name "**instrument**" as standard; the password is also "**instrument**".

After local login, the instrument software starts with the settings made during manual remote control unless another start setup was explicitly selected in the **File** menu.

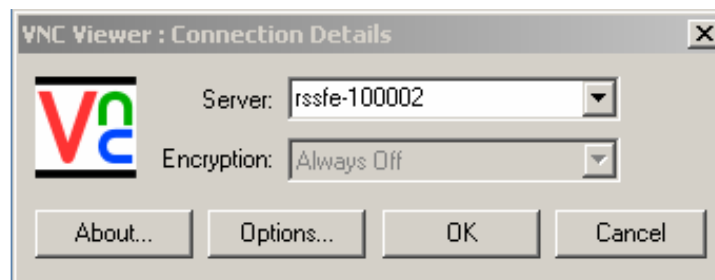
### 3.7.2 VNC

Once it is launched, VNC simulates the user interface of the instrument. This allows the instrument to be manually operated from the external computer in the same way as from the instrument itself.

For remote manual operation to work, the following requirements must be met: There must be a connection between the instrument and computer via a LAN, the VNC viewer must be installed on the computer, and the VNC server must be installed on the R&S® SFE or R&S® SFE100.

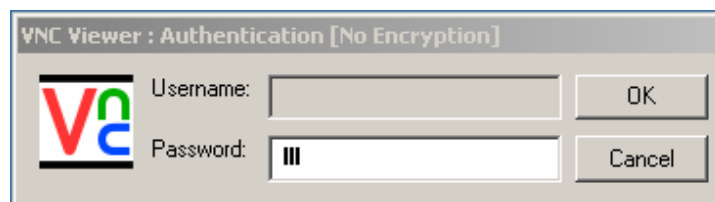
Manual remote operation is launched on the external computer by launching the VNC viewer. The instrument must be selected as the instrument for remote operation, i.e. its IP address or computer name must be entered in the Connection details window.

Figure 3.7-2 Connection details



Click OK to establish the connection. You will be prompted for the session password.

Figure 3.7-3 VNC authentication



After you enter the password **SFE**, the screen of the instrument will appear on the external computer.

If you need to directly operate the instrument, it is not necessary to log off the external user.

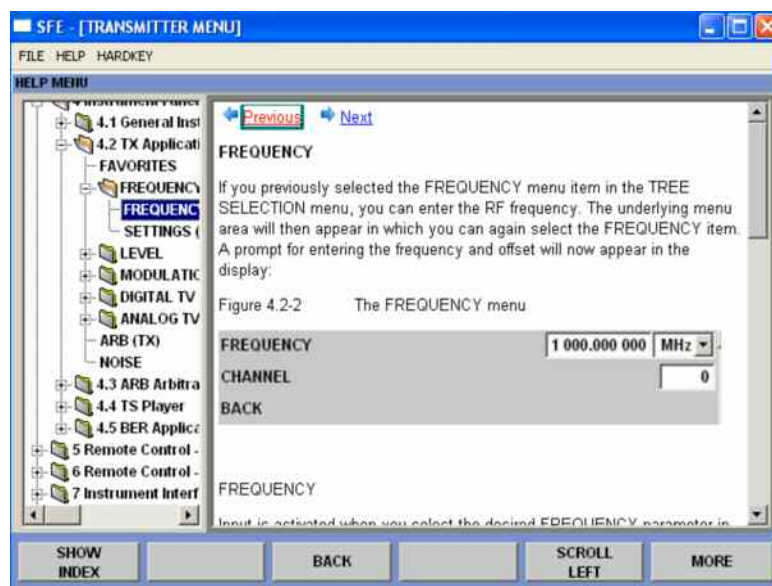
The external user can end remote operation on the external window by closing the VNC application.

## 3.5 Help System

The instrument has a context-sensitive help system. The help system provides a help page for every parameter and can be called up at any time while the instrument is being operated.

The help system has a navigation bar, i.e. starting from the context-sensitive page, you can navigate to other help pages by using the contents list, the index, scroll arrows, and page-internal links.

Figure 3.5-1 Help menu



In addition to the context-sensitive help, online help for all functions of the instrument is compiled on the supplied CD-ROM. This help can be called up on any computer using the Internet Explorer (version 4.0 and higher).

## Operating context-sensitive help

Function	Front panel	Mouse
<p>Open help</p> <p><b>Help page for selected parameter is displayed.</b></p>	Press <b>HELP</b> key.	Click HELP/CONTENTS
<p><b>Close help</b></p>	Press <b>HELP</b> key again.	Click HELP/CONTENTS
<p><b>Activate link</b></p> <p>Help opens linked page.</p>	Highlight link using rotary knob or arrow keys and activate with rotary-knob click or <b>ENTER</b> key.	Click link.
<p>Scroll through help</p>	Highlight <b>Previous</b> or <b>Next</b> in help window using cursor keys and activate with rotary-knob click or <b>ENTER</b> key.	Click <b>Previous</b> or <b>Next</b> .
<p><b>Select item from contents list</b></p> <p>Help page for selected item is displayed.</p>	Press <b>Show Contents</b> button below index list. Highlight item you want using rotary knob or cursor keys and then press rotary knob or <b>ENTER</b> key.	Click <b>Show Contents</b> Click item.
<p><b>Select index item</b></p> <p>Help page for selected item is displayed.</p>	Press <b>Show Index</b> button below contents. Type desired term in entry field and then press rotary knob or <b>ENTER</b> key or highlight item using rotary knob or cursor keys and then press rotary knob or <b>ENTER</b> key.	Click <b>Show Index</b> Click item.

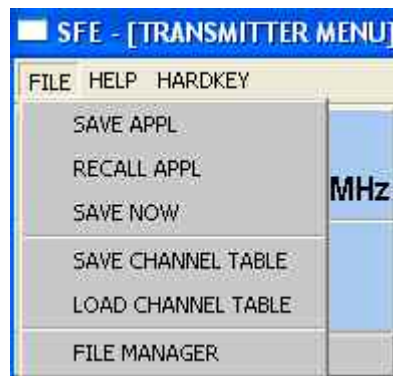
## 3.6 File Management

The instrument uses files to store all instrument data, i.e. system and user data. User data includes saved instrument settings, fading profiles for the fading option, transport streams for the TS generator option, and curve shapes for the arbitrary waveform generator.

The files are stored on the instrument's hard disk. The D: drive is available for storing user-defined data and can have any number of directory structures. Various default directories are preconfigured; however, you can change them at any time.

The C: drive is a protected system drive. The files on this drive contain data that must not be changed. Therefore, this drive should not be accessed since reconstruction of the system partition will lead to data loss. To prevent system files from being deleted or overwritten inadvertently, the C: drive is not displayed in the File menu. It can be accessed by disabling a protection level (see Protection Level in the Setup menu).

Figure 3.6-1 File management



Files can be exchanged either via a memory stick or a connected network.

A memory stick is connected to the USB interface and is assigned the E:\ drive.

When the instrument is connected to a network, you will also see all of the network drives for which you have access rights.

You can access the File menu via the File key or the menu bar.

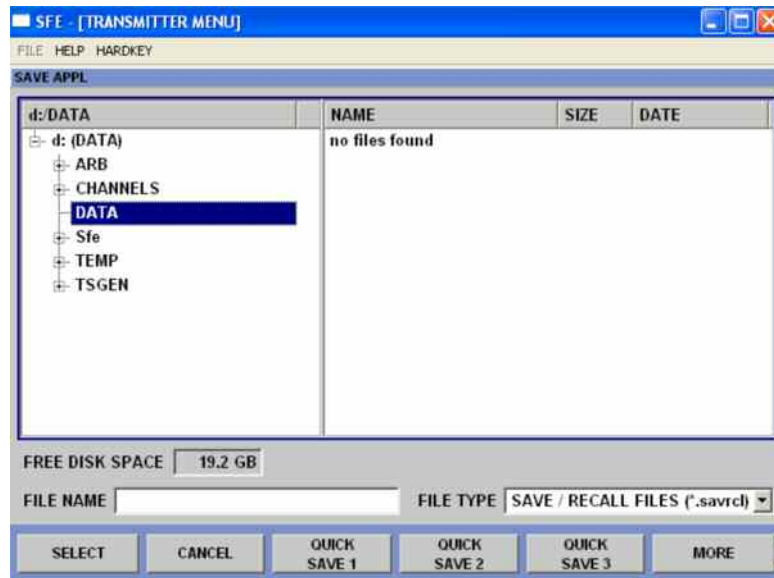
### 3.6.1 SAVE /RECALL APPL

The available drives and directories are shown on the left-hand side, and the files in the selected directory are shown on the right-hand side. Only the relevant files (without file extensions) are shown.

Any file name can be used when saving and creating files; the file extension, however, is assigned automatically and cannot be entered. The file is saved on the selected path.

**SAVE APPL...** Calls the menu for storing the current instrument setting.

Figure 3.6-2 The SAVE APPL menu

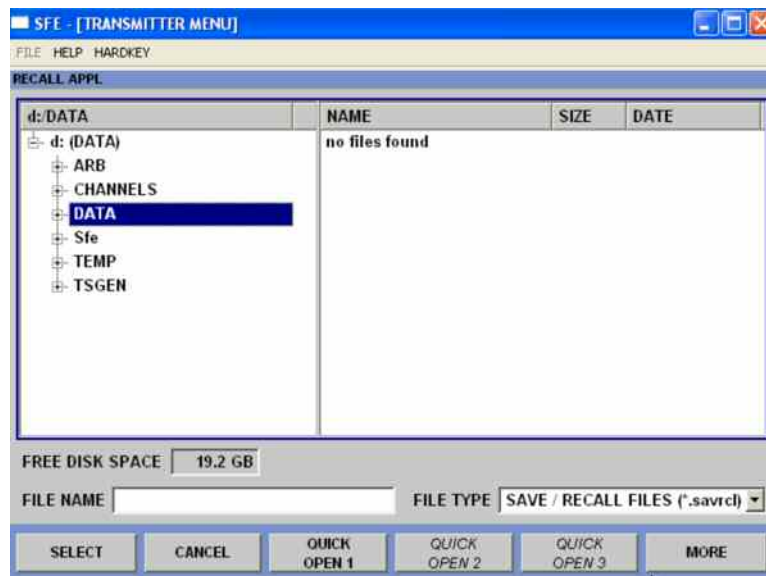




The available drives and directories are shown on the left-hand side, and the files in the selected directory are shown on the right-hand side.

- ◆ **"Directory"**                      Selects the directory in which the file is to be stored.
- ◆ **DISK FREE SPACE**            Displays the available disk space.
- ◆ **FILE NAME**                      For entering the file name of the file without file extension. This file is then created.
- ◆ **FILE TYPE**                        For selecting the file extension.
- ◆ **SELECT**                            Stores the current instrument settings under the specified path.
- ◆ **QUICK SAVE 1-5**                Stores the current instrument settings in one of the five intermediate memories. These instrument settings are retained until a different instrument setting is stored in the intermediate memory. When the instrument is switched off, the contents of the intermediate memories are retained.
- ◆ **FILE MANAGER**                 Calls the File Management menu.
- ◆ **RECALL APPL...**                Calls the menu for calling up a stored instrument setting.

Figure 3.6-3 The RECALL APPL menu



The existing modes of operation and listings are indicated on the left side. The files in the selected listing are seen on the right side.

- ◆ **"Directory"**                      Selects the directory in which the file is to be stored.
- ◆ **DISK FREE SPACE**            Displays the available disk space.
- ◆ **FILE NAME**                      For entering the file name of the file without file extension. This file is then created.
- ◆ **FILE TYPE**                      For selecting the file extension.
- ◆ **SELECT**                          Stores the current instrument settings under the specified path.
- ◆ **QUICK SAVE 1-5**                Stores the current instrument settings in one of the five intermediate memories. These instrument settings are retained until a different instrument setting is stored in the intermediate memory. When the instrument is switched off, the contents of the intermediate memories are retained.
- ◆ **FILE MANAGER**                Calls the **File Management** menu.

#### **Remote control commands:**

##### **SAVE APPL**

\*SAV 1; MMEMemory:STORe:STATe 1, <string>

Example for <string>: "D:\DATA\SaveApplExample.savrcI"

##### **RECALL APPL**

MMEMemory:LOAD:STATe 1, <string>; \*RCL 1

Example for <string>: "D:\DATA\SaveApplExample.savrcI"

##### **SAVE NOW**

No remote command available

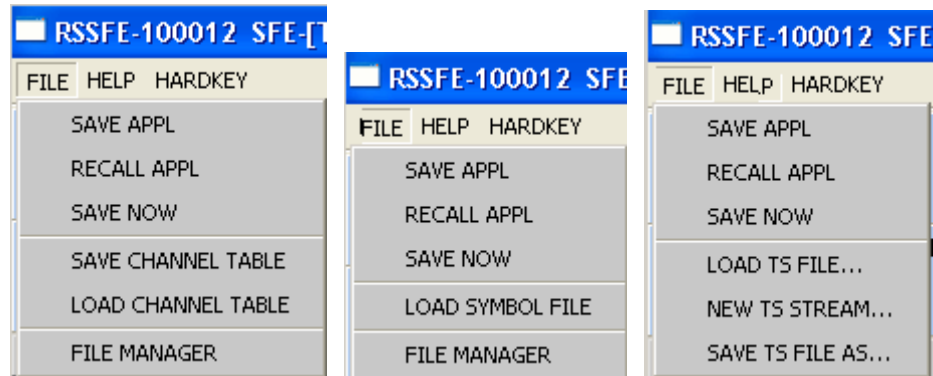
### **3.6.2 Save Now**

For storing the current instrument setting immediately.

### 3.6.3 Application-Specific Entries

Depending on the installed application, additional SAVE/RECALL menu items will be offered.

Figure 3.6-4 The SAVE/RECALL menu



There are application-specific file dialogs for channel, TS files and ARB files, for example.

The file dialog is carried out as in the case of SAVE/RECALL APPL; the only dialogs not available are the QUICK SAVE/OPEN dialogs.

Depending on the application, the respective FILE TYPE is already specified.

A directory structure that facilitates file sorting has already been created on the D: partition of the hard disk.

#### Remote control commands:

##### SAVE CHANNEL TABLE

```
[SOURCE]:FREQUENCY:CHANNEL:TABLE:SELECT <string>
```

```
Example for <string>: "D:\CHANNELS\ChannelTableExample.chan"
```

##### LOAD CHANNEL TABLE

```
[SOURCE]:FREQUENCY:CHANNEL:TABLE:STORE <string>
```

```
Example for <string>: "D:\CHANNELS\ChannelTableExample.chan"
```

or

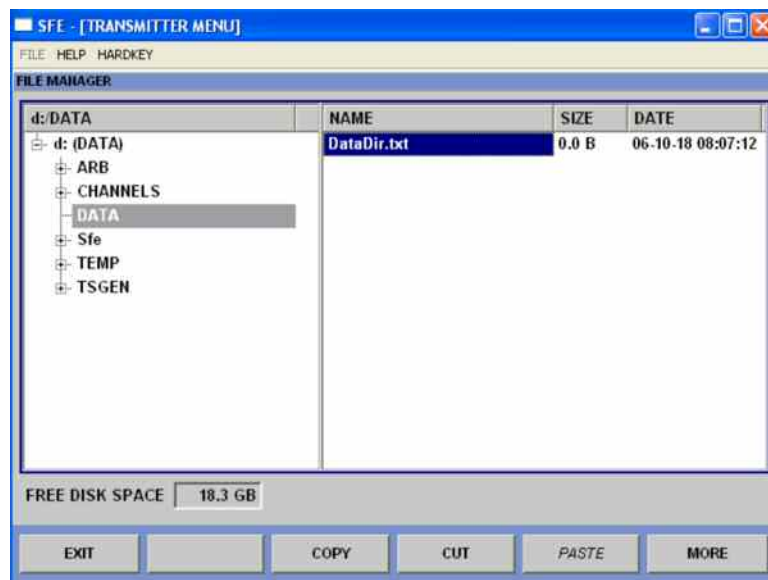
```
MEMORY:LOAD:STATE 1, "D:\CHANNELS\ChannelTableExample.chan";
```

```
*RCL 1
```

### 3.6.4 File Manager

The **File Management** menu provides all the functions required for file management. Directories can be created, and files copied, deleted, and moved between the directories on the drives (hard disk, memory stick, and network drives).

Figure 3.6-5 File manager



The available drives and directories are shown on the left-hand side, and the files in the selected directory are shown on the right-hand side. The buttons/softkeys trigger the assigned action, e.g. copying, moving, or deleting the highlighted file.

In addition, it is possible to create a new directory in the level below the highlighted directory.

◆ **Moving file:**

Highlight the file and then use the **CUT** button/softkey. Highlight the directory to which the file is to be moved and then use the **PASTE** button/softkey. If a file with the same name already exists in the target directory, a confirmation query appears which the user must acknowledge before the file will be overwritten.

◆ **Copying file:**

Highlight the file and then use the **COPY** button/softkey. Highlight the directory to which the file is to be copied and then use the **PASTE** button/softkey. If a file with the same name already exists in the target directory, a confirmation query appears which the user must acknowledge before the file is overwritten.

◆ **Renaming file:**

Highlight the file and then use the **RENAME** button/softkey. A window opens in which the new file name can be entered. Enter the name and press the Enter key. If a file with the same name already exists, a confirmation query appears which the user must acknowledge before the file is overwritten.

◆ **Deleting file:**

Highlight the file and then use the **DELETE** button/softkey. A confirmation query then appears which the user must acknowledge before the file is deleted.

◆ **Creating a new directory:**

Highlight the drive or directory level under which the new directory is to be created, and then use the **NEW FOLDER** button/softkey. A window opens in which the new directory name can be entered. Enter the name and press the Enter key.

**Table 3.6-1 List of user-file extensions that are assigned automatically in the instrument**

List type	Content	File extension
Instrument state	Instrument settings	*.savrc1
Transport stream	MPEG data files	*.trp *.gts
Arbitrary waveforms	ARB waveforms	*.wv
Phase noise	Phase noise shapes	*.noise
Channel table	User-defined channel tables	*.chan

**Remote control commands:**

**FILE MANAGER**

MMEMory:ATTRibute

MMEMory:CATalog:LENGth?/qonly/

MMEMemory:CATalog?/qonly/  
MMEMemory:CDIRectory  
MMEMemory:COPI/nquery/  
MMEMemory:DATA  
MMEMemory:DCATalog:LENGth?/qonly/  
MMEMemory:DCATalog?/qonly/  
MMEMemory:DELeTe/nquery/  
MMEMemory:DRIVes?/qonly/  
MMEMemory:LOAD:STATe/nquery/  
MMEMemory:MDIRectory/nquery/  
MMEMemory:MOVE/nquery/  
MMEMemory:MSIS  
MMEMemory:RDIRectory/nquery/  
MMEMemory:STORe:STATe/nquery/

## 3.7 Manual Remote Control

The instrument can be remote-controlled from an external PC. This allows the convenient operation of the instrument from the desktop although the instrument is integrated in a rack in the next room.

**Manual remote control** (in contrast to **remote control**) does not use remote-control commands but separate Windows software, which is installed on the external PC.

There are two choices: use of VNC or Remote Desktop.

### 3.7.1 Remote Desktop

When launched, the Windows XP **Remote Desktop Connection** software simulates the instrument user interface. This allows the instrument to be manually operated from the external computer in the same way as from the instrument itself.

Two preconditions for manual control are a connection between the instrument and the PC via a LAN network and the installation of the software on the PC.

The procedures for setting up a connection and installing the remote operation software on the external computer are described in Chapter 1.

Manual remote control is started on the external computer by calling up the **Remote Desktop Connection** program and clicking the **Connect** button. The instrument must be selected for remote control, i.e. its computer name must be displayed in the **Computer:** window.



If the PC is configured for the remote-control of multiple instruments, the instruments are in the list selected with the  button. The user ID and password (**instrument** in both cases) can be stored when the software is first installed. The entries are made in the extended menu "Options>>".



After login, the instrument firmware of the instrument boots on the external PC. After booting is completed, the instrument's screen appears and the instrument is ready for manual remote control from the external computer. The start settings that were active before the connection was established are used unless another start setting is explicitly selected in the **File** menu. The individual functions are operated using the mouse and keyboard. Front-panel keys that are not directly available on the keyboard can be substituted by key combinations (see table in the section below).

The device GUI of the instrument is disabled when the connection is set up. Operation from the instrument itself is not possible during manual remote control. Access by an external computer and the identity of the remote user is indicated on the login display of Windows XP Embedded.

For return to direct operation on the instrument, the external user must be logged off and the local user logged on.

The external user can log off in the **Start** menu on the external controller by clicking **Disconnect** in the lower right-hand corner of menu.



Figure 3.7-1



This logoff is also possible in the remote-control message window on the instrument.

Login of the local user is possible only in the remote-control display on the instrument. In the R&S® SFE, the local user can log in with the name "**instrument**" as standard; the password is also "**instrument**".

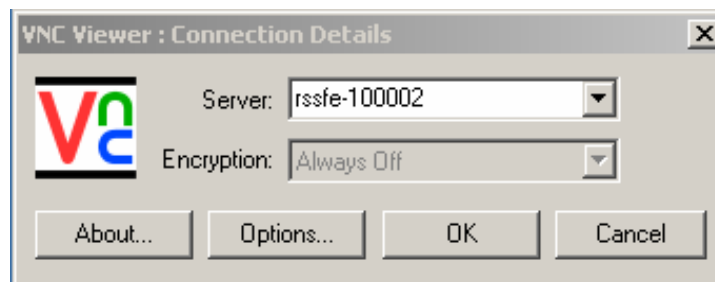
After local login, the instrument software starts with the settings made during manual remote control unless another start setup was explicitly selected in the **File** menu.

### 3.7.2 VNC

Once it is launched, VNC simulates the user interface of the instrument. This allows the instrument to be manually operated from the external computer in the same way as from the instrument itself. For remote manual control to work, the following requirements must be met: There must be a connection between the instrument and computer via a LAN, the VNC viewer must be installed on the computer, and the VNC server must be installed on the R&S® SFE or R&S® SFE100.

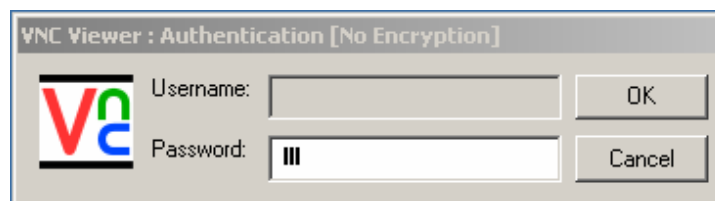
Manual remote control is launched on the external computer by launching the VNC viewer. The R&S® SFE must be selected as the instrument for remote control, i.e. its IP address or computer name must be entered in the Connection details window.

Figure 3.7-2 Connection details



Click OK to establish the connection. You will be prompted for the session password.

Figure 3.7-3 VNC authentication



After you enter the password **SFE**, the screen of the instrument will appear on the external computer.

If you need to directly operate the R&S® SFE, it is not necessary to log off the external user.

The external user can end remote control on the external window by closing the VNC application.