

R&S[®] ETC

Compact TV Analyzer

Getting Started



2116.7884.02 – 03.02

This manual describes the following R&S[®]ETC models:

- 2116.5000.04/08

The firmware of the R&S[®]ETC makes use of several valuable open source software packages. The most important of them are listed below, together with their corresponding open source license. The verbatim license texts are provided on the user documentation CD-ROM (included in delivery).

Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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The following abbreviations are used throughout this manual:
R&S[®]XYZ is abbreviated as R&S XYZ

Basic Safety Instructions

Always read through and comply with the following safety instructions!

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

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

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













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

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systems and all accessories. For product-specific information, see the data sheet and the product documentation.

Safety labels on products

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

Symbol	Meaning	Symbol	Meaning
	Notice, general danger location Observe product documentation	○	ON/OFF supply voltage
	Caution when handling heavy equipment	⏻	Standby indication
	Danger of electric shock	≡	Direct current (DC)
	Warning! Hot surface	~	Alternating current (AC)
	Protective conductor terminal	⎓	Direct/alternating current (DC/AC)
	Ground	□	Device fully protected by double (reinforced) insulation
	Ground terminal		EU labeling for batteries and accumulators For additional information, see section "Waste disposal/Environmental protection", item 1.
	Be careful when handling electrostatic sensitive devices	 	EU labeling for separate collection of electrical and electronic devices For additional information, see section "Waste disposal/Environmental protection", item 2.
	Warning! Laser radiation For additional information, see section "Operation", item 7.		

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Signal words and their meaning

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



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



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



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



Indicates information considered important, but not hazard-related, e.g. messages relating to property damage. In the product documentation, the word ATTENTION is used synonymously.

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

Operating states and operating positions

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

1. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products:
predefined operating position is always with the housing floor facing down, IP protection 2X, use only indoors, max. operating altitude 2000 m above sea level, max. transport altitude 4500 m above sea level. A tolerance of $\pm 10\%$ shall apply to the nominal voltage and $\pm 5\%$ to the nominal frequency, overvoltage category 2, pollution severity 2.

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2. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves). An installation that is not carried out as described in the product documentation could result in personal injury or even death.
3. Do not place the product on heat-generating devices such as radiators or fan heaters. The ambient temperature must not exceed the maximum temperature specified in the product documentation or in the data sheet. Product overheating can cause electric shock, fire and/or serious personal injury or even death.

Electrical safety

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

1. Prior to switching on the product, always ensure that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with a protective conductor contact and protective conductor.
3. Intentionally breaking the protective conductor either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
4. If there is no power switch for disconnecting the product from the AC supply network, or if the power switch is not suitable for this purpose, use the plug of the connecting cable to disconnect the product from the AC supply network. In such cases, always ensure that the power plug is easily reachable and accessible at all times. For example, if the power plug is the disconnecting device, the length of the connecting cable must not exceed 3 m. Functional or electronic switches are not suitable for providing disconnection from the AC supply network. If products without power switches are integrated into racks or systems, the disconnecting device must be provided at the system level.

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5. Never use the product if the power cable is damaged. Check the power cables on a regular basis to ensure that they are in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by, for example, tripping over the cable or suffering an electric shock.
6. The product may be operated only from TN/TT supply networks fuse-protected with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket provided for this purpose. Otherwise, sparks that result in fire and/or injuries may occur.
8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
9. For measurements in circuits with voltages $V_{\text{rms}} > 30 \text{ V}$, suitable measures (e.g. appropriate measuring equipment, fuse protection, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC60950-1/EN60950-1 or IEC61010-1/EN 61010-1 standards that apply in each case.
11. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
12. If a product is to be permanently installed, the connection between the protective conductor terminal on site and the product's protective conductor must be made first before any other connection is made. The product may be installed and connected only by a licensed electrician.
13. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fuse-protected in such a way that anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.
14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.
15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.

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16. Unless specified otherwise, products are not liquid-proof (see also section "Operating states and operating positions", item 1). Therefore, the equipment must be protected against penetration by liquids. If the necessary precautions are not taken, the user may suffer electric shock or the product itself may be damaged, which can also lead to personal injury.
17. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product has been moved from a cold to a warm environment. Penetration by water increases the risk of electric shock.
18. Prior to cleaning the product, disconnect it completely from the power supply (e.g. AC supply network or battery). Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluents for cellulose lacquers.

Operation

1. Operating the products requires special training and intense concentration. Make sure that persons who use the products are physically, mentally and emotionally fit enough to do so; otherwise, injuries or material damage may occur. It is the responsibility of the employer/operator to select suitable personnel for operating the products.
2. Before you move or transport the product, read and observe the section titled "Transport".
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.
4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal/Environmental protection", item 1.
5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.

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6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.
7. Laser products are given warning labels that are standardized according to their laser class. Lasers can cause biological harm due to the properties of their radiation and due to their extremely concentrated electromagnetic power. If a laser product (e.g. a CD/DVD drive) is integrated into a Rohde & Schwarz product, absolutely no other settings or functions may be used as described in the product documentation. The objective is to prevent personal injury (e.g. due to laser beams).
8. EMC classes (in line with EN 55011/CISPR 11, and analogously with EN 55022/CISPR 22, EN 55032/CISPR 32)
 - Class A equipment:
Equipment suitable for use in all environments except residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings
Note: Class A equipment is intended for use in an industrial environment. This equipment may cause radio disturbances in residential environments, due to possible conducted as well as radiated disturbances. In this case, the operator may be required to take appropriate measures to eliminate these disturbances.
 - Class B equipment:
Equipment suitable for use in residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings

Repair and service

1. The product may be opened only by authorized, specially trained personnel. Before any work is performed on the product or before the product is opened, it must be disconnected from the AC supply network. Otherwise, personnel will be exposed to the risk of an electric shock.
2. Adjustments, replacement of parts, maintenance and repair may be performed only by electrical experts authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, protective conductor test, insulation resistance measurement, leakage current measurement, functional test). This helps ensure the continued safety of the product.

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Batteries and rechargeable batteries/cells

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

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

Transport

1. The product may be very heavy. Therefore, the product must be handled with care. In some cases, the user may require a suitable means of lifting or moving the product (e.g. with a lift-truck) to avoid back or other physical injuries.
2. Handles on the products are designed exclusively to enable personnel to transport the product. It is therefore not permissible to use handles to fasten the product to or on transport equipment such as cranes, fork lifts, wagons,

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etc. The user is responsible for securely fastening the products to or on the means of transport or lifting. Observe the safety regulations of the manufacturer of the means of transport or lifting. Noncompliance can result in personal injury or material damage.

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

Waste disposal/Environmental protection

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

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

Instrucciones de seguridad elementales

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

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

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









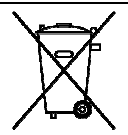
Se parte del uso correcto del producto para los fines definidos si el producto es utilizado conforme a las indicaciones de la correspondiente documentación del producto y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso del producto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

Instrucciones de seguridad elementales


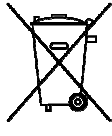


Tener en cuenta las informaciones de seguridad sirve para evitar en lo posible lesiones o daños por peligros de toda clase. Por eso es imprescindible leer detalladamente y comprender por completo las siguientes informaciones de seguridad antes de usar el producto, y respetarlas durante el uso del producto.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

Señalización de seguridad de los productos

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

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

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

Palabras de señal y su significado

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



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



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



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



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

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

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

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Estados operativos y posiciones de funcionamiento

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

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

Seguridad eléctrica

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

1. Antes de la puesta en marcha del producto se deberá comprobar siempre que la tensión preseleccionada en el producto coincida con la de la red de alimentación eléctrica. Si es necesario modificar el ajuste de tensión, también se deberán cambiar en caso dado los fusibles correspondientes del producto.

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2. Los productos de la clase de protección I con alimentación móvil y enchufe individual solamente podrán enchufarse a tomas de corriente con contacto de seguridad y con conductor de protección conectado.
3. Queda prohibida la interrupción intencionada del conductor de protección, tanto en la toma de corriente como en el mismo producto. La interrupción puede tener como consecuencia el riesgo de que el producto sea fuente de choques eléctricos. Si se utilizan cables alargadores o regletas de enchufe, deberá garantizarse la realización de un examen regular de los mismos en cuanto a su estado técnico de seguridad.
4. Si el producto no está equipado con un interruptor para desconectarlo de la red, o bien si el interruptor existente no resulta apropiado para la desconexión de la red, el enchufe del cable de conexión se deberá considerar como un dispositivo de desconexión.
El dispositivo de desconexión se debe poder alcanzar fácilmente y debe estar siempre bien accesible. Si, p. ej., el enchufe de conexión a la red es el dispositivo de desconexión, la longitud del cable de conexión no debe superar 3 m).
Los interruptores selectores o electrónicos no son aptos para el corte de la red eléctrica. Si se integran productos sin interruptor en bastidores o instalaciones, se deberá colocar el interruptor en el nivel de la instalación.
5. No utilice nunca el producto si está dañado el cable de conexión a red.
Compruebe regularmente el correcto estado de los cables de conexión a red. Asegúrese, mediante las medidas de protección y de instalación adecuadas, de que el cable de conexión a red no pueda ser dañado o de que nadie pueda ser dañado por él, p. ej. al tropezar o por un choque eléctrico.
6. Solamente está permitido el funcionamiento en redes de alimentación TN/TT aseguradas con fusibles de 16 A como máximo (utilización de fusibles de mayor amperaje solo previa consulta con el grupo de empresas Rohde & Schwarz).
7. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. La no observación de estas medidas puede provocar chispas, fuego y/o lesiones.
8. No sobrecargue las tomas de corriente, los cables alargadores o las regletas de enchufe ya que esto podría causar fuego o choques eléctricos.
9. En las mediciones en circuitos de corriente con una tensión $U_{\text{eff}} > 30 \text{ V}$ se deberán tomar las medidas apropiadas para impedir cualquier peligro (p. ej. medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).

Instrucciones de seguridad elementales

10. Para la conexión con dispositivos informáticos como un PC o un ordenador industrial, debe comprobarse que éstos cumplan los estándares IEC60950-1/EN60950-1 o IEC61010-1/EN 61010-1 válidos en cada caso.
11. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar lesiones, fuego o daños en el producto.
12. Si un producto se instala en un lugar fijo, se deberá primero conectar el conductor de protección fijo con el conductor de protección del producto antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
13. En el caso de dispositivos fijos que no estén provistos de fusibles, interruptor automático ni otros mecanismos de seguridad similares, el circuito de alimentación debe estar protegido de modo que todas las personas que puedan acceder al producto, así como el producto mismo, estén a salvo de posibles daños.
14. Todo producto debe estar protegido contra sobretensión (debida p. ej. a una caída del rayo) mediante los correspondientes sistemas de protección. Si no, el personal que lo utilice quedará expuesto al peligro de choque eléctrico.
15. No debe introducirse en los orificios de la caja del aparato ningún objeto que no esté destinado a ello. Esto puede producir cortocircuitos en el producto y/o puede causar choques eléctricos, fuego o lesiones.
16. Salvo indicación contraria, los productos no están impermeabilizados (ver también el capítulo "Estados operativos y posiciones de funcionamiento", punto 1). Por eso es necesario tomar las medidas necesarias para evitar la entrada de líquidos. En caso contrario, existe peligro de choque eléctrico para el usuario o de daños en el producto, que también pueden redundar en peligro para las personas.
17. No utilice el producto en condiciones en las que pueda producirse o ya se hayan producido condensaciones sobre el producto o en el interior de éste, como p. ej. al desplazarlo de un lugar frío a otro caliente. La entrada de agua aumenta el riesgo de choque eléctrico.
18. Antes de la limpieza, desconecte por completo el producto de la alimentación de tensión (p. ej. red de alimentación o batería). Realice la limpieza de los aparatos con un paño suave, que no se deshilache. No utilice bajo ningún concepto productos de limpieza químicos como alcohol, acetona o diluyentes para lacas nitrocelulósicas.

Instrucciones de seguridad elementales

Funcionamiento

1. El uso del producto requiere instrucciones especiales y una alta concentración durante el manejo. Debe asegurarse que las personas que manejen el producto estén a la altura de los requerimientos necesarios en cuanto a aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario u operador es responsable de seleccionar el personal usuario apto para el manejo del producto.
2. Antes de desplazar o transportar el producto, lea y tenga en cuenta el capítulo "Transporte".
3. Como con todo producto de fabricación industrial no puede quedar excluida en general la posibilidad de que se produzcan alergias provocadas por algunos materiales empleados —los llamados alérgenos (p. ej. el níquel)—. Si durante el manejo de productos Rohde & Schwarz se producen reacciones alérgicas, como p. ej. irritaciones cutáneas, estornudos continuos, enrojecimiento de la conjuntiva o dificultades respiratorias, debe avisarse inmediatamente a un médico para investigar las causas y evitar cualquier molestia o daño a la salud.
4. Antes de la manipulación mecánica y/o térmica o el desmontaje del producto, debe tenerse en cuenta imprescindiblemente el capítulo "Eliminación/protección del medio ambiente", punto 1.
5. Ciertos productos, como p. ej. las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. Deben tomarse todas las medidas necesarias para la protección de las mujeres embarazadas. También las personas con marcapasos pueden correr peligro a causa de la radiación electromagnética. El empresario/operador tiene la obligación de evaluar y señalar las áreas de trabajo en las que exista un riesgo elevado de exposición a radiaciones.
6. Tenga en cuenta que en caso de incendio pueden desprenderse del producto sustancias tóxicas (gases, líquidos etc.) que pueden generar daños a la salud. Por eso, en caso de incendio deben usarse medidas adecuadas, como p. ej. máscaras antigás e indumentaria de protección.

Instrucciones de seguridad elementales

7. Los productos con láser están provistos de indicaciones de advertencia normalizadas en función de la clase de láser del que se trate. Los rayos láser pueden provocar daños de tipo biológico a causa de las propiedades de su radiación y debido a su concentración extrema de potencia electromagnética. En caso de que un producto Rohde & Schwarz contenga un producto láser (p. ej. un lector de CD/DVD), no debe usarse ninguna otra configuración o función aparte de las descritas en la documentación del producto, a fin de evitar lesiones (p. ej. debidas a irradiación láser).
8. Clases de compatibilidad electromagnética (conforme a EN 55011 / CISPR 11; y en analogía con EN 55022 / CISPR 22, EN 55032 / CISPR 32)
 - Aparato de clase A:
Aparato adecuado para su uso en todos los entornos excepto en los residenciales y en aquellos conectados directamente a una red de distribución de baja tensión que suministra corriente a edificios residenciales.
Nota: Los aparatos de clase A están destinados al uso en entornos industriales. Estos aparatos pueden causar perturbaciones radioeléctricas en entornos residenciales debido a posibles perturbaciones guiadas o radiadas. En este caso, se le podrá solicitar al operador que tome las medidas adecuadas para eliminar estas perturbaciones.
 - Aparato de clase B:
Aparato adecuado para su uso en entornos residenciales, así como en aquellos conectados directamente a una red de distribución de baja tensión que suministra corriente a edificios residenciales.

Reparación y mantenimiento

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

Instrucciones de seguridad elementales

Baterías y acumuladores o celdas

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

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

Transporte

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

Instrucciones de seguridad elementales

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

Eliminación/protección del medio ambiente

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

Instrucciones de seguridad elementales

4. En caso de que durante el trato del producto se formen sustancias peligrosas o combustibles que deban tratarse como residuos especiales (p. ej. refrigerantes o aceites de motor con intervalos de cambio definidos), deben tenerse en cuenta las indicaciones de seguridad del fabricante de dichas sustancias y las normas regionales de eliminación de residuos. Tenga en cuenta también en caso necesario las indicaciones de seguridad especiales contenidas en la documentación del producto. La eliminación incorrecta de sustancias peligrosas o combustibles puede causar daños a la salud o daños al medio ambiente.

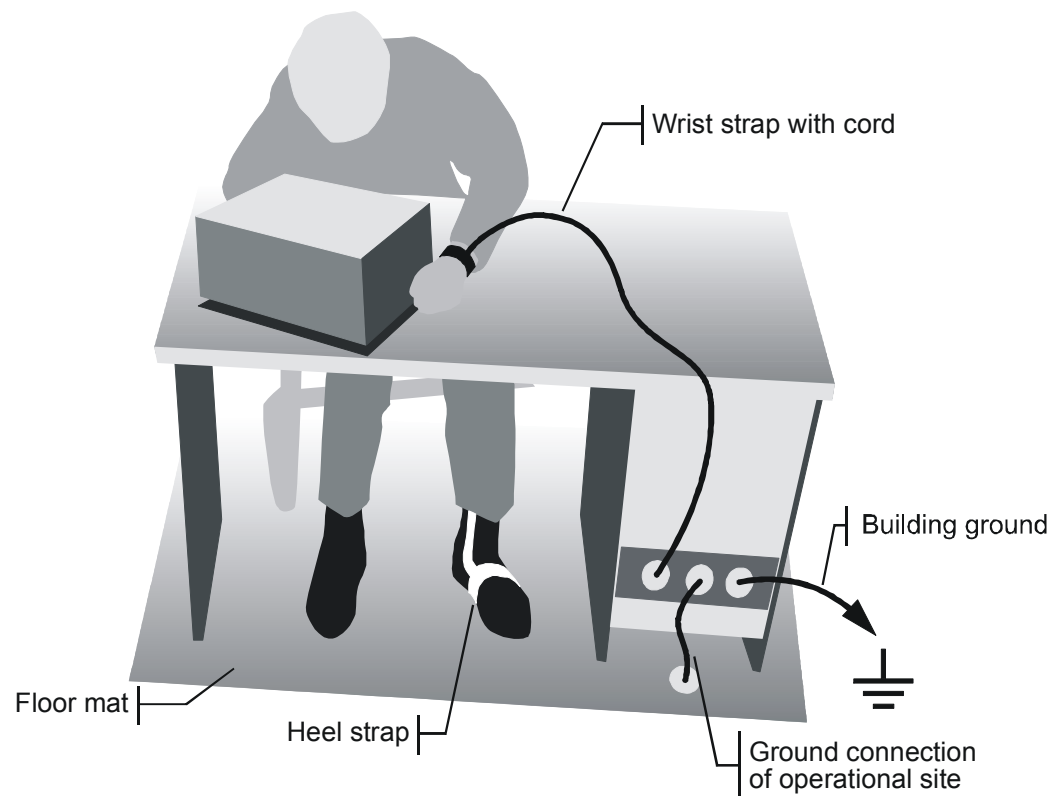
Se puede encontrar más información sobre la protección del medio ambiente en la página web de Rohde & Schwarz.

Instructions for Electrostatic Discharge Protection

NOTICE

Risk of damaging electronic components

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



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

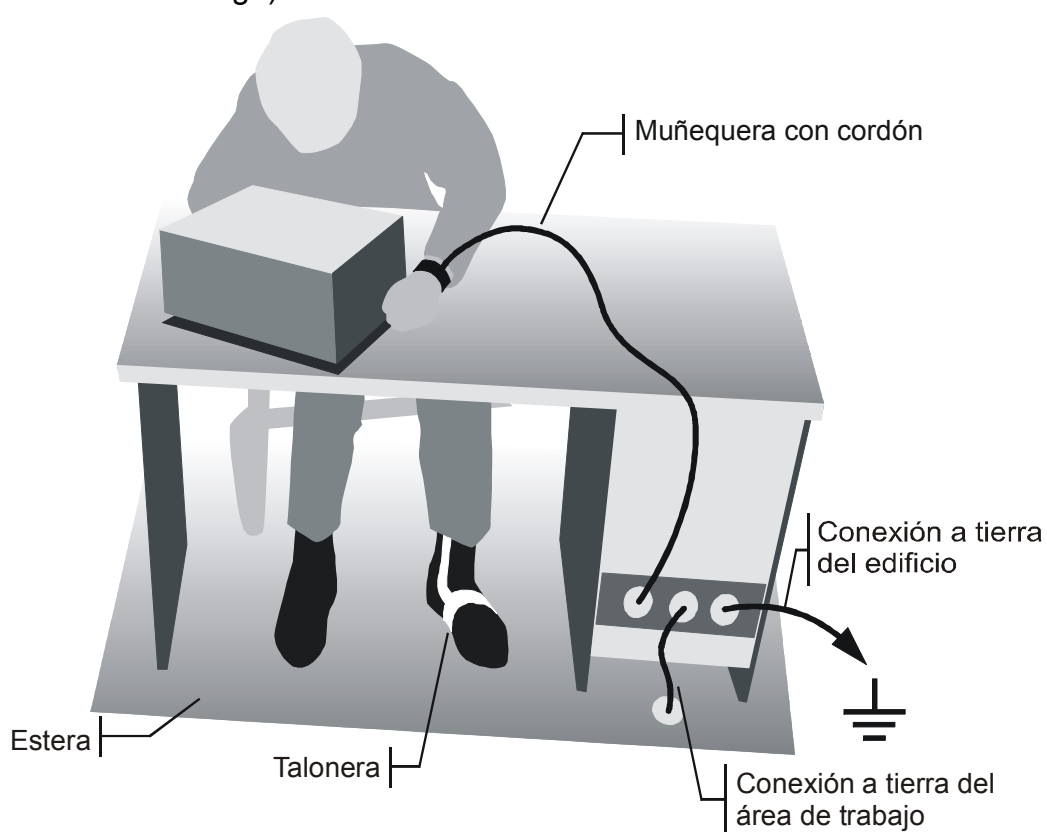
- Wrist strap with cord to ground connection
 - Conductive floor mat and heel strap combination
-

Instrucciones para la protección contra descargas electrostáticas

AVISO

Riesgo de avería de los componentes electrónicos

Para evitar averías en los componentes electrónicos, el área de trabajo tiene que estar protegido contra descargas 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 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.

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Quality management and environmental management

Certified Quality System

ISO 9001

Certified Environmental System

ISO 14001

Sehr geehrter Kunde,

Sie haben sich für den Kauf eines Rohde&Schwarz-Produktes entschieden. Sie erhalten damit ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unserer Qualitäts- und Umweltmanagementsysteme entwickelt, gefertigt und geprüft. Rohde&Schwarz ist unter anderem nach den Managementsystemen ISO 9001 und ISO 14001 zertifiziert.

Der Umwelt verpflichtet

- ▮ Energie-effiziente, RoHS-konforme Produkte
- ▮ Kontinuierliche Weiterentwicklung nachhaltiger Umweltkonzepte
- ▮ ISO 14001-zertifiziertes Umweltmanagementsystem

Dear customer,

You have decided to buy a Rohde&Schwarz product. This product has been manufactured using the most advanced methods. It was developed, manufactured and tested in compliance with our quality management and environmental management systems. Rohde&Schwarz has been certified, for example, according to the ISO 9001 and ISO 14001 management systems.

Environmental commitment

- ▮ Energy-efficient products
- ▮ Continuous improvement in environmental sustainability
- ▮ ISO 14001-certified environmental management system

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 de ce produit ont été effectués selon nos systèmes de management de qualité et de management environnemental. La société Rohde&Schwarz a été homologuée, entre autres, conformément aux systèmes de management ISO 9001 et ISO 14001.

Engagement écologique

- ▮ Produits à efficience énergétique
- ▮ Amélioration continue de la durabilité environnementale
- ▮ Système de management environnemental certifié selon ISO 14001



ROHDE & SCHWARZ

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Preface

This chapter gives an overview of the user documentation and the conventions used in the documentation.

Documentation Overview

For the R&S ETC, the following product manuals are provided:

- Getting started

This manual is delivered with the R&S ETC in printed form and in PDF format on the CD-ROM. It provides the information needed to set up the R&S ETC and start working with it. Also a sample application is described. For instructions on installation, refer to the release notes. The printed getting started manual also includes general information, e.g. the basic safety instructions.

- User manual

This manual is delivered with the R&S ETC in PDF format on CD-ROM. It provides the necessary information to work with the R&S ETC. For additional information on default settings and parameters, refer to the data sheet.

- Remote control

This manual is delivered with the R&S ETC in PDF format on CD-ROM. It describes the operation of the R&S ETC by means of remote control. This option comes by default in the basic device.

Conventions Used in the Documentation

Key names and all names of graphical user interface elements are written in capital letters.

When describing how to operate the R&S ETC, several alternative methods may be available to perform the same task. If possible, the procedure using the front panel is described. The terms "select" and "press" may refer to any of the described methods, i.e. using the keys on the R&S ETC or on a keyboard, or a mouse pointer in the display.

1 Setting Up the Instrument

WARNING

Risk of physical injury

To avoid physical injury to yourself or others, always follow the instructions provided in the following chapters. Furthermore, observe the safety instructions at the beginning of this manual.

1.1 Unpacking the Instrument

The R&S ETC is shipped together with its mandatory accessories in a cardboard box. To unpack its contents, proceed as described in chapter [1.1.2](#).

1.1.1 Inspecting for Shipping Damage

Check the following. If anything is damaged, immediately notify the carrier.

1. Check the shipping container and cushioning material for damage.
2. Unpack the box and check the housing for visible damages or loose parts.

1.1.2 Unpacking the Box

1. Open the cardboard box.
2. Remove the accessories box from the packing.
3. Remove the polyethylene protection pads from the R&S ETC.
4. Take the R&S ETC out of the packaging.
5. Remove the protective foil from the screen.



Retain the original packing material. If the R&S ETC needs to be transported or shipped at a later date, you can use the material to prevent control elements and connectors from being damaged. Rohde & Schwarz will only accept claims of warranty if the R&S ETC is shipped with sufficient packaging.

1.1.3 Checking the Accessories

The R&S ETC comes with the following accessories:

- AC power plug (country-specific)
- USB cable
- Getting started manual
- CD-ROM containing the complete user documentation

1.1.4 Warranty Conditions

For information on warranty conditions for the R&S ETC refer to the terms of the delivery documents.

1.2 Putting Up the Instrument

The R&S ETC compact TV analyzer is designed for interior use only.

NOTICE

Risk of instrument damage

Make sure that the following conditions are met at the operation site:

- The ambient temperature does not exceed the range specified in the data sheet.
- All fan openings are unobstructed and the airflow perforations are unimpeded. The minimum distance from the wall is at least 10 cm.

Failure to meet these conditions may cause damage to the R&S ETC or other devices in the test setup.

If necessary, use proper protective equipment to protect DUTs against electrostatic discharge in the event of human contact.

1.2.1 Placing the Instrument on a Bench Top

The R&S ETC is designed for use under general laboratory conditions.

⚠ WARNING

Risk of injuries

If the R&S ETC is not set up securely, you or others can be injured.

Place the R&S ETC on a stable and level surface. Do not place anything on top of the R&S ETC, if the R&S ETC is not in a level position.

Before folding out the feet at the R&S ETC bottom, read the safety instructions for instruments with fold-out feet at the beginning of this manual carefully.

2 Interfaces and Connectors

This chapter describes the front panel and the rear panel of the R&S ETC, including all status displays and connectors. See the data sheet for information about permissible levels on the inputs and output levels on the outputs.

If you use the interfaces and connectors, take care to avoid electromagnetic interference. For details see chapter [3.1](#).

2.1 Front Panel

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



Fig. 2-1: Front panel view

- | | |
|--|---|
| 1 = Hardkeys (left and right of the display) | 7 = Menu bar (touch operation possible) |
| 2 = USB connector | 8 = Connector for accessories |
| 3 = On/standby key | 9 = RF input |
| 4 = Headphone connector | 10 = Keypad |
| 5 = Tracking generator output | 11 = Rotary knob |
| 6 = Display | 12 = Cursor keys |

2.1.1 On/Standby Key

See (3) in [Fig. 2-1](#).

The on/standby key works only if the AC power switch on the back of the R&S ETC is switched on. The on/standby key switches the R&S ETC from stand-by to on and back.

For further information see chapter [4.1](#).

2.1.2 Hardkeys

See (1) in [Fig. 2-1](#).

For detailed information see the user manual.

Hardkey	Description
PRESET	Sets a defined instrument state.
SAVE/RCL	To store and load measurement results and settings.
SETUP	To perform basic instrument configurations.
HCOPYY	To customize the printout. To select and configure the printer.
MODE	To select between measurement modes.
FREQ	Sets the frequency for the frequency range under consideration.
SPAN	Sets the frequency span to be analyzed.
AMPT	Sets the reference level, the RF attenuation/preselection and the unit for the level display. To select transducer factors.
BW	Sets the resolution bandwidth, video bandwidth and channel bandwidth.
SWEEP	Sets the sweep time and the trigger. To select continuous measurement or single measurement.
MEAS	To perform measurements.
TRACE	To configure the measured data acquisition and the analysis of the measurement data.
LINES	Configures display lines and limit lines.
MKR	Sets the absolute and relative measurement markers (markers and delta markers).
MKR->	Positions the absolute and relative measurement markers (markers and delta markers).

2.1.3 Keypad

See (10) in [Fig. 2-1](#).

The keys on this keypad have a multiple purpose. The required characters are selected by pressing the keys an appropriate number of times.

For detailed information see the user manual, chapter "Operating Concepts".

Key	Description
0 to 9 a to z	To enter numbers and characters in entry fields.
.	To enter a decimal point.
-	To enter a minus sign.
GHz/dBm MHz/dBm kHz Hz	To enter the unit for an entry with dimension and confirm the entry.
CANCEL	Exits the selected parameter value without modification.
BACK	Deletes the character to the left of the cursor.
ENTER	Confirms a dimensionless entry. Editing mode is terminated and the value is applied.

2.1.4 Rotary Knob

See (11) in [Fig. 2-1](#).

- To vary the input value of a numeric entry field. The step size depends on the parameter.
- To move the cursor in the tables and lists.
- To confirm your entry, press on the rotary knob (Click = ENTER). Editing mode is terminated and the value is applied.

2.1.5 Cursor Keys

See (12) in [Fig. 2-1](#).

UPARROW/DNARROW keys:

- In a numeric entry field, increases or decreases the parameter value.
- In a list or table, scrolls vertically to select a parameter.

LEFTARROW/RIGHTARROW keys:

- In editing mode, move the cursor in the input fields forward and back.
- In a list or table, scrolls horizontally to select a parameter.

2.1.6 Display

See (6) in [Fig. 2-1](#).

The lower part of the display is a touch-sensitive. There, the menu bar is displayed.

For information on the graphical user interface see the user manual, chapter "Operating Concepts".

2.1.7 USB Interface

See (2) in [Fig. 2-1](#).

Universal serial bus (USB) interface, type A (host USB 2.0). Used to connect a memory stick to perform a firmware update (for details see release notes).



Use a suitable double-shielded cable to connect the USB interface.

2.1.8 Headphone Connector

See (4) in [Fig. 2-1](#).

A 3.5 mm headphone jack is provided. The internal impedance of the connector is approx. 10 Ω .

2.1.9 GEN OUT

See (5) in [Fig. 2-1](#).

Both models, 2116.5000.04 and 2116.5000.08, have a tracking generator (R&S ETC-K10 option required) and the corresponding output connector.

The nominal output level can be reduced in 1 dB steps.

NOTICE**Risk of instrument damage**

The reverse voltage up to the voltage stated on the R&S ETC housing must not be exceeded.

2.1.10 ACCESSORIES

See (8) in [Fig. 2-1](#).

Specially configured for accessories used for the following activities:

- Supplying power
- Controlling accessories
- Transferring data
- Controlling power sensors (R&S FSH-Z1/Z18/Z14/Z44)

For further information see chapter [3.3.2](#).

2.1.11 RF IN

See (9) in [Fig. 2-1](#).

N female connector used to connect the DUT to the R&S ETC. Make sure not to overload it and follow the instructions in the NOTICE below.

⚠ WARNING**Shock hazard**

Be careful not to cause short-circuits. Never exceed the value for the DC input voltage specified on the housing. Ensure that the R&S ETC is switched off and disconnected from the power supply by removing the plug from the AC power connector before touching the RF input.

NOTICE**Risk of instrument damage**

The RF input is AC-coupled. The DC voltage must never exceed the value specified on the housing since this can damage the R&S ETC. The RF input is protected against static discharges and voltage pulses by limiting circuits.

The maximum permissible continuous power at the RF input is 20 dBm (100 mW). The RF input can be loaded with up to 30 dBm (1 W) for a maximum of three minutes. Loading with 1 W for an extended period of time can damage the R&S ETC.



Use a suitable double-shielded cable to connect RF IN.

2.2 Rear Panel

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



Fig. 2-2: Rear panel view

- 1 = AC power supply connector and switch
- 2 = 1PPS input signal
- 3 = Input for external trigger or external reference frequency
- 4 = TS ASI output
- 5 = Connector for additional accessories
- 6 = USB interface
- 7 = LAN interface

2.2.1 AC Power Supply Connector and Switch

See (1) in [Fig. 2-2](#).

The IEC 320 / EN 60320 AC power supply connector and the AC power switch are combined (type C14). The AC power switch is located below the AC power connector.

Switch positions:

- I: The R&S ETC is in operation.
- O: The R&S ETC is disconnected from the AC power supply entirely.

For further information see chapter [3.2](#) and chapter [4](#)

2.2.2 1PPS IN

See (2) in [Fig. 2-2](#).

Used to connect a 1PPS input signal for use with the GPS receiver (R&S HA-Z240, order no. 1309.6700.02).

2.2.3 REF IN/TRIGGER IN

See (3) in [Fig. 2-2](#).

BNC female connector used for the following inputs:

- External trigger signal to start a measurement. The trigger threshold is similar to that of TTL signals.
- 10 MHz external reference for frequency synchronization. The reference signal level must be > 0 dBm.

Select the input in the SETUP menu (SETUP key, INSTRUMENT SETUP menu).

NOTICE**Risk of instrument damage**

Never apply currents above 600 mA or voltages above 28 V to the BNC socket.



Use a suitable double-shielded cable to connect REF IN/TRIGGER IN.

2.2.4 TS OUT

See (4) in [Fig. 2-2](#).

BNC female connector used to supply the transport stream signal (TS ASI) of the received TV signal.

The TS ASI serial transport stream is available only in the following modes:

- DVB-T/H / DVB-T2 / ISDB-T RECEIVER – MEASUREMENT LIST
- DVB-T/H / DVB-T2 / ISDB-T RECEIVER – CONSTELLATION DIAGRAM and DVB-T/H RECEIVER – TPS INFO.

NOTICE

Risk of instrument damage

Never apply currents above 600 mA or voltages above 20 V to the BNC socket.



Use a suitable double-shielded cable to connect TS OUT.

2.2.5 AUX

See (5) in [Fig. 2-2](#).

Connector for additional accessories, for example the GPS receiver (R&S HA-Z240, order no. 1309.6700.02). Used for the following:

- Controlling accessories
- Supplying accessories with power
- Transferring data

For further information see chapter [3.3.2](#).

2.2.6 USB DEV

See (6) in [Fig. 2-2](#).

Mini universal serial bus (USB) interface, type B (USB 2.0 standard). Used to transfer data between the R&S ETC and a directly connected computer.



For connection, use the USB cable supplied with the R&S ETC.

2.2.7 LAN

See (7) in [Fig. 2-2](#).

Used to transfer data between the R&S ETC and a directly connected computer. For connection, use any LAN cable.

The LAN interface is configured using the SETUP key, INSTRUMENT SETUP menu.

3 Connecting the Instrument

This chapter describes how to connect the R&S ETC to the power supply and external devices.

3.1 Preventing Electromagnetic Interference

Use only suitable and shielded signal/control cables. In particular, cables connected to the following connectors and interfaces can cause EMC problems:

- RF IN, see chapter [2.1.11](#)
- REF IN/TRIGGER IN, see chapter [2.2.3](#)
- TS OUT, see chapter [2.2.4](#)
- USB, see chapter [2.1.7](#) and [2.2.6](#)
- LAN, see chapter [2.2.7](#)

3.2 Connecting to the AC Power Supply

The R&S ETC can be used with different AC power voltages and adapts itself automatically to it. Adjusting the R&S ETC to a particular AC supply voltage is therefore not required. Refer to the datasheet for the requirements of voltage and frequency.

⚠ WARNING**Shock hazard**

Observe the basic safety instructions at the beginning of this manual, especially the instructions on electrical safety.

Take care that the AC voltage lies within the limits printed on the AC power connector of the R&S ETC and listed in the data sheet.

- ▶ Connect the R&S ETC to the AC power supply, using the power cable that is supplied. The AC power connector is located on the rear panel of the R&S ETC (see chapter [2.2.1](#)).

Since the R&S ETC complies with safety class EN61010-1, it should only be connected to a socket with a ground contact.

3.3 Connecting External Devices

The R&S ETC supports a wide range of external devices.

3.3.1 Memory Stick

You can exchange data by using a memory stick which you plug into the USB interface on the front panel, for example to perform a firmware update. For details refer to the release notes.

3.3.2 Accessories

A wide range of accessories are available for the R&S ETC. The R&S ETC supplies and controls the accessories using the ACCESSORIES or AUX connector. If the AUTO ACCESSORY DETECTION setting is activated, the connected accessory is automatically detected.

Setting the Accessory Detection

1. Press the SETUP key.
2. Tap INSTRUMENT SETUP.
The R&S ETC opens a list of general settings.
3. Under HARDWARE, select AUTO ACCESSORY DETECTION.
A submenu opens.
4. Select ON/OFF to activate/deactivate the automatic detection of accessories.



If the connected accessory is detected, the item is displayed in the DETECTED ACCESSORY field under HARDWARE.

3.4 Connecting to a Computer

The powerful R&S ETC View software is available for tasks such as documenting measurement results and creating limit lines and channel tables. The software is supplied with the R&S ETC, but runs on a computer. To use the R&S ETC View software, you need to install the R&S ETC View software on your computer (see software manual) and establish a connection between the R&S ETC and your computer. For details see chapter [6.1](#).



If no connection can be established between the R&S ETC View software and the R&S ETC following successful configuration, check the firewall settings on your computer.

4 Switching On or Off the Instrument

WARNING

Shock hazard

Observe the basic safety instructions at the beginning of this manual, especially the instructions on electrical safety.

4.1 Instrument States

The LEDs on the on/standby key indicate the current state of the R&S ETC (see also chapter 2.1.1). The following states are possible:

- Off

The AC power switch on the back of the R&S ETC is switched off (see chapter 2.2.1).

Both LEDs on the on/standby key are switched off.

- Ready

The R&S ETC is ready for operation.

The green LED (left LED) on the on/standby key is illuminated.

- Standby

The R&S ETC is supplied with the operating voltage, but is not ready for operation.

The yellow LED (right LED) on the on/standby key is illuminated.

WARNING

Shock hazard

In standby mode, the R&S ETC is still power-supplied.

4.2 Switching On the Instrument

NOTICE

Risk of instrument damage

Before switching on the R&S ETC, make sure that the following conditions are met:

- The R&S ETC is set up as described in chapter 1.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are correctly connected and are not overloaded. In particular, do not exceed the maximum permissible reverse power allowed at the RF outputs.

The values are specified in the data sheet. Failure to meet these conditions may cause damage to the R&S ETC or other devices in the test setup.

Switching on the R&S ETC

1. Make sure that the R&S ETC is connected to the AC power supply (see chapter 3.2).
2. Press the AC power switch on the rear panel into I position (see chapter 2.2.1).
3. Press the on/standby key on the front panel.

The R&S ETC starts booting.

After booting is completed, the main screen of the R&S ETC is displayed, and the R&S ETC is ready for operation.

The configuration settings that were active before the R&S ETC was last switched off are automatically restored.

4.3 Switching Off the Instrument

NOTICE

Risk of losing data

If you switch off the running R&S ETC using the rear panel switch or by disconnecting the power cord before shutting it down, the R&S ETC loses its current settings. Furthermore, program data may be lost.

Always shut down the R&S ETC first.

Switching Off the R&S ETC

1. Press the on/standby key on the front panel.

The R&S ETC saves the current settings to the internal memory and shuts down the operating system. During this process, a message may be displayed.

The power supply is switched over to standby and the yellow LED on the on/standby key is illuminated.

2. If you want to completely disconnect the R&S ETC from the AC power line, set the AC switch on the rear panel to the O position, or disconnect the R&S ETC from the AC power supply.

All LEDs on the on/standby key should go out.

⚠ WARNING

Danger of shock hazard

In standby mode, there is still AC supply voltage present in the R&S ETC.

4.4 Checking the Provided Options

The R&S ETC may be equipped with options. In order to check whether the installed options correspond to the options indicated on the delivery note, proceed as follows.

1. Press the SETUP key.
2. Tap INSTALLED OPTIONS.

The R&S ETC displays all available options with the appropriate status.

If an option is installed, the installation status differs for permanent or temporary installed options.

4.5 Turn-On Tests



Perform functional tests only in operating temperature. See data sheet for the required warm-up time.

The self alignment in network analyzer mode is described in the user manual, chapter "Basic Instrument Configurations".

Checking the Date of the Last Self Alignment

1. Press the SETUP key.
2. Tap INSTRUMENT SETUP.
3. Select SELF ALIGNMENT DATE.

5 Sample Application

Follow the instructions in this chapter to perform your first measurement with the R&S ETC. For an expanded selection of measurement examples and background information refer to the user manual.

Test Setup

- ▶ Using an RF cable, connect the RF output of the TV signal generator to the RF input of the R&S ETC.

As a TV signal generator, you can use e.g. an R&S SFU/SFE/SFE100.

Performing the Measurement

1. Configure the TV signal generator as follows:
 - Frequency: 674 MHz
 - RF level: -20 dBm
 - TV standard: DVB-T/H
 - Bandwidth: 8 MHz
 - DVB-T/H parameter: 8K FFT, GI = 1/8, CR = 3/4
2. Power on R&S ETC.
3. Press the MODE key and tap TV ANALYZER.
4. In the MEAS MODE menu, select the following:
 - Under TV STANDARD, select DVB-T/H.
 - Under MEASUREMENT MODE, select MEASUREMENT LIST.
5. Press the PRESET key.
6. Set the frequency:
 - Press the FREQ key.
 - In the RF field, enter *674 MHz* and press ENTER.
7. Press the BW key and tap CH BW 8 MHZ.
8. At the TV signal generator, turn on the RF output.

Once the R&S ETC locks to the signal, the measurement list view will be updated with the measurement on the TV signal.

9. Verify the following:

- The demodulator and FEC decoder are LOCKED (green).
- The DVB-T/H parameters are correctly displayed as shown below.

DVB-T/H		Meas List		<No Profile>		24/02/12		09:03		
	RF			674 MHz						
	Band			---						
	Channel Table			---						
	Gain Control / RF Attenuation			Auto Low Distortion / 40 dB						
	OFDM Bw / Channel Bw			7.6071429 MHz / 8 MHz						
Measurement Parameter					Result					
Power					-20.83 dBm					
Crest Factor					12.26 dB					
Demodulator					locked					
Sideband Position					normal					
Transmission Parameter Signaling					8K		1/8		QAM64 NH	
Carrier Frequency Offset					175.4 Hz					
Symbol Rate Offset					0.3 ppm					
Modulation Error Ratio					rms	26.9	dB	peak	14.7	dB
Error Vector Magnitude					rms	2.97	%	peak	12.02	%
FEC Decoder					locked					
BER before Viterbi / Reed Solomon					9.8E-07				0.0E-10	
Packet Error Ratio					0.0E-07					
Packet Errors					0 /s					
MPEG TS Bitrate					24.882359 Mbit/s					
Meas Mode	Meas Profile	RF Att / Gain Ctrl	Demod Settings	BER Reset	TPS Info					

6 Operating the Instrument in a LAN

The R&S ETC is equipped with a network interface and can be connected to an Ethernet LAN (local area network). The network card operates with 100 Mbit Ethernet IEEE 802.3u. The TCP/IP network protocol and the associated network services are preconfigured.

To be able to exchange data within a local area network (LAN), every computer or instrument that is connected must have a unique IP address or a unique computer name.

You can use the interface e.g. for the following:

- Transferring data
- Printing on network printers
- Controlling the R&S ETC from a remote computer (see the remote control manual)
- Using the R&S ETC View software (see the software manual)

6.1 Connecting the Instrument to the Network

NOTICE

Risk of network failure/virus infection

Before connecting the R&S ETC to the network or configuring the network, do the following:

- Consult your network administrator.
- If your network does not support DHCP or if you choose to disable dynamic TCP/IP configuration, you must assign valid address information before connecting the R&S ETC to the LAN.

Errors may affect the entire network.

Efficient virus protection is a prerequisite for secure operation in the network.

Never connect the R&S ETC to a network without proper protection against a virus infection, as doing so may cause damage to the R&S ETC software.

Setting up the connection does not cause any problems on the network. Likewise, disconnecting the R&S ETC from the network does not cause any problems as long as no data traffic to and from the R&S ETC is in progress.

Establishing a Connection to a Computer of the Network

The procedure depends on whether your network uses a DHCP server or not.

1. Configure the network card depending on your network configuration. Make sure to meet all conditions that are listed in chapter [6.2.1](#).
 - In a network with a DHCP server, look up the assigned IP address and subnet mask of the R&S ETC as described in chapter [6.3.1](#), and configure the computer accordingly.
 - In a network without a DHCP server, configure the R&S ETC and the computer accordingly (see chapter [6.3.2](#)).
2. Establish the connection as described in the chapter [6.2.1](#), "Establishing the Connection".

6.2 Establishing a Point-to-Point Connection

You can establish a direct connection between the R&S ETC and your computer using the LAN or the USB interface.

6.2.1 Using the LAN Interface

Before establishing a connection, you need to make sure that the R&S ETC and computer configurations meet the following conditions:

- The computer and R&S ETC subnet masks are identical.
- The first three number blocks of the computer and R&S ETC IP address are identical. The last number block of the computer IP address differs from the last number block of the R&S ETC IP address.

For example, if the R&S ETC uses **172.29.26.63** as IP address, the computer could have the following IP address: **172.29.26.1**.

- The R&S ETC View software is installed on the computer.

Configuring the R&S ETC

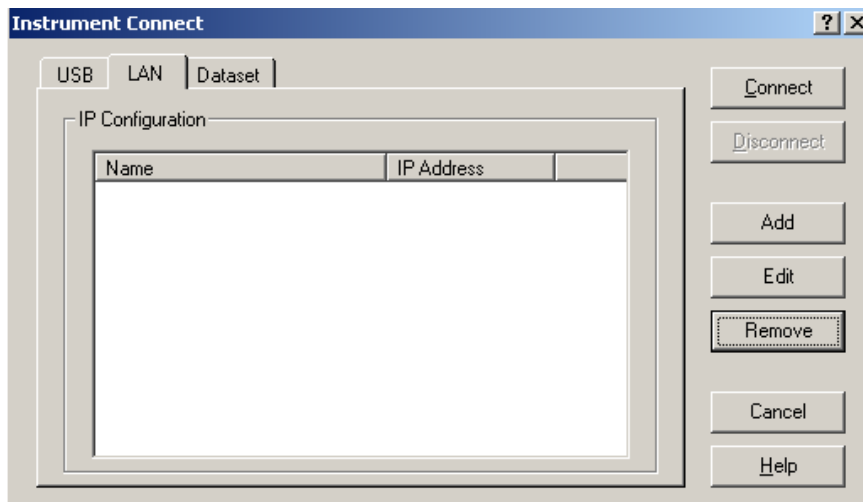
- ▶ Configure the network card as described in chapter [6.3.2](#).

Configuring the Computer

- ▶ Assign an IP address and a subnet mask that meet the conditions above.

Establishing the Connection

1. Make sure that the R&S ETC and the computer are switched on.
2. Connect the R&S ETC directly to the computer with the supplied LAN cable. For details on the LAN interface see chapter [2.2.7](#).
3. On the computer, start the R&S ETC View software.
4. In the "Instrument Connect" dialog, select the "LAN" tab.



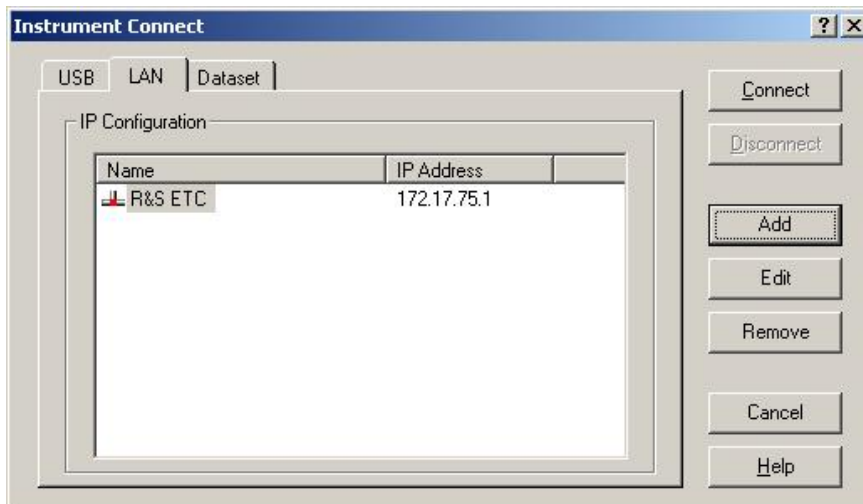
5. Click "Add" to create a new network connection.
6. In the "Name" field, enter the name for the new network connection, e.g. R&S ETC.



7. In the "IP Address" field, enter the IP address set for the R&S ETC, e.g. 172.17.75.1.

8. Click OK.

The connection is displayed in the "Instrument Connect" dialog.



9. Select the new connection named "R&S ETC".

10. Click "Connect" to establish a connection to the R&S ETC.

6.2.2 Using the USB Interface

Before establishing a connection, you need to make sure that the R&S ETC and computer configurations meet the following conditions:

- The computer and R&S ETC subnet masks are identical.

For the USB connection, the R&S ETC uses a fixed IP address: **172.16.10.10**. The subnet mask is 255.255.0.0.

- The last two number blocks of the computer IP address differ from the last two number blocks of the R&S ETC IP address.

For example, with the first two number blocks fixed, the computer could have the following IP address: **172.16.66.5**.

- The R&S ETC View software is installed on the computer.

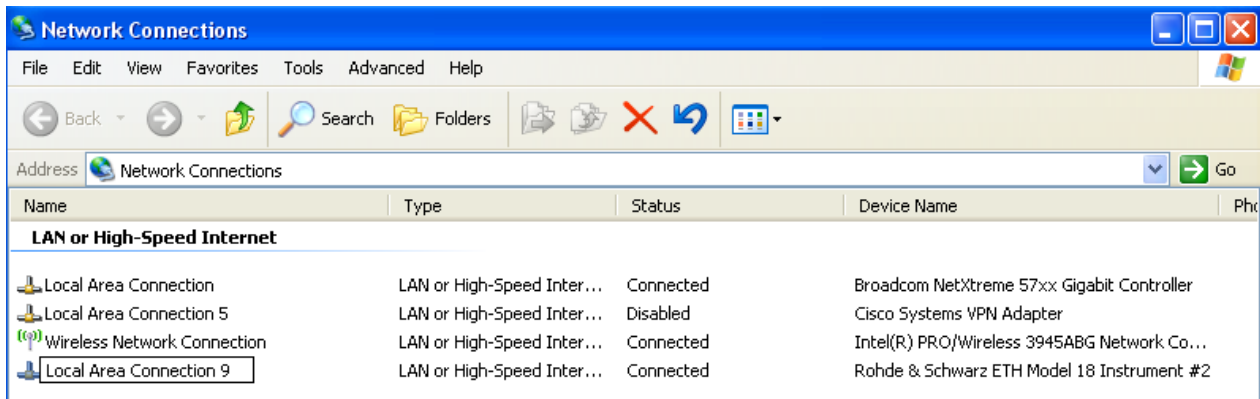
Configuring the Computer

- ▶ Assign an IP address and a subnet mask that meet the conditions above.

Establishing the Connection

1. Make sure that the R&S ETC and the computer are switched on.
2. Connect the R&S ETC directly to the computer with the supplied USB cable. For details on the USB see chapter 2.2.6.

In the "Network Connections" window of the computer, a new LAN connection is displayed with the R&S ETC device name.



If connected for the first time, the wizard for finding new hardware appears on the computer screen.

3. If the wizard is displayed, the software for the new hardware must be installed:
 - Select to install the software automatically and confirm with "Next".
 - After a few seconds, the wizard indicates that the software for the new hardware has been installed.
 - Complete the installation with "Finish".
4. On the computer, start the R&S ETC View software.
5. In the "Instrument Connect" dialog, select the "USB" tab.

The USB connection is preconfigured and cannot be modified. The USB connection is established using a predefined IP address.
6. Select the R&S ETC connection.
7. Click "Connect" to establish the connection to the R&S ETC.

6.3 Configuring the Network Card

Under Windows CE 5.0, network card drivers do not need to be installed separately. If the R&S ETC is connected to the LAN, Windows CE 5.0 automatically detects the network connection and activates the required drivers.

The configuration tasks depend on whether your network has a DHCP server or not. If necessary, ask your network administrator.

6.3.1 Networks with DHCP Server

In networks using the dynamic host configuration protocol (DHCP), the R&S ETC is automatically assigned a free IP address when connected to the network.

Activating DHCP

For this purpose, DHCP must be activated on the R&S ETC. By default, DHCP is activated. If the setting has been altered, proceed as follows.

1. Press the SETUP key.
2. Tap INSTRUMENT SETUP.

The R&S ETC opens a list of general settings.

3. Under LAN PORT, select DHCP MODE.

A selection list opens.

LAN Port	
MAC Address	00-90-b8-18-81-aa
DHCP	Off
IP Address	Off
Subnet Mask	On

4. Select ON.

DHCP is activated on the R&S ETC, and the DHCP server can allocate an IP address and a subnet mask to the R&S ETC. This process can take several seconds.

Under the LAN PORT, the assigned values are displayed in the IP ADDRESS and SUBNET MASK fields.

6.3.2 Networks without DHCP Server

In a network without a DHCP server, assign a fixed IP address and subnet mask to the R&S ETC.



Contact your network administrator to obtain a free IP address.

Changing the IP Address and Configuring the Network Protocols

1. Press the SETUP key.
2. Tap INSTRUMENT SETUP.

The R&S ETC opens a list of general settings.

LAN Port	
MAC Address	00-90-b8-18-aa-f6
DHCP	Off
IP Address	172.29.26.63
Subnet Mask	255.255.255.0
Gateway	172.0.0.1

3. Deactivate DHCP:
 - a. Under LAN PORT, select DHCP MODE.
 - b. Select OFF.
4. Set the IP address:
 - a. Under LAN PORT, select IP ADDRESS.
 - b. Enter the IP address (e.g. 172.29.26.63).
5. Set the subnet mask:
 - a. Under LAN PORT, select SUBNET MASK.
 - b. Enter the subnet mask (e.g. 255.255.255.0).
6. For LAN connections with firewall, set a default gateway address:
 - a. Under LAN PORT, select GATEWAY.
 - b. Enter the gateway (e.g. 172.0.0.1).

7 Installed Software

The firmware and the operating system are already installed on the R&S ETC.

For further information:

- Performing a firmware update: see the release notes.
- Installing software options: see the user manual.

7.1 Operating System

The R&S ETC is equipped with the Windows CE 5.0 operating system.

When the R&S ETC is delivered, the operating system is configured for optimum operation. Changes to the system settings are required only if you configure the network and the settings do not conform to the default settings.

NOTICE**Risk of causing instrument unusability**

To prevent malfunctions and to avoid instrument repair, only install service packs approved by Rohde & Schwarz.

7.2 Additional Software

NOTICE**Risk of causing instrument unusability**

The R&S ETC is equipped with the Windows CE 5.0 operating system. The use and installation of additional software may impair instrument function. Thus, run only programs that Rohde & Schwarz has tested for compatibility with the R&S ETC software.

The programs used on the R&S ETC under Windows CE 5.0 have been adapted to the R&S ETC. Existing R&S ETC software must always be modified using only update software released by Rohde & Schwarz.

8 Maintenance

The R&S ETC does not need a periodic maintenance unless it is operated in dusty areas.

NOTICE**Risk of instrument damage**

If the R&S ETC is operated in dusty areas, the fans may become obstructed by dust or other particles in the process of time. Make sure to check and, if necessary, clean the fans regularly to ensure they operate properly at all times. If the R&S ETC is run with obstructed fans for a longer period, it may become overheated which may cause damage.

Clean the outside of the instrument when necessary and check the rated data from time to time.

If any problem arises, contact one of our customer support centers. The addresses of our customer support centers are provided at the beginning of this manual.

8.1 Cleaning the Instrument

The outside of the R&S ETC is suitably cleaned using a soft, lint-free dust cloth. Make sure that vents are not obstructed.

⚠ WARNING**Danger of shock hazard**

Before cleaning the R&S ETC, ensure that the R&S ETC is switched off and disconnected from all power supplies.

NOTICE**Instrument damage caused by cleaning agents**

Cleaning agents contain substances that may damage the R&S ETC, e.g. solvent-containing cleaning agents may damage the front panel labeling or plastic parts.

Never use cleaning agents such as solvents (thinners, acetone, etc), acids, bases, or other substances.

8.2 Storing the Instrument

The storage temperature range of the R&S ETC is given in the data sheet. If the R&S ETC is to be stored for a longer period of time, it must be protected against dust.

Repack the R&S ETC as it was originally packed when transporting or shipping. The two protective foam plastic parts prevent the control elements and connectors from being damaged. The antistatic packing foil avoids any undesired electrostatic charging to occur.

If you do not use the original packaging, provide for sufficient padding to prevent the R&S ETC from slipping inside the package. Wrap antistatic packing foil around the R&S ETC to protect it from electrostatic charging.

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