

# R&S® ZNB

## Vector Network Analyzers

### Getting Started



1316.0062.02 – 07

This manual describes the following vector network analyzer types:

- R&S® ZNB4, order no. 1311.6010.22 (2 test ports)
- R&S® ZNB4, order no. 1311.6010.24 (4 test ports)
- R&S® ZNB8, order no. 1311.6010.42 (2 test ports)
- R&S® ZNB8, order no. 1311.6010.44 (4 test ports)

The firmware of the instrument makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgement" 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 guide: R&S® ZNBxx is abbreviated as R&S ZNBxx, R&S® ZNB-xxx as R&S ZNB-xxx

# 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 attached 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 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.

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

## Symbols and safety labels

							
Notice, general danger location Observe product documentation	Caution when handling heavy equipment	Danger of electric shock	Warning! Hot surface	PE terminal	Ground	Ground terminal	Be careful when handling electrostatic sensitive devices

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

### Tags 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 the possibility of incorrect operation which can result in damage to the product.

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 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, pollution severity 2, overvoltage category 2, 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.
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 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 death.

### Electrical safety

*If the information on electrical safety is not observed either at all 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 an earthing contact and protective earth connection.
3. 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.
4. If the product does not have a power switch for disconnection from the AC supply network, the plug of the connecting cable is regarded as the disconnecting device. In such cases, always ensure 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 network. If products without power switches are integrated into racks or systems, a disconnecting device must be provided at the system level.
5. 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, you can ensure that the cable will not 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 fused 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. 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, fusing, 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 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 licensed electrician.
13. 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 anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.

## Basic Safety Instructions

14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.
15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.
16. Unless specified otherwise, products are not liquid-proof (see also section "Operating states and operating positions", item 1. Therefore, the equipment must be protected against penetration by liquids. If the necessary precautions are not taken, the user may suffer electric shock or the product itself may be damaged, which can also lead to personal injury.
17. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product has been moved from a cold to a warm environment. Penetration by water increases the risk of electric shock.
18. Prior to cleaning the product, disconnect it completely from the power supply (e.g. AC supply network or battery). Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluents for cellulose lacquers.

### Operation

1. Operating the products requires special training and intense concentration. Make sure that persons who use the products are physically, mentally and emotionally fit enough to do so; otherwise, injuries or material damage may occur. It is the responsibility of the employer/operator to select suitable personnel for operating the products.
2. Before you move or transport the product, read and observe the section titled "Transport".
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.
4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal", item 1.
5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.
6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.
7. 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).

### 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, PE conductor test, insulation resistance measurement, leakage current measurement, functional test). This helps ensure the continued safety of the product.

### Batteries and rechargeable batteries/cells

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

1. Cells must not be taken apart or crushed.
2. Cells or batteries must not be exposed to heat or fire. Storage in direct sunlight must be avoided. Keep cells and batteries clean and dry. Clean soiled connectors using a dry, clean cloth.
3. Cells or batteries must not be short-circuited. Cells or batteries must not be stored in a box or in a drawer where they can short-circuit each other, or where they can be short-circuited by other conductive materials. Cells and batteries must not be removed from their original packaging until they are ready to be used.
4. Keep cells and batteries out of the hands of children. If a cell or a battery has been swallowed, seek medical aid immediately.
5. Cells and batteries must not be exposed to any mechanical shocks that are stronger than permitted.
6. 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.
7. 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.
8. Cells and batteries must be recycled and kept separate from residual waste. Rechargeable batteries and normal batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.

### Transport

1. The product may be very heavy. Therefore, the product must be handled with care. In some cases, the user may require a suitable means of lifting or moving the product (e.g. with a lift-truck) to avoid back or other physical injuries.

2. Handles on the products are designed exclusively to enable personnel to transport the product. It is therefore not permissible to use handles to fasten the product to or on transport equipment such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport or lifting. Observe the safety regulations of the manufacturer of the means of transport or lifting. Noncompliance can result in personal injury or material damage.
3. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely and properly. The manufacturer assumes no responsibility for accidents or collisions. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident.

### **Waste disposal**

1. 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.
2. 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.

## 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. 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 adjunto 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.









## Informaciones elementales de seguridad

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

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

### Símbolos y definiciones de seguridad

							
Aviso: punto de peligro general  Observar la documentación del producto	Atención en el manejo de dispositivos de peso elevado	Peligro de choque eléctrico	Advertencia: superficie caliente	Conexión a conductor de protección	Conexión a tierra	Conexión a masa	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)

					
Tensión de alimentación de PUESTA EN MARCHA / PARADA	Indicación de estado de espera (Standby)	Corriente continua (DC)	Corriente alterna (AC)	Corriente continua / Corriente alterna (DC/AC)	El aparato está protegido en su totalidad por un aislamiento doble (reforzado)

## Palabras de señal y su significado

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



PELIGRO identifica un peligro inminente con riesgo elevado que provocará muerte o lesiones graves si no se evita.



ADVERTENCIA identifica un posible peligro con riesgo medio de provocar muerte o lesiones (graves) si no se evita.



ATENCIÓN identifica un peligro con riesgo reducido de provocar lesiones leves o moderadas si no se evita.



AVISO indica la posibilidad de utilizar mal el producto y, como 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 del producto y solamente en combinación con el producto correspondiente. La utilización de las palabras de señal en combinación con productos o documentaciones que no les correspondan puede llevar a interpretaciones equivocadas y tener por consecuencia daños en personas u objetos.

## Estados operativos y posiciones de funcionamiento

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

1. Si no se convino de otra manera, es para los productos Rohde & Schwarz válido lo que sigue: como posición de funcionamiento se define por principio la posición con el suelo de la caja para abajo, modo de protección IP 2X, grado de suciedad 2, categoría de sobrecarga eléctrica 2, 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.
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, pueden causarse lesiones o incluso la muerte.
3. No ponga el producto sobre aparatos que generen calor (p. ej. radiadores o calefactores). La temperatura ambiente no debe superar la temperatura máxima especificada en la documentación del producto o en la hoja de datos. En caso de sobrecalentamiento del producto, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

## Seguridad eléctrica

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

1. Antes de la puesta en marcha del producto se deberá comprobar siempre que la tensión preseleccionada en el producto coincida con la de la red de alimentación eléctrica. Si es necesario modificar el ajuste de tensión, también se deberán cambiar en caso dado los fusibles correspondientes del producto.
2. Los productos de la clase de protección I con alimentación móvil y enchufe individual solamente podrán enchufarse a tomas de corriente con contacto de seguridad y con conductor de protección conectado.
3. Queda prohibida la interrupción intencionada del conductor de protección, tanto en la toma de corriente como en el mismo producto. La interrupción puede tener como consecuencia el riesgo de que el producto sea fuente de choques eléctricos. Si se utilizan cables alargadores o regletas de enchufe, deberá garantizarse la realización de un examen regular de los mismos en cuanto a su estado técnico de seguridad.
4. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de conexión como interruptor. En estos casos se deberá asegurar que el enchufe siempre sea de fácil acceso (de acuerdo con la longitud del cable de conexión, 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 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.).
10. Para la conexión con dispositivos informáticos como un PC o un ordenador industrial, debe comprobarse que éstos cumplan los estándares IEC60950-1/EN60950-1 o IEC61010-1/EN 61010-1 válidos en cada caso.
11. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar lesiones, fuego o daños en el producto.

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

## **Funcionamiento**

1. El uso del producto requiere instrucciones especiales y una alta concentración durante el manejo. Debe asegurarse que las personas que manejen el producto estén a la altura de los requerimientos necesarios en cuanto a aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario u operador es responsable de seleccionar el personal usuario apto para el manejo del producto.
2. Antes de desplazar o transportar el producto, lea y tenga en cuenta el capítulo "Transporte".
3. Como con todo producto de fabricación industrial no puede quedar excluida en general la posibilidad de que se produzcan alergias provocadas por algunos materiales empleados, los llamados alérgenos (p. ej. el níquel). Si durante el manejo de productos Rohde & Schwarz se producen reacciones alérgicas, como p. ej. irritaciones cutáneas, estornudos continuos, enrojecimiento de la conjuntiva o dificultades respiratorias, debe avisarse inmediatamente a un médico para investigar las causas y evitar cualquier molestia o daño a la salud.
4. Antes de la manipulación mecánica y/o térmica o el desmontaje del producto, debe tenerse en cuenta imprescindiblemente el capítulo "Eliminación", 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.
7. 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).

### **Reparación y mantenimiento**

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

### **Baterías y acumuladores o celdas**

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

1. No deben desmontarse, abrirse ni triturarse las celdas.
2. Las celdas o baterías no deben someterse a calor ni fuego. Debe evitarse el almacenamiento a la luz directa del sol. Las celdas y baterías deben mantenerse limpias y secas. Limpiar las conexiones sucias con un paño seco y limpio.
3. Las celdas o baterías no deben cortocircuitarse. Es peligroso almacenar las celdas o baterías en estuches o cajones en cuyo interior puedan cortocircuitarse por contacto recíproco o por contacto con otros materiales conductores. No deben extraerse las celdas o baterías de sus embalajes originales hasta el momento en que vayan a utilizarse.
4. Mantener baterías y celdas fuera del alcance de los niños. En caso de ingestión de una celda o batería, avisar inmediatamente a un médico.
5. Las celdas o baterías no deben someterse a impactos mecánicos fuertes indebidos.

## Informaciones elementales de seguridad

6. 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.
7. 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).
8. Las baterías y celdas deben reciclarse y no deben tirarse a la basura doméstica. Las baterías o acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de eliminación y reciclaje.

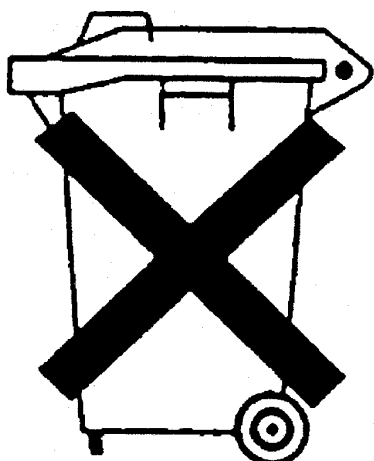
### Transporte

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

### Eliminación

1. 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.
2. 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.

## Safety Instructions



### Kundeninformation zum Batteriegesetz (BattG)

Dieses Gerät enthält eine Batterie bzw. Akkumulator. Diese dürfen nicht mit dem Hausmüll entsorgt werden.

Nach Ende der Lebensdauer darf die Entsorgung nur über eine geeignete Sammelstelle oder eine Rohde & Schwarz-Kundendienststelle erfolgen.

Beachten Sie unbedingt die Hinweise zu Batterien und Akkumulatoren in den grundlegenden Sicherheitshinweisen.

### Safety Regulations for Batteries (according to BattG)

This equipment houses a battery or rechargeable battery that may not be disposed of as normal household waste.

After its useful life, the battery or rechargeable battery may only be disposed of at a suitable depot or at a Rohde & Schwarz customer service center.

Always follow the instructions on batteries and rechargeable batteries in the basic safety instructions.

### Información para el cliente relativa a la Ley de Baterías (BattG)

Este equipo contiene una batería o acumulador, que no se deben desechar en los contenedores de basura domésticos.

Después de la vida útil, la batería solo se podrá eliminar en un depósito apropiado o en un centro de atención al cliente de Rohde & Schwarz.

Le rogamos que respete escrupulosamente las indicaciones referidas a baterías, acumuladores contenidas en las instrucciones de seguridad elementales.

### Consignes de sécurité pour batteries (selon la loi BattG)

Cet appareil contient des batteries (piles, batteries et accumulateurs) qui ne doivent pas être jetées dans une poubelle pour ordures ménagères.

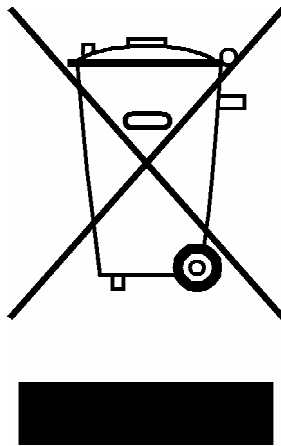
Une fois usagées, elles doivent être éliminées dans un centre de collecte agréé ou un centre de service clients de Rohde & Schwarz.

Veillez à respecter scrupuleusement les consignes de sécurité fondamentales concernant les piles, batteries et accumulateurs.

# 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.





# Qualitätszertifikat

## Certificate of quality

## Certificat de qualité

Certified Quality System  
**ISO 9001**

Certified Environmental System  
**ISO 14001**

### **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 Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde&Schwarz-Qualitätsmanagementsystem ist u.a. nach ISO9001 und ISO14001 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. 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 standards such as ISO9001 and ISO14001.

### **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 respectent nos normes de gestion qualité. Le système de gestion qualité de Rohde&Schwarz a été homologué, entre autres, conformément aux normes ISO9001 et ISO14001.

### **Engagement écologique**

- ▮ Produits à efficience énergétique
- ▮ Amélioration continue de la durabilité environnementale
- ▮ Système de gestion de l'environnement certifié selon ISO 14001



Certificate No.: 2011-50

This is to certify that:

Equipment type	Stock No.	Designation
ZNB4	1311.6010.22/24	VECT.NETW.ANALYZER 2/4 PORT
ZNB8	1311.6010.42/44	VECT.NETW.ANALYZER 2/4 PORT

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 61326-1: 2006  
EN 61326-2-1: 2006  
EN 55011: 2007 + A2: 2007, class A  
EN 61000-3-2: 2006 + A1:2009 + A2:2009  
EN 61000-3-3: 2008

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

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

Munich, 2011-11-08

Central Quality Management GF-QP / Chadzelek

1311.6010.42

CE

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# 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.

### Europe, Africa, Middle East

Phone +49 89 4129 12345  
[customersupport@rohde-schwarz.com](mailto:customersupport@rohde-schwarz.com)

### North America

Phone 1-888-TEST-RSA (1-888-837-8772)  
[customer.support@rsa.rohde-schwarz.com](mailto:customer.support@rsa.rohde-schwarz.com)

### Latin America

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# 1 Documentation Map

The R&S ZNB documentation is delivered as a printed Getting Started guide and a documentation CD-ROM providing the complete user documentation. In addition, a help system is embedded in the instrument.

## 1.1 Getting Started Guide

The Getting Started guide describes everything that is needed to put the instrument into operation and helps you to get familiar with the R&S ZNB. It gives an introduction to the instrument's operating concept and provides simple measurement examples. A printed Getting Started guide is delivered with each R&S ZNB.

## 1.2 User Manual

The User Manual complements the Getting Started guide, providing a detailed description of the instrument's capabilities, examples and reference information for manual and remote control. The User Manual is available on the documentation CD-ROM; the most recent version is available for download on the R&S ZNB product pages on the R&S internet.

## 1.3 Help System

The help system is embedded in the instrument, offering quick, context-sensitive reference to the information needed for operation and programming. It comprises the complete information of the Getting Started guide and the User Manual.

You can use the help also if you control the instrument from an external monitor. Furthermore you can transfer the help to your PC and use it as a standalone help.

## 1.4 Documentation CD-ROM

The CD-ROM contains the complete user documentation for the R&S ZNB:

- the help system
- the quick start guide in printable form
- the user manual in printable form
- brochures and data sheets in printable form
- the service manual in printable form
- links to different useful sites in the R&S internet



## 2 Putting the Analyzer into Operation

This section describes the basic steps to be taken when setting up the analyzer for the first time.

Simple measurement examples are reported in [chapter 4, "Performing Measurements"](#), on page 24; for a description of the operating concept refer to [chapter 5, "Operating the Instrument"](#), on page 33. For all background and reference information concerning manual and remote control of the instrument refer to your analyzer's help system or user manual. A more detailed description of the hardware connectors and interfaces is also part of the help system or user manual.

---

### **WARNING**

#### **Risk of injury and instrument damage**

The instrument must be used in an appropriate manner to prevent electric shock, fire, personal injury, or damage.

- Do not open the instrument casing.
- Read and observe the "Basic Safety Instructions" at the beginning of this manual or on the documentation CD-ROM, in addition to the safety instructions in the following sections. Notice that the data sheet may specify additional operating conditions.

---

### **NOTICE**

#### **Risk of instrument damage during operation**

An unsuitable operating site or test setup can cause damage to the instrument and to connected devices. Ensure the following operating conditions before you switch on the instrument:

- All fan openings are unobstructed and the airflow perforations are unimpeded. The minimum distance from the wall is 10 cm.
- The instrument is dry and shows no sign of condensation.
- The instrument is positioned as described in the following sections.
- The ambient temperature does not exceed the range specified in the data sheet.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are correctly connected and are not overloaded.

---

## 2.1 Unpacking and Checking the Instrument

Check the equipment for completeness using the delivery note and the accessory lists for the various items. Should you notice any damage, immediately contact the carrier who delivered the instrument.

**Packing material**

Retain the original packing material. If the instrument needs to be transported or shipped at a later date, you can use the material to protect the control elements and connectors.

**NOTICE****Risk of instrument damage during transportation and shipment**

Insufficient protection against mechanical and electrostatic effects during transportation and shipment can damage the instrument.

- Always make sure that sufficient mechanical and electrostatic protection is provided.
- When shipping an instrument, the original packaging should be used. If this is not available, allow for sufficient padding to prevent the instrument from moving around inside the box. Pack the instrument in antistatic wrap to protect it from electrostatic charging.
- Secure the instrument to prevent any movement and other mechanical effects during transportation.

The **carrying handles** at the front are designed to lift or carry the instrument. Do not apply an excessive external force to the handles.

## 2.2 Positioning the Instrument

The network analyzer is designed for use under laboratory conditions, either on a bench top or in a rack. Notice the general ambient conditions at the operating site described under "[Risk of instrument damage during operation](#)" on page 8.

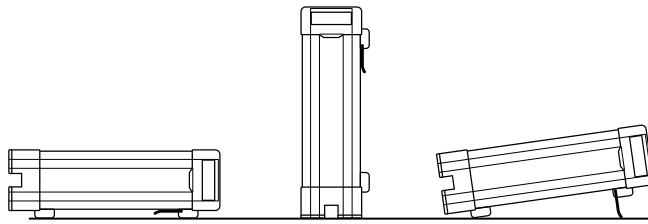
**NOTICE****Risk of electrostatic discharge**

Electrostatic discharge (ESD) can cause damage to the electronic components of the DUT and the analyzer. ESD is most likely to occur when you connect or disconnect a device under test (DUT) or test fixture to the analyzer's test ports.

To prevent ESD, use a wrist strap and cord and connect yourself to the ground connector on the rear panel of the R&S ZNB. For additional information refer to the "Instructions for Electrostatic Discharge Protection" on the R&S ZNB documentation CD-ROM.

## 2.3 Bench Top Operation

If the analyzer is operated on a bench top, the surface should be flat. The instrument can be used in horizontal or vertical position, standing on its feet, or with the support feet on the bottom expanded.



## 2.4 Operation in a 19" Rack

The R&S ZNB can be mounted in 19" racks using the adapter R&S ZZA-KN5 (order number 1175.3040.00). Proceed according to the mounting instructions supplied with the rack adapter.

### NOTICE

#### Risk of instrument damage in a rack

An insufficient airflow can cause the instrument to overheat, which may disturb the operation and even cause damage.

Make sure that all fan openings are unobstructed, that the airflow perforations are unimpeded, and that the minimum distance from the wall is 10 cm.

## 2.5 EMI Suppression

To suppress generated electromagnetic interference (EMI), operate the instrument only while it is closed, with all shielding covers fitted. Note the EMC classification in the data sheet.

Use appropriate shielded cables to ensure successful control of electromagnetic radiation during operation, especially for the following connector types:

- BNC rear panel connectors (EXT. TRIGGER OUT, EXT TRIGGER IN, REF OUT, REF IN): Use double shielded cables and terminate open cable ends with 50  $\Omega$ .
- USER PORT: Use only double shielded cables or disconnect the input pins of the USER PORT connector in order to avoid spurious input signals which may cause undesirable events. This is of particular importance if the external trigger input (pin no. 2) is used.
- USB: Use double-shielded USB cables and ensure that external USB devices comply with EMC regulations.
- GPIB (IEEE/IEC 625): Use a shielded GPIB cable.
- LAN: Use CAT6 or CAT7 cables.

The use of external accessories for the network analyzers may introduce additional connector, cable, and cable length requirements. Refer to the relevant documentation.

## 2.6 Connecting the Analyzer to the AC Supply



The network analyzer is automatically adapted to the AC supply voltage. The supply voltage must be in the range 100 V to 240 V; 50 Hz to 60 Hz or 400 Hz. The mains connector is located in the upper part of the rear panel.

- ▶ Connect the network analyzer to the AC power source using the AC power cable delivered with the instrument.

The maximum power consumption and the typical power consumption of the individual analyzer models are listed in the data sheet.

## 2.7 Power on and off



The AC power switch is located in the upper part of the rear panel, together with the mains connector.

- ▶ To turn the power on or off, switch the AC power switch to position I (On) or 0 (Off).

After power-on, the analyzer automatically goes to standby or ready state, depending on the state of the standby toggle key at the front panel when the instrument was switched off last time.

The AC power switch can be permanently on. It is recommendable, however, to switch it off if the instrument is not used for some time. Observe the instructions for startup and shutdown in [chapter 3.3, "Startup and Shutdown"](#), on page 19.

## 2.8 Standby and Ready State



The standby toggle key is located in the bottom left corner of the front panel.

- In standby state, the right, amber LED is on. The standby power only supplies the power switch circuits and the optional oven quartz (option R&S ZNB-B4, "OCXO Frequency Reference", order no. 1316.1769.02). In this state it is safe to switch the AC power off and disconnect the instrument from the power supply.
- In ready state, the left, green LED is on and all modules are power-supplied. When switched to ready state, the analyzer initiates its startup procedure.

It is recommendable to switch the vector network analyzer to standby state or power it off if it is not used for some time. Observe the instructions for startup and shutdown in [chapter 3.3, "Startup and Shutdown"](#), on page 19.

## 3 Instrument Tour

This chapter gives an overview of the control elements and connectors of the R&S ZNB and gives all information that is necessary to put the instrument into operation and connect external devices. Notes on reinstallation of the R&S ZNB software appear at the end of the chapter.



### Two-port and four-port network analyzers

The figures and examples in this Getting Started guide show a two-port network analyzer. Everything described in this guide is also valid for four-port analyzers. The extended measurement functionality of the four-port instruments is described in the help system and in the user manual.

## 3.1 Front Panel Tour

The front panel of the network analyzer consists of the touchscreen with the diagrams and softtool panels (left side), the hardkey area (right side) and the test port area below. Brief explanations on the controls and connectors, the hardkey area and the rear panel can be found on the next pages.

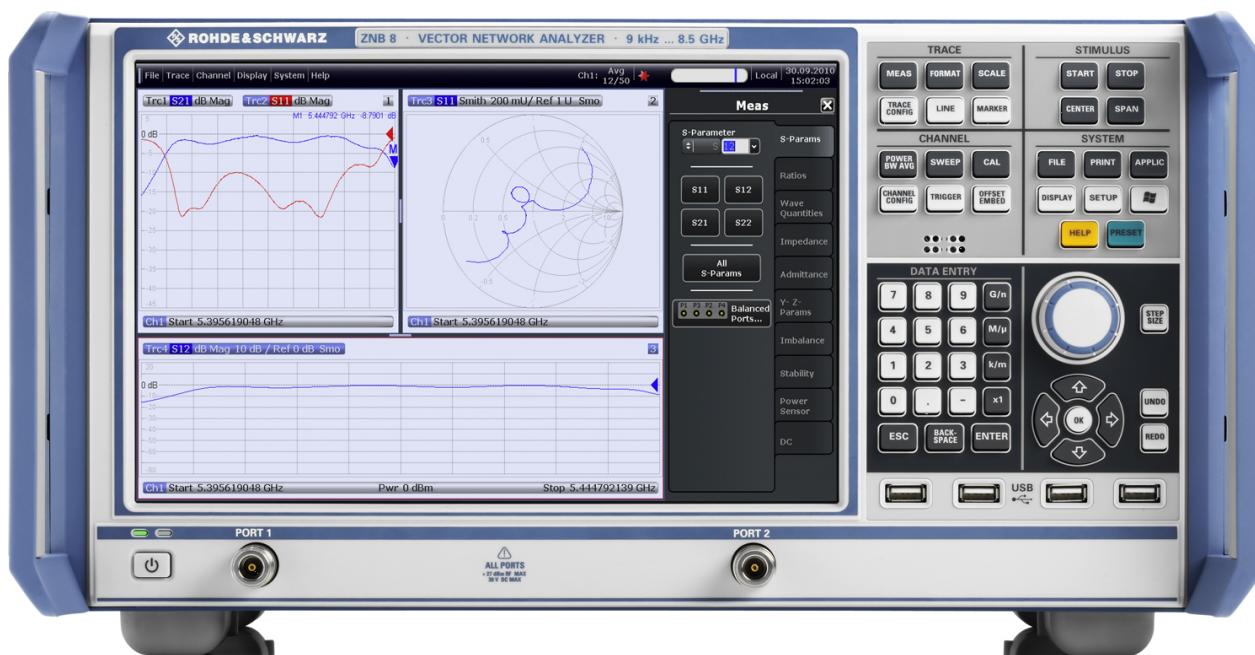


Fig. 3-1: R&S ZNB8 with two ports

**NOTICE****Instrument damage caused by cleaning agents**

Cleaning agents contain substances that may damage the instrument, e.g. cleaning agents that contain a solvent may damage the front panel labeling or plastic parts.

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

The outside of the instrument can be cleaned sufficiently using a soft, lint-free dust cloth.

### 3.1.1 Touchscreen

The analyzer is equipped with a 12.1" XGA color touchscreen. The touchscreen presents all measurement results, mostly in the form of diagrams. Besides, all instrument functions can be accessed and operated by tapping the control elements on the touchscreen. For an introduction to touchscreen operation, refer to [chapter 5.1, "Touchscreen and Front Panel Operation"](#), on page 33.

The following sections contain further useful information about manual control of the R&S ZNB.

- Refer to the other sections in [chapter 5, "Operating the Instrument"](#), on page 33 to learn how to handle traces and diagrams, and how to use menus, keys and softtools.
- Refer to chapter "Concepts and Features" in the user manual or help system to obtain information about the results in the diagram.
- Refer to section "Display Menu" in the user manual or help system to learn how to customize the screen.
- Refer to the data sheet for the technical specifications of the display.

**Screen saver**

The screen saver function of the operating system can be used to switch off the display if the analyzer receives no command for a selectable period of time. The display is switched on again if any front panel key is pressed.

To enable the screen saver, access the Windows® operating system (e.g. by pressing the Windows key in the SUPPORT keypad) and tap "Control Panel > Hardware and Sound > Power Options > Edit Plan Settings > Turn off the display".

### 3.1.2 Setup Keys

The keys in the TRACE, CHANNEL, STIMULUS, and SYSTEM keypads call up groups of related measurement settings. Each key corresponds to a softtool tab or a function of the graphical user interface.



The TRACE keys give access to all trace settings, to the limit check settings, and to the marker functions including marker search.

- The MEAS settings select the measured and displayed quantity.
- The FORMAT settings define how the measured data is presented in the diagram.
- The SCALE settings define how the active trace is displayed in the diagram selected via FORMAT.
- The TRACE CONFIG settings store traces to the memory and perform mathematical operations on traces.
- The LINES settings define limits for the measurement results, visualize them in the diagrams and activate/deactivate the limit check.
- The MARKER settings position markers on a trace, configure their properties and select the format of the numerical readout. Markers can also be used to locate specific points on the trace, define the sweep range, and scale the diagram.



The CHANNEL keys give access to the hardware-related (channel) settings.

- The POWER BW AVG settings define the power of the internal signal source, the IF bandwidth, and the sweep average.
- The SWEEP settings define the scope of measurement, including the sweep type and the number of measured sweeps.
- CAL provides all functions that are necessary to perform a system error correction (calibration).
- CHANNEL CONFIG provides functions for channel management.
- The TRIGGER settings control the start of the measurement sequence.
- OFFSET EMBED provides a selection of length offset parameters to shift the measurement plane.



START CENTER or STOP SPAN define the sweep range, depending on the sweep type.



The SYSTEM keys provide general system settings.

- FILE provides standard Windows® functions used to create, save, recall or print recall sets, to copy the active screen and to shut down the application.
- The PRINT settings control an external printer that is used to print a hardcopy of the current recall set.
- APPLIC gives access to external software tools.
- DISPLAY gives access to all display settings and to the functions which activate, modify and arrange different diagrams.
- SETUP provides general system settings which are not restricted to a particular recall set.
- The Windows® key opens the startup menu of the Windows® operating system from where you can perform system configurations and call up additional software utilities.
- HELP opens the context-sensitive help system of the analyzer.
- PRESET performs a preset of the instrument settings.

### 3.1.3 Data Entry Keys



The keys in the DATA ENTRY keypad are used to enter numbers, units, and characters. The data entry keys are only enabled while the cursor is placed on a data input field in a dialog or in the Help navigation pane.

- The keys 0 to 9 enter the corresponding numbers.
- The function of the "." and "-" keys depends on the data type of the active input field:
  - In numeric input fields, the keys enter the decimal point and a negative sign for the entered numeric value. Multiple entries have no effect.
  - In character input fields, the keys enter a dot and a hyphen, respectively. Both entries can be repeated as often as desired.
- The function of the four unit keys depends on the data type of the active input field; see [chapter 5.4, "Entering Data"](#), on page 41.
  - In numeric input fields, the G/n, M/μ, k/m or x1 keys multiply the entered value with factors of  $10^{(-)9}$ ,  $10^{(-)6}$ ,  $10^{(-)3}$  or 1 and add the appropriate physical unit. x1 is equivalent to ENTER and confirms the previous entry.
  - In character input fields, the G/n, M/μ, k/m keys enter the letters G, M, K, respectively. x1 is equivalent to ENTER and confirms the previous entry.
- ESC is used to:
  - Cancel entries / close dialogs without activating the entries made (equivalent to the "Close" button).
  - Close the Help system.
- ENTER is used to:
  - Activate the selected active control element, e.g. a button in a dialog or a link in the "Contents" page of the Help system.
  - Confirm selections and entries made and close dialogs (equivalent to the "OK" button).
  - Compress or expand menus or the Help table of contents
- BACKSPACE deletes the last character before the cursor position or the selected character sequence or numeric value.

### 3.1.4 Rotary Knob

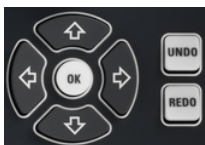


The rotary knob increases and decreases numerical values, scrolls within lists, activates controls and confirms entries. Turning or pressing the rotary knob is equivalent to the action of the "Cursor Up" and "Cursor Down" navigation keys or of the ENTER key in the DATA ENTRY keypad, respectively.

STEP SIZE opens an input box to select the steps (in units of the current physical parameter) between two consecutive numerical values. The step size is also valid for value changes using the "Cursor Up" and "Cursor Down" keys. See also [chapter 5.4.2, "Using the Numeric Editor"](#), on page 42.



### 3.1.5 Navigation Keys



The keys in the NAVIGATION keypad are used to navigate within the touchscreen and the help system, to access and control active elements.

The "Cursor Up" and "Cursor Down" keys are used to:

- Scroll up and down in lists, e.g. among menu items, in a list of keywords, in the Help table of contents, or in the Help index
- Navigate between table rows in diagrams. Press "OK" to toggle between navigation mode and data entries.
- Increase and decrease numerical input values

"Cursor Up" (Down) become inactive as soon as the beginning of the list is reached. "Cursor Up" (Down) is equivalent to a rotation of the rotary knob to the right (left).

The "Cursor Left" and "Cursor Right" keys are used to:

- Move the cursor to the left or right within input fields
- Navigate between table columns in diagrams. Press "OK" to toggle between navigation mode and data entries.
- Compress or expand menus or the Help table of contents
- Move the highlighted item in the menu bar of the active application

ENT OK is equivalent to the action of the ENTER key in the DATA ENTRY keypad.

UNDO reverses the last action, if possible. REDO reverses the action of the UNDO button.

### 3.1.6 Standby Key



The standby toggle switch is located in the bottom left corner of the front panel.

The key serves two main purposes:

- Toggle between standby and ready state; see [chapter 2.8, "Standby and Ready State"](#), on page 11.
- Shut down the instrument; see [chapter 3.3, "Startup and Shutdown"](#), on page 19.

### 3.1.7 Front Panel Connectors

The test ports and four USB connectors are located on the front panel of the analyzer.

#### 3.1.7.1 Test Ports



N-connectors numbered 1, 2 ... The test ports serve as outputs for the RF stimulus signal and as inputs for the measured RF signals from the DUT (response signals).

- With a single test port, it is possible to generate a stimulus signal and measure the response signal in reflection. For a measurement example refer to [chapter 4.2, "Reflection S-Parameter Measurement"](#), on page 31.

- With 2, 3 or 4 test ports, it is possible to perform full two-port, 3-port or 4-port measurements; see [chapter 4.1, "Transmission S-Parameter Measurement"](#), on page 25.

### NOTICE

#### Maximum input levels

The maximum input levels at all test ports according to the front panel labeling or the data sheet must not be exceeded.

In addition, the maximum input voltages of the other input connectors at the rear panel must not be exceeded.



It is recommended to use a torque wrench when screwing RF cables on the test port connectors. Standard IEEE 287 specifies a torque of  $(1.5 \pm 0.2)$  Nm for N connectors.

#### 3.1.7.2 USB Connectors

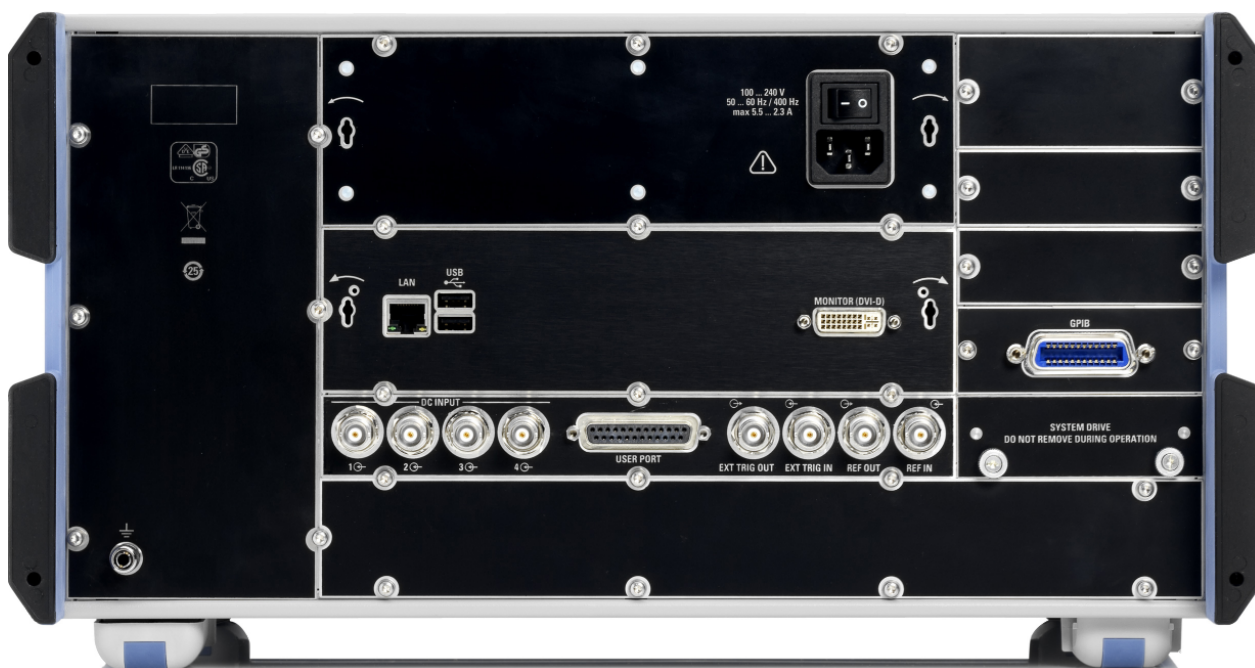
Four high speed Universal Serial Bus connectors of type A (master USB), used to connect e.g a keyboard, mouse or other pointing devices, the Calibration Unit (accessory R&S ZV-Z5x), a printer or external storage devices (USB stick, CD-ROM drive etc.).



The length of passive connecting USB cables should not exceed 1 m. The maximum current per USB port is 500 mA. See also [chapter 2.5, "EMI Suppression"](#), on page 10.

## 3.2 Rear Panel Tour

This section gives an overview of the rear panel controls and connectors of the network analyzer.



**Fig. 3-2: R&S ZNB rear view**

The following connectors are available on all instruments:

- LAN is an RJ-45 connector. Use this connector to integrate the instrument to a Local Area Network, primarily for remote control purposes; see [chapter 6.3, "Remote Operation in a LAN"](#), on page 51.
- The two additional USB connectors are equivalent to the USB connectors on the front panel; see [chapter 3.1.7, "Front Panel Connectors"](#), on page 16.
- MONITOR (DVI-D) is an external monitor connector; see [chapter 3.4.4, "Connecting a Monitor"](#), on page 22.
- USER PORT is a 25-pin D-Sub connector used as an input and output for low-voltage (3.3 V) TTL control signals.
- EXT TRIG IN and EXT TRIG OUT are two BNC connectors for low-voltage (3.3 V) TTL external trigger signals.
- REF OUT is a BNC output for the internal reference frequency of the R&S ZNB. Use this connector to synchronize other instruments to the analyzer.
- REF IN is a BNC input for an external reference frequency. Use this connector to synchronize the R&S ZNB to another device.
- SYSTEM DRIVE contains the removable system hard disk of the R&S ZNB, containing all software (including the operating system and the VNA application) and data. No other hard disk is built in. Do not remove the disk during operation.
- The ground connector in the lower left corner of the rear panel provides the ground of the analyzer's supply voltage. Use this connector for ESD protection; see ["Risk of electrostatic discharge"](#) on page 9.

The following optional connectors can be installed in addition:

- Option R&S ZNB-B10 provides a GPIB bus connector according to standard IEEE 488 / IEC 625.

- Options R&S ZNB4-B81 / R&S ZNB8-B81, "DC Inputs", provide four BNC inputs labeled DC INPUT 1 ... 4. The inputs are intended for DC measurements and can be adjusted to different voltage ranges.
- Option R&S ZNB-B1, "Bias Tees", provides two or four additional BNC inputs labeled BIAS 1 ... 4 (for two-port or four-port analyzers). The inputs can be used to apply an external DC voltage (bias) to the test ports. For fuse replacement refer to [chapter 7.2, "Replacing Fuses"](#), on page 57.

### NOTICE

#### Input levels, EMC

The maximum input levels and voltages of the input connectors at the front and rear panel must not be exceeded.

Use double shielded cables at the BNC rear panel connectors (EXT. TRIGGER OUT, EXT TRIGGER IN, REF OUT, REF IN) and match signals with 50  $\Omega$  in order to comply with EMC directives! See also [chapter 2.5, "EMI Suppression"](#), on page 10.

## 3.3 Startup and Shutdown

To start the analyzer, proceed as follows:

1. Make sure that the instrument is connected to the AC power supply and switch the AC power switch on the rear panel to position I (On).
2. If necessary, press the standby toggle key on the front panel to switch the instrument to ready state (the green LED goes on).

The analyzer automatically performs a system check, boots the Windows® operating system and then starts the network analyzer (VNA) application. If the last analyzer session was terminated regularly, the VNA application uses the last recall set with all instrument settings.

To shut down the analyzer, proceed as follows:

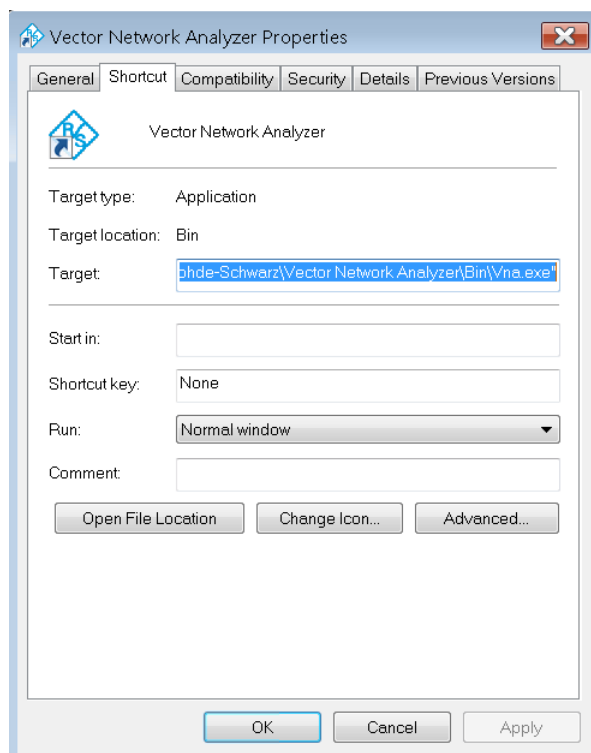
1. Press the standby key to save the current recall set, close the VNA application, shut down Windows®, and set the instrument to standby state. Of course you can also perform this procedure step by step like in any Windows session.
2. If desired, set the AC power switch to position 0 (Off).

**NOTICE****Risk of data loss**

It is strongly recommended to switch the analyzer to standby state before disconnecting it from the AC supply. If you set the power switch to 0 while the VNA application is still running, you will lose the current settings. Moreover, loss of program data can not be excluded if the application is terminated improperly.

**Minimizing the VNA application**

With a minimized VNA application, you can access your analyzer's Windows® desktop or run other applications. To start the VNA application with a minimized window on a continuing basis, right-click the VNA shortcut icon on the desktop and open the "Properties" dialog. In the "Shortcut" tab, select "Run: Minimized".



After a software update the VNA application is started with a maximized window again. Moreover, if a second VNA application is started after a first, minimized application, this will cause the first application to appear in the foreground.

## 3.4 Connecting External Accessories

The equivalent USB ports of the analyzer can be used to connect a variety of accessories:

- A mouse simplifies operation of the instrument using the controls and dialogs of the Graphical User Interface (GUI).
- A keyboard simplifies the entry of data.
- A printer generates hard copies of the screen contents.

In addition the analyzer provides interfaces for monitor connection and network integration:

- An external monitor shows the magnified Graphical User Interface (GUI) with all diagrams and controls.
- A LAN connection can be established in order to access the hard disk or control the analyzer from an external PC.

### 3.4.1 Connecting a Mouse

A USB mouse can be connected to any of the Universal Serial Bus connectors. The mouse is detected automatically when it is connected. It is safe to connect or disconnect the mouse during the measurement.



#### Mouse configuration

Use the "Start > Control Panel > Hardware and Sound > Devices and Printers > Mouse" menu of Windows® to configure the mouse properties. To access Windows®, press the Windows key on the external keyboard or on the front panel.

Operating the analyzer does not require a mouse. You can access all essential functions by tapping the touchscreen and the keys on the front panel. Tapping a control element for a short time corresponds to the action of the left mouse button. A longer touch (touch and hold) simulates the right mouse button (e.g. for opening context menus). Tapping twice (double-tap) corresponds to a double-click (e.g. for opening the on-screen keyboard).

---

### 3.4.2 Connecting a Keyboard

A keyboard can be connected to any of the Universal Serial Bus connectors. The keyboard is detected automatically when it is connected. The default input language is English – US. It is safe to connect or disconnect the external keyboard during the measurement.



### Keyboard configuration

Use the "Start > Control Panel > Clock, Language, and Region > Region and Language > Keyboards and Languages" dialog of Windows® to configure the keyboard properties. To access Windows®, press the Windows key on the external keyboard or on the front panel.

Operating the analyzer does not require a keyboard. You can access all essential functions by tapping the touchscreen and the keys on the front panel.

## 3.4.3 Connecting a Printer

A printer can be connected to any of the Universal Serial Bus connectors.

It is safe to connect or disconnect the printer during the measurement. When printing a copy (PRINT), the analyzer checks whether a printer is connected and turned on and whether the appropriate printer driver is installed. If required, printer driver installation is initiated using the operating system's "Add Printer Wizard". The wizard is self-explanatory. A printer driver needs to be installed only once, even though the printer may be temporarily removed from the analyzer.



### Printer driver installation

A great variety of printer drivers is available on the analyzer. To obtain the complete list, access Windows® (press the Windows key) and open the "Start > Control Panel > Hardware and Sound > Devices and Printers" menu.

You can load updated and improved driver versions or new drivers from an installation disk, USB memory stick or another external storage medium. Alternatively, if the analyzer is integrated in a network, you can install driver data stored in a network directory. In either case, use the "Add Printer" wizard to complete the installation.



### Printer configuration

Use the "Page Setup" dialog or the "Start > Control Panel > Devices and Printers" menu of Windows® to configure the printer properties and printing preferences.

## 3.4.4 Connecting a Monitor



A standard monitor can be connected to the MONITOR (DVI-D) connector of the R&S ZNB.

### NOTICE

#### Safety aspects

The monitor must be connected while the instrument is switched off (or in standby mode). Otherwise correct operation can not be guaranteed.

The monitor displays the magnified analyzer screen with all diagrams, measurement results and control elements. No extra configuration is required. With an additional mouse or keyboard connected to the analyzer, you can control the measurement from the external monitor. If desired, click "DISPLAY > View Bar > Hard Key Panel" to add the "Hard Key Panel" to the analyzer screen.

### 3.4.5 Connecting a LAN Cable

A LAN cable can be connected to the LAN connector on the rear panel of the analyzer. To establish a LAN connection proceed as follows:

1. Refer to section [chapter 6.3.1, "Assigning an IP Address"](#), on page 52 and learn how to avoid connection errors.
2. Connect a CAT6 or CAT7 RJ-45 (LAN, Ethernet) cable to the LAN port.

The LAN port of the analyzer is an auto-crossover Ethernet port. You can connect it to a network that is equipped with Ethernet hardware (hub, switch, router), but you can also set up a direct connection to a computer or another test instrument. For both connection types, you can use either crossover or standard straight-through Ethernet cables. The IP address information is displayed in the "SETUP > Remote Settings" softtool panel.



## 4 Performing Measurements

The following chapter presents a sample session with a R&S ZNB network analyzer and explains how to solve basic tasks that you will frequently encounter when working with the instrument.

---

### CAUTION

#### Safety considerations

Before starting any measurement on your network analyzer, please note the instructions given in [chapter 2, "Putting the Analyzer into Operation"](#), on page 8.

---



Use the "S-Parameter Wizard" accessible via "TRACE > MEAS > S-Params > S-Param Wizard ..." to perform a standard S-parameter measurement in a straightforward way. The wizard provides a series of dialogs where you can select the test setup, screen configuration and measurement parameters, configure the essential channel settings and perform a guided calibration.

---

#### Measurement stages in the wizard

The different dialogs of the "S-parameter Wizard" correspond to the typical stages of any measurement:

1. Select the test setup
  2. Define port impedances
  3. Select the measurement parameters and the diagrams
  4. Define the sweep range
  5. Adjust the receiver and source settings (measurement bandwidth, source power)
  6. Perform a calibration
- 



In the following we assume that you tap the analyzer's touchscreen to access all instrument functions. Refer to [chapter 5.1, "Touchscreen and Front Panel Operation"](#), on page 33 and [chapter 5.4, "Entering Data"](#), on page 41 to learn how to access instrument functions and control dialogs by other means.

---



#### Two-port and four-port network analyzers

The examples in this chapter show a two-port network analyzer. You can also perform the measurements on a four-port analyzer using any test port or any combination of two test ports. For more advanced measurement examples which require a four-port instrument refer to the help system or to the user manual.

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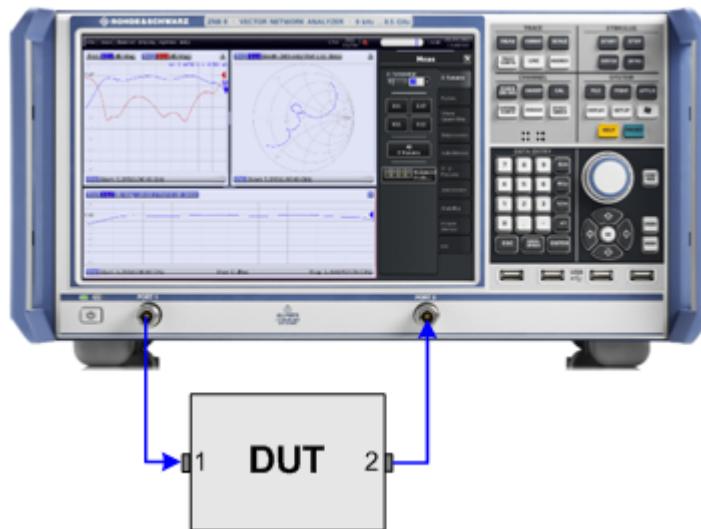
## 4.1 Transmission S-Parameter Measurement

In a transmission measurement, the analyzer transmits a stimulus signal to the input port of the device under test (DUT) and measures the transmitted wave at the DUT's output port. The trace settings allow you to select the measured quantities and display formats, depending on what you want to learn from the data. A minimum of two analyzer test ports are required for transmission measurements.

In the following example, the analyzer is set up for a two-port transmission measurement. A frequency sweep range is selected, the instrument is calibrated and the measurement result is analyzed using various display formats.

### 4.1.1 Connecting the Instrument for Transmission Measurements

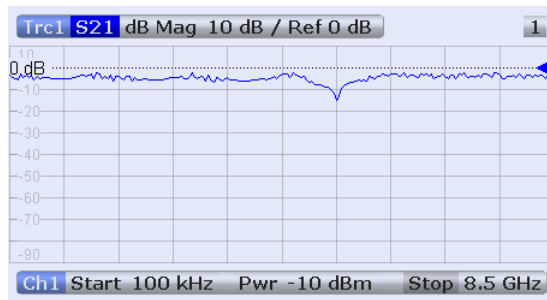
In order to prepare a transmission measurement, you have to connect your DUT (which for simplicity we assume to have appropriate connector, e.g. male N 50 Ω connectors) in-between a pair of analyzer test ports. All test ports are equivalent for this measurement and may be interchanged. It is recommended to preset the R&S ZNB in order to start from a definite instrument state.



1. Connect the DUT between test ports 1 and 2 of the network analyzer as shown above.
2. Proceed as described in [chapter 3.3, "Startup and Shutdown"](#), on page 19, to switch on the instrument and start the VNA application.
3. Press the PRESET key in the SYSTEM keypad to perform a factory preset of the analyzer.



The analyzer is now set to its default state. The default measured quantity is the transmission S-parameter  $S_{21}$ .



Press TRACE > TRACE CONFIG and use the control elements in the "Traces" softtool panel if you wish to create a new trace or a new diagram.

#### 4.1.2 Selecting the Sweep Range and Other Parameters

After preset the display shows a diagram with a dB Mag scale. The sweep range (scale of the horizontal axis) is from 100 kHz to the maximum frequency of the analyzer, and the S-parameter  $S_{21}$  is selected as a measured quantity. This S-parameter is the forward transmission coefficient of the DUT, defined as the ratio of the transmitted wave at the DUT's output port (port no. 2) to the incident wave at the DUT's input port (port no. 1).

The R&S ZNB automatically adjusts its internal source and receiver to the selected measured quantities: For an  $S_{21}$  measurement, a stimulus signal (termed  $a_1$ ) is transmitted at the analyzer port no. 1; the transmitted wave (termed  $b_2$ ) is measured at port 2. The stimulus signal from the analyzer port no. 2 is not needed except for some calibration types.

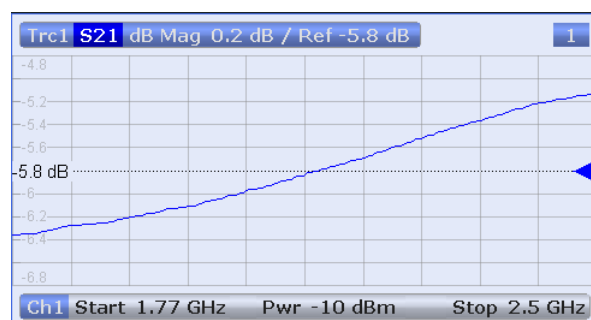
To gain some more insight into the transmission characteristics of your DUT you can select a smaller sweep range.

1. Press STIMULUS > START and enter the lowest frequency you want to measure in the "Start Frequency" input field (e.g. 1.77 GHz) of the opened softtool panel. For convenient numeric entry, tap the input field twice to open the "Numeric Editor" dialog.



**Tip:** If you use the DATA ENTRY keys at the front panel for data entry, simply type 1.77 and terminate the entry with the G/n key. Refer to [chapter 5.4, "Entering Data"](#), on page 41 to learn more about entering numeric values and characters.

2. Tap the "Stop Frequency" input field (below "Start Frequency") and enter the highest frequency you want to measure (e.g. 2.5 GHz).
3. Tap "TRACE > SCALE > Scale Values" and activate the "Auto Scale Trace" function. The analyzer adjusts the scale of the diagram to fit in the entire  $S_{21}$  trace, leaving an appropriate display margin.



**Tip:** Refer to [chapter 5.5, "Scaling Diagrams"](#), on page 45 to learn more about the different methods and tools for diagram scaling.

### 4.1.3 Calibrating the Instrument

Calibration (system error correction) is the process of eliminating systematic, reproducible errors from the measurement results. E.g. in the current test setup, the connecting cables between the analyzer ports and the DUT introduce an attenuation of the waves on their way from the analyzer port 1 to the input of the DUT and from the DUT output to the analyzer port 2. The non-zero length of the cables also introduces a phase shift of the waves. Both effects impair the accuracy of the S-parameter measurement.

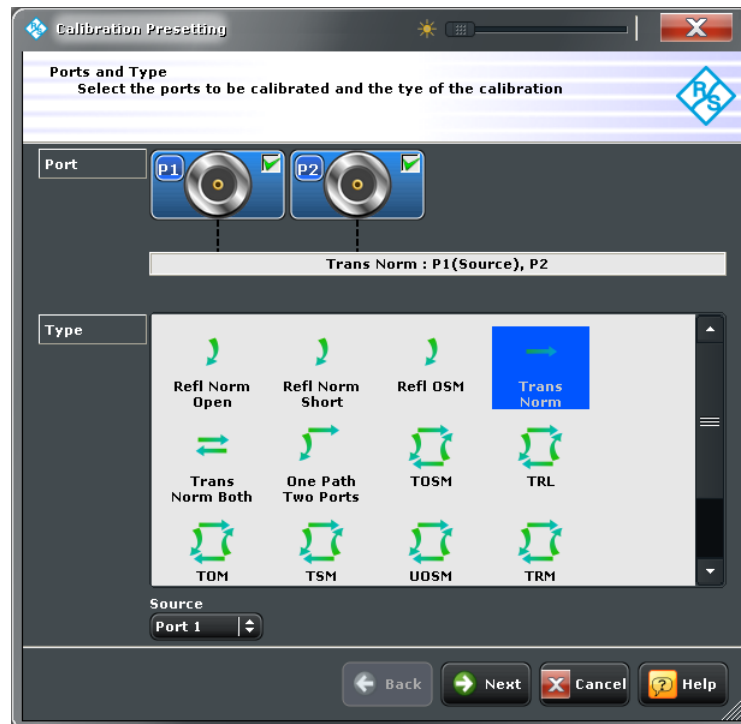
The analyzer provides a wide range of sophisticated calibration methods for all types of measurements. Which calibration method is selected depends on the expected system errors, the accuracy requirements of the measurement, on the test setup and on the types of calibration standards available.

In the following we assume that the calibration kit R&S ZV-Z121 contains an appropriate male Through standard ("Through (mm)") with known physical properties. With a single Through, it is possible to perform a normalization, compensating for a frequency-dependent attenuation and phase shift in the signal paths.

Due to the R&S ZNB's calibration wizard, calibration is a straightforward, menu-guided process.

1. Replace the DUT by the Through (mm) standard from the calibration kit R&S ZV-Z121.
2. Tap "CHANNEL > CAL > Start Cal (Manual)" to open the "Calibration Presetting" dialog.

3. Select the port combination Port 1 (P1) and Port 2 (P2) and the calibration type "Trans Norm". Ensure that port 1 is defined as the source port.

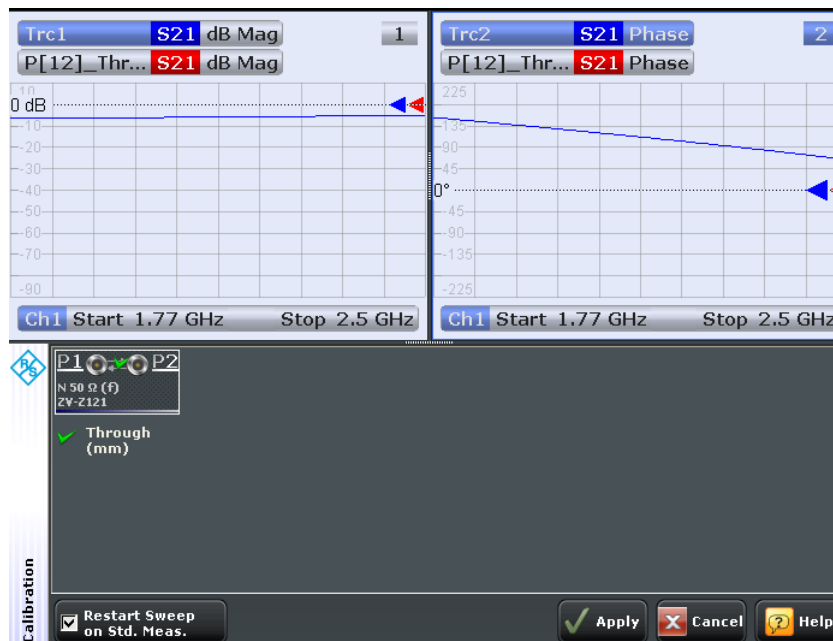


4. Tap "Next" to proceed to the next "Calibration Presetting" dialog. Select the test port connector type and gender (here: N 50  $\Omega$ , Female, corresponding to a male calibration standard) and the calibration kit (here: "ZV-Z121"), then click "Start".



The next dialog of the calibration wizard shows that only a single calibration standard needs to be measured.

5. Tap "Through (mm)" to initiate the measurement of the connected through standard.



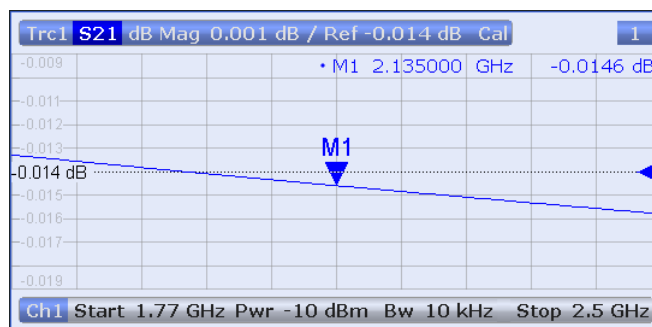
The analyzer performs a calibration sweep for the measured quantity  $S_{21}$ . The magnitude and phase of the result is displayed in two diagrams, together with the expected typical result for a through standard (red traces, hidden by the blue ones in our example). The similarity of the red and the blue traces indicates that the Through standard has been properly connected. After the R&S ZNB has completed the calibration sweep and calculated the correction data, the "Apply" button is available.

6. Click "Apply" to close the wizard and apply the system error correction to the current measurement. A "Cal" label appears in the trace list.
7. Remove the Through standard and connect the DUT again.

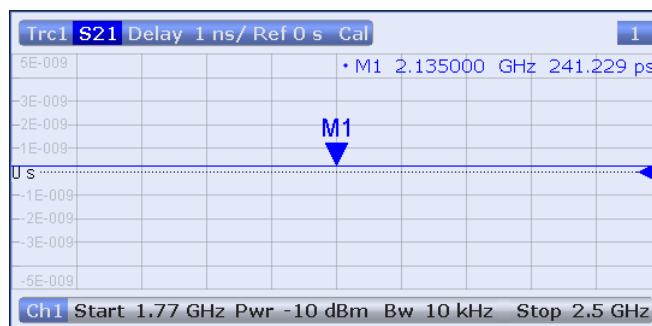
#### 4.1.4 Evaluating Data

The analyzer provides various tools to optimize the display and analyze the measurement data. For instance, you can use markers to determine maxima and minima on the trace, and change the display format to obtain information about the group delay of the transmitted wave.

1. Tap "TRACE > MARKER > Mkr 1". This places "Marker 1" to its default position (center of the sweep range).  
A marker symbol (triangle) appears on the trace. The stimulus value (frequency) and response value (magnitude of the transmission coefficient converted to a dB value) at the marker position is displayed in the marker info field in the upper right corner of the diagram.



2. Select the "Marker Search" softtool tab and activate "Min" search.  
The marker jumps to the absolute minimum of the curve in the entire sweep range. The marker info field shows the coordinates of the new marker position.
3. Tap "TRACE > FORMAT" and select the "Delay" of the transmission coefficient as displayed quantity.  
The group delay represents the propagation time of the wave through the DUT; it is displayed in a Cartesian diagram. The marker info field shows the frequency and group delay at the marker position.



Refer to section "Display Formats and Diagram Types" in the help system or in the user manual to learn more about the diagram properties.

#### 4.1.5 Saving and Printing Data

The analyzer provides standard functions for saving measurement settings and for saving or printing the results. You can use these functions as if you were working on a standard PC. Moreover you can export your trace data to an ASCII file and reuse it in a later session or in an external application.



Data transfer is made easier if external accessories are connected to the analyzer or if the instrument is integrated into a LAN. Refer to [chapter 3.4, "Connecting External Accessories"](#), on page 21, and [chapter 6.3, "Remote Operation in a LAN"](#), on page 51 to obtain information about the necessary steps.

1. Tap "TRACE > TRACE CONFIG > Trace Data > Export...".

2. In the "Export Data" dialog opened, select the file type \*.csv. Enter a file location ("Look in:") and file name and tap "Save".  
The active trace data is written to an ASCII file.
3. Tap "SYSTEM > PRINT > Print Now" to create a hardcopy of your diagram.
4. Select "To File..." or "To Clipboard" to copy the diagram to a file or an external application.
5. Tap "SYSTEM > FILE > Setup > Save...".
6. In the "Save" dialog opened, enter a file location and name and tap "Save".  
The active recall set containing your instrument settings is stored to a file and can be used again in a later session.

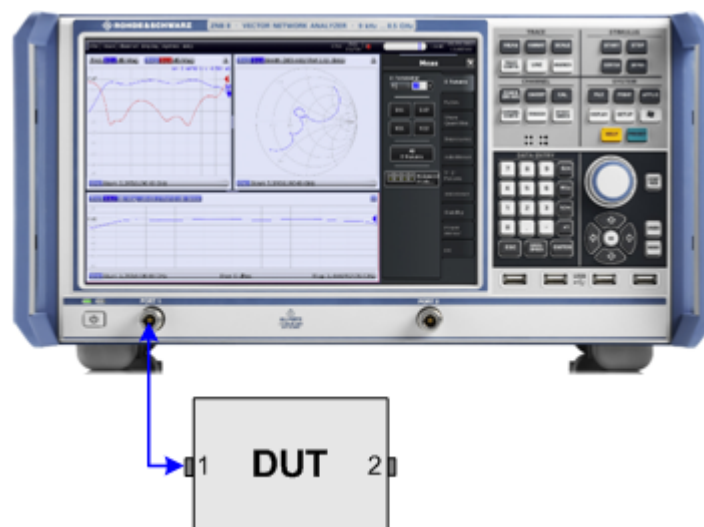
Proceed as described in [chapter 3.3, "Startup and Shutdown"](#), on page 19 to shut down your analyzer.

## 4.2 Reflection S-Parameter Measurement

In a reflection measurement, the analyzer transmits a stimulus signal to the input port of the device under test (DUT) and measures the reflected wave. A number of trace formats allow you to express and display the results, depending on what you want to learn from the data. Only one analyzer test port is required for reflection measurements.

In principle a reflection measurement involves the same steps as a transmission measurement. Note the following differences:

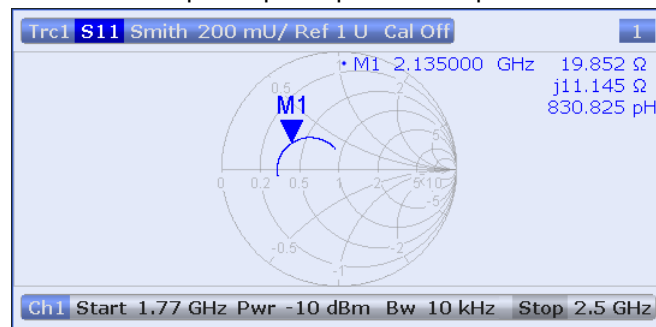
- The basic test setup for reflection measurements involves a single DUT and analyzer port. For instance, you can connect the input of your DUT to port 1 of the analyzer as shown below.



You can also use the basic transmission test setup, e.g. if you want to measure reflection and transmission parameters in parallel.



- The analyzer provides special calibration types for reflection measurements. Use the calibration wizard and select an appropriate type. The full n-port calibration types (TOSM, UOSM, TNA ...) will correct the system errors for all transmission and reflection S-parameters.
- Some of the trace formats are particularly suited for reflection measurements. E.g. you can display the measured reflection coefficient  $S_{11}$  in a Smith chart in order to obtain the complex input impedance at port no. 1.



## 5 Operating the Instrument

The following sections describe how to solve basic tasks that you will frequently encounter when working with the instrument. In particular you can learn how to access instrument functions and control dialogs without a mouse and/or keyboard.



### Customizing the screen

The contents of the screen and the size and position of many display and control elements are not fixed. You can display or hide most elements. You can also drag and drop traces, info fields, and even the softtool panel to your preferred position; see [chapter 5.3.4, "Using Drag and Drop"](#), on page 41.

## 5.1 Touchscreen and Front Panel Operation

You can access all control elements of the vector network analyzer by tapping the touchscreen and the keys on the front panel. The following examples are intended to make you familiar with touchscreen and front panel key operation.

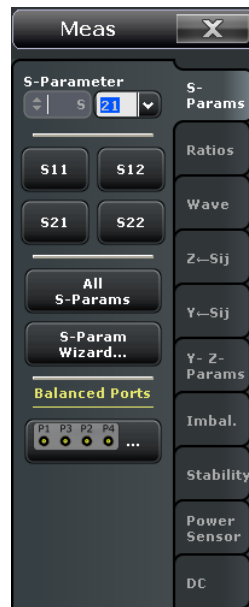
The analyzer functions are arranged in softtool panels and dialogs. Front panel keys open the most frequently used panels. This provides quick access to the instrument settings, avoiding complicated menu structures and long operating sequences. The control elements in the softtool panels can be accessed in different alternative ways.

### Using front panel keys

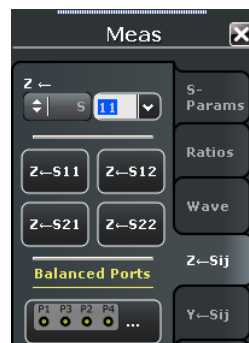
To access an instrument function via front panel keys,

1. Press the front panel key, e.g. the MEAS key in the TRACE panel.

The corresponding softtool panel appears on the right side of the touchscreen.



2. Tap the desired softtool tab, e.g. "Z ← Sij".



3. Tap the control element, e.g. "Z ← S11".

The diagram immediately shows the result of your setting. In the present example, the active trace shows the converted impedance parameter  $Z_{11}$ .

A control element with three dots (e.g. "System Config...") opens a dialog with a group of related settings.

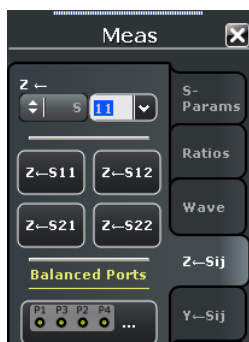


### Using the menu bar

The menu bar across the bottom of the touchscreen provides an alternative access to **all** instrument functions. To repeat the "Z<-S11" setting described above,

- ▶ Tap "Trace > Meas > Impedance > Z<-S11".

The diagram immediately shows the result of your setting. At the same time, the related softtool tab is opened.



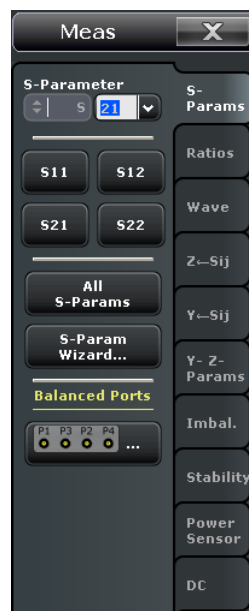
### Using context menus

Context menus are another alternative for quick access to instrument settings. To repeat the "Z<-S11" setting described above,

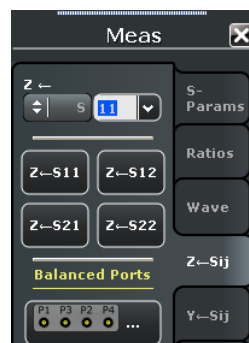
1. Touch and hold the measured quantity section in the trace list for a couple of seconds until the context menu appears.



2. Tap "S-Parameter" to open the "Meas > S-Params" softtool panel.



3. Tap "Impedance > Z ← S11".

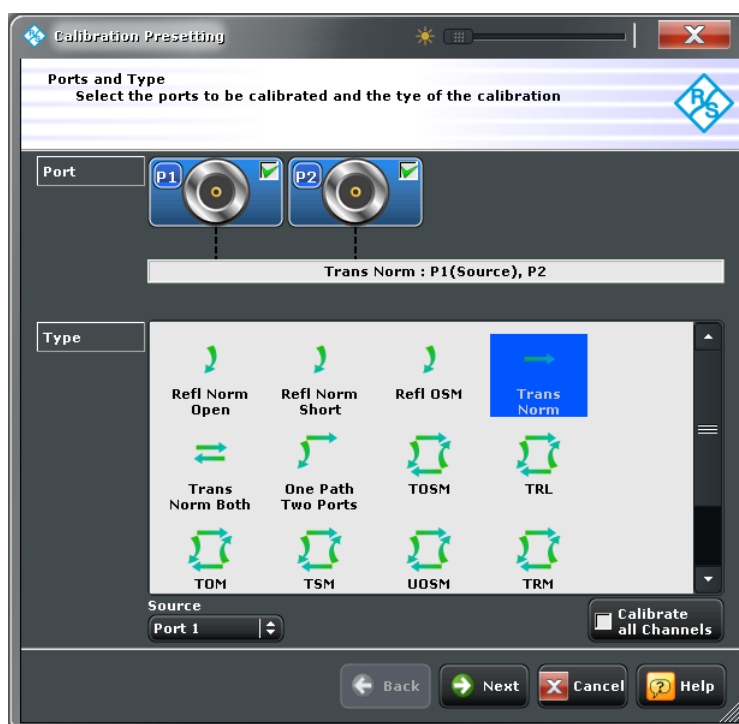


The following table shows possible touchscreen operations with the corresponding mouse operations.

Touchscreen	Mouse	Typical task
Tap control element for a short time	Click control element (left mouse button)	Select button or softtool tab
Tap for an extended time (tap and hold)	Click (right button)	Open context menu
Tap twice (double-tap)	Double-click (left button)	Open on-screen keyboard

## 5.2 Working with Dialogs

Dialogs provide groups of related settings and allow to make selections and enter data in an organized way. The settings are visualized, if possible. An example is shown below.



All dialogs are operated in a similar way.

- To open a dialog, tap a softtool button with three dots behind its labeling (e.g. "Start Cal (Manual) ...").
- Use the "Transparency" function to obtain a transparent dialog which you can control while viewing the underlying traces and display elements.
- Drag and drop the hatched triangle in the lower right corner to modify the size of a diagram.
- Some dialogs are subdivided into tabs, containing groups of related settings. Tap on a tab to access the settings.
- Tap "OK" to activate the current settings and close the dialog, "Cancel" to discard all changes.

- The Help system provides useful information about each dialog's specific settings. Tap "Help" to open the Help.

## 5.3 Handling Diagrams, Traces, and Markers

The analyzer displays measurement results as traces in rectangular diagrams. Markers are used to read specific numerical values and to search for points or regions on a trace. The following section will make you familiar with some of the graphical tools which the R&S ZNB provides for trace and marker handling.



### For further reference

Refer to chapter "Concepts and Features" in the R&S ZNB Help or in the User Manual to learn more about traces, channels, and screen elements.

### 5.3.1 Adding New Traces and Diagrams

A new trace is needed if you want to measure and display an additional quantity.

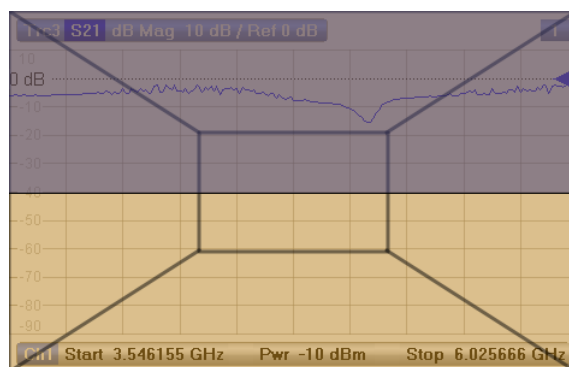
**Typical scenario:** The transmission coefficient  $S_{21}$  is measured as described in [chapter 4.1, "Transmission S-Parameter Measurement"](#), on page 25. A trace is added to display the reflection coefficient  $S_{11}$  for comparison.



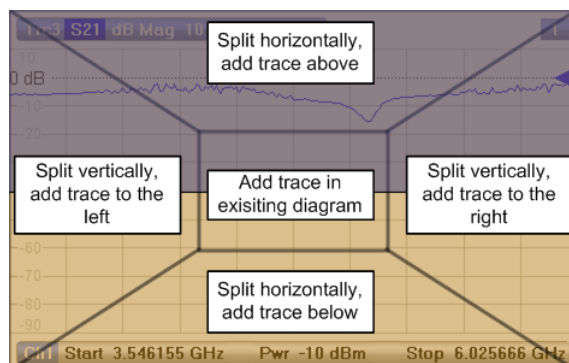
To create a new trace,

1. Drag and drop the "New Trace" icon in the toolbar above the diagram area into a diagram.

The diagram changes its color scheme and contents as shown below. A rectangle with diagonal lines divides the diagram into different sectors.



2. Select the sector, depending on whether you want to display the new trace in the existing diagram, or whether you want to add a new diagram.



- In the dialog box that is opened when you release the "New Trace" icon, select an S-parameter to display.

For a four-port analyzer:



The R&S ZNB generates a new trace for the selected S-parameter.



### Alternative control elements

The "TRACE > Trace Config" softtool tab provides more functions for trace handling. The "DISPLAY > Display > Diagram" softtool tab provides function for efficient diagram handling.

To add a trace for an arbitrary measured quantity (e.g. a ratio, wave, impedance, or admittance parameter), you can open the tabs of the "TRACE > Meas" softtool and simply drag and drop the corresponding softkeys into a diagram area.

### 5.3.2 Adding New Markers

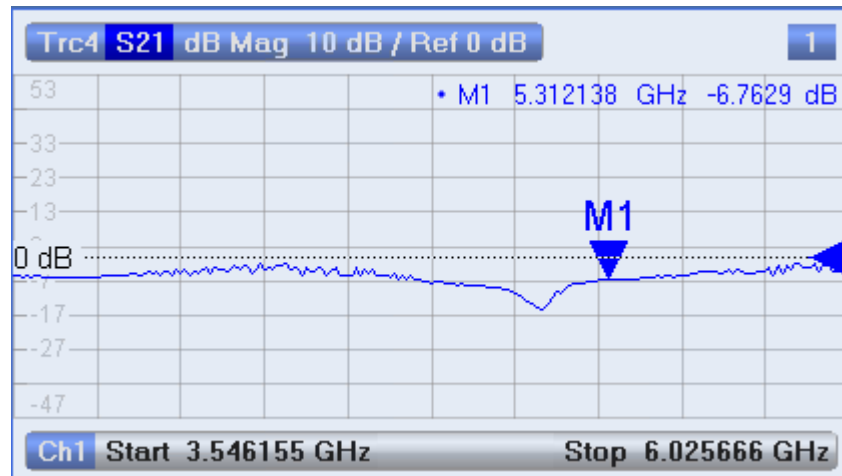
A marker is needed e.g. if you want to read a particular numerical trace value.



To add a new marker,

- Drag and drop the "New Marker" icon in the toolbar above the diagram area to the desired position.  
The marker appears on the active trace. The marker info field displays the stimulus value (x-axis value) and response value (y-axis value) at the marker position. The response value varies as the analyzer continues performing sweeps.





Alternatively, any marker offered in "TRACE > Marker > Markers" softtool tab can be positioned on the active trace by Drag&Drop.



#### Active trace, alternative control elements

The trace line of the active trace in the upper part of the diagram is highlighted. If the diagram contains several traces, first click a trace or a trace line to select the active trace, then add a marker.

The "TRACE > Marker > Markers" softtool tab provides more functions for marker handling.

### 5.3.3 Deleting Display Elements



Markers, traces, diagram areas, and other display elements are most conveniently deleted using the "Delete" icon in the toolbar above the diagram area.

- To delete a single marker, drag it into vertical direction to release it from the trace and drop it onto the "Delete" icon.  
To delete a set of markers, drag and drop their marker info field onto the "Delete" icon. You can delete all types of marker info fields, including e.g. the info fields for a bandfilter search.  
Deleting a marker and its info field also disables the associated marker function.
- To delete a trace, drag and drop its trace line onto the "Delete" icon.
- To delete a channel, drag and drop all associated traces onto the "Delete" icon.
- To hide the limit lines and disable the limit check, drag and drop the PASS / FAIL message onto the "Delete" icon. The limit line itself is not deleted; you can re-use it any time.
- To delete a diagram area, drag and drop the diagram number label in the upper right corner onto the "Delete" icon.

The context menu of some display elements (e.g. markers) also provides the "Delete" function.



### Undo function

If you happen to delete a display element unintentionally, you can simply restore it using the UNDO key or the "Undo" icon in the toolbar.

## 5.3.4 Using Drag and Drop

You can drag and drop many of the R&S ZNB's control and display elements in order to change their size and position. The drag and drop functionality is often more convenient to use than the equivalent buttons of the softtool panels. The following table gives an overview.

**Table 5-1: Drag and drop functionality for various screen elements**

Screen element	Action	Drag and drop...
Diagram	Create	"New Trace" icon --> existing diagram; see <a href="#">chapter 5.3.1, "Adding New Traces and Diagrams"</a> , on page 38
	Re-size	Frame (shaded bar in-between adjacent diagrams)
	Delete	Diagram number label ---> "Delete" icon; see <a href="#">chapter 5.3.3, "Deleting Display Elements"</a> , on page 40
Trace	Create	"New Trace" or "New Ch + Tr" icon --> existing diagram; see <a href="#">chapter 5.3.1, "Adding New Traces and Diagrams"</a> , on page 38
	Move vertically	Reference line marker (right diagram edge)
	Move into other or new diagram	Trace line
	Delete	Trace line --> "Delete" icon; see <a href="#">chapter 5.3.3, "Deleting Display Elements"</a> , on page 40
	Reset / suspend graphic zoom	"Graphic Zoom" element in additional trace line --> "Delete" icon; see <a href="#">chapter 5.5.1, "Using the Graphic Zoom"</a> , on page 45
Marker	Create	"New Marker" icon --> existing diagram; see <a href="#">chapter 5.3.2, "Adding New Markers"</a> , on page 39
	Move horizontally	Marker symbol
	Delete	Marker or marker info field --> "Delete" icon; see <a href="#">chapter 5.3.3, "Deleting Display Elements"</a> , on page 40
Marker info field	Add / delete	See marker above (the info field is always tied to a marker)
	Move within diagram	Marker info field (move to one of several pre-defined positions)
Softtool area	Move	Softtool area (move to the right or left edge of the screen)

## 5.4 Entering Data

The analyzer provides dialogs with various types of input fields where you can enter numeric values and character data. Data entry with a mouse and an external keyboard

is a standard procedure known from other Windows® applications. However, there are various other ways to enter data.

### 5.4.1 Using Front Panel Keys

You can use the keys in the DATA ENTRY keypad to enter numbers, units, and characters.

To enter a numeric value

1. Tap a numeric data input field to activate it.
2. Press the DATA ENTRY keys.
  - Use "0" to "9" to enter the corresponding numbers.
  - Use "." and "-" to enter a decimal point or change the sign of the value.
  - Use "G/n", "M/ $\mu$ ", "k/m", or "x1" to multiply the entered value with factors of  $10^{(-)9}$ ,  $10^{(-)6}$ ,  $10^{(-)3}$  or 1 and add the appropriate physical unit.

To enter a character string

1. Tap a character data input field to activate it.
2. Press the DATA ENTRY keys as if you were writing a short message on your mobile phone.
  - Press "0" to "9" once to enter the corresponding numbers.
  - Use "." or "-" to enter a dot or a hyphen.
  - Use "G/n", "M/ $\mu$ ", or "k/m" to enter the letters G, M or K (case-insensitive).
  - Use the BACKSPACE key to correct wrong entries, deleting the character to the left of the current cursor position.
  - Press ENTER to complete an entry.
  - Press ESC CANCEL to discard the entries made.
3. To enter letters other than G, M or K, you can also use one of the methods described in the following sections:
  - [chapter 5.4.3, "Using the Analyzer's On-Screen Keyboard"](#), on page 43
  - [chapter 5.4.4, "Using the Windows® On-Screen Keyboard"](#), on page 44

### 5.4.2 Using the Numeric Editor

The "Numeric Editor" is a tool for convenient entry and modification of numeric values. It is available for all numeric input fields in the "Vector Network Analyzer" (VNA) application.

Operation with touchscreen or mouse:

1. Double-tap or double-click to activate a numeric input field in a dialog or in a softtool panel and open the numeric editor.



2. Tap on the buttons in the numeric keypad to compose the numeric input value.
3. If desired, select a "Stepsize" and use the cursor up/down buttons to increment/decrement the current value. If a marker is active, you can also set the numeric value to the current marker value ("Set to Marker").
4. After completing the input string tap "Enter" to apply your selection and close the numeric editor.



#### STEP SIZE key

If a numeric input field is active, the STEP SIZE front panel key to the right of the rotary knob opens a dialog box containing the "Step Size" panel of the numeric editor. Use this box for efficient operation of the rotary knob.

### 5.4.3 Using the Analyzer's On-Screen Keyboard

The on-screen "Keyboard" allows you to enter characters, in particular letters, without an external keyboard. It is available for all character input fields in the "Vector Network Analyzer" (VNA) application.

Operation with touchscreen:

1. Double-tap to activate a character data input field in a dialog or in a softtool panel and open the on-screen keyboard.



2. Tap the buttons to select the characters for the input string.
3. After completing the input string tap "Enter" to apply your selection and close the keyboard.

Operation with a mouse:

1. Double-click a character data input field to open the on-screen keyboard.
2. Click a sequence of characters and "Enter" to apply your selection and close the keyboard.

#### 5.4.4 Using the Windows® On-Screen Keyboard

The Windows® on-screen keyboard allows you to enter characters, in particular letters, even if an input field cannot call up the analyzer's own on-screen keyboard. Examples are input fields in standard Windows® dialogs.



To call up the on-screen keyboard,

1. Press the Windows key in the SUPPORT keypad to access Windows® and open the start menu.
2. If you do not find the "On-Screen Keyboard" in the start menu, tap "All Programs > Accessories > Ease of Access > On-Screen Keyboard".



The "APPLIC – External Tools" submenu contains a shortcut to the Windows® on-screen keyboard. Simply click "Screen Keyboard" to open the keyboard.

## 5.5 Scaling Diagrams

The analyzer provides many alternative tools for customizing the diagrams and for setting the sweep range. Choose the method that is most convenient for you.

### 5.5.1 Using the Graphic Zoom

The graphic zoom function magnifies a rectangular portion of the diagram (zoom window) to fill the entire diagram area. The sweep points are not affected.



To activate the graphic zoom,

- Tap the "Zoom Active Trc" icon in the toolbar above the diagram area. The icon changes its color as shown on the left side.
- To define the zoom window, tap on one corner, then move your finger across the touchscreen until you have reached the diagonal corner.



The zoom function is executed as soon as you release the touchscreen. The zoom window is zoomed in both horizontal and vertical direction. In general, the zoomed diagram shows only part of the sweep range; the distance between the displayed sweep points increases.

While the zoom function is active for a particular trace, an additional trace line below the channel line indicates the zoomed stimulus range. You can repeat the graphic zoom for different traces in the diagram and assign independent zoom windows, as shown in the example below.

Ch1	Start 100 kHz	—	Pwr -10 dBm	Stop 3 GHz
Trc1	Start 826.321971 MHz	—	Graphic Zoom	Stop 2.320312 GHz
Trc2	Start 981.655861 MHz	—	Graphic Zoom	Stop 1.084197 GHz



To restore the original size of the diagram and display the entire sweep range, tap the "toggle zoom" icon. You can tap the icon repeatedly to change between the zoomed and unzoomed view. Alternatively, you can drag and drop the "Graphic Zoom" element in the additional trace line onto the "Delete" button.



### Alternative settings

The "toggle zoom" icon opens the "TRACE > Scale > Zoom" where you can refine the displayed zoom range using numeric entries. To zoom the stimulus range and change the sweep point spacing so that the number of displayed sweep points is maintained, use "STIMULUS > Stimulus > Zoom Stimulus".

Refer to the R&S ZNB Help or User Manual for details.

## 5.5.2 Setting the Sweep Range

The sweep range for all channels is displayed in the channel list across the bottom of the diagram:

Ch1	Start	100 kHz	—	Pwr	-10 dBm	Bw	10 kHz	Stop	3 GHz
Ch2	Start	100 kHz	—	Pwr	-10 dBm	Bw	10 kHz	Stop	3 GHz
Ch3	Freq	1 GHz	—	Pwr	-10 dBm	Bw	10 kHz	Stop	1 s
Ch4	Start	100 kHz	—	Pwr	-10 dBm	Bw	10 kHz	Stop	3 GHz
Trc4	Start	-1 ns	—			Time Domain		Stop	4 ns

To change the sweep range, use one of the following methods:

- Press either the START and STOP keys or the CENTER and SPAN keys in the STIMULUS keypad.
- Tap and hold the start or stop value in the channel list for some seconds (with a mouse: right-click) and select "Start Frequency", "Stop Frequency", "Center Frequency", "Frequency Span" from the context menu.
- Select "Start Frequency", "Stop Frequency", "Center Frequency", "Frequency Span" from the "Channel > Stimulus > Stimulus" menu.
- Use the marker functions ("TRACE > MARKER > Marker Function"; see [chapter 5.5.6, "Using Marker Functions"](#), on page 47).

## 5.5.3 Reference Value and Position

The analyzer provides three parameters for changing the scale of the vertical (response) axis:

- Changing the "Ref Value" or "Ref Position" shifts the trace in vertical direction and adjusts the labels of the vertical axis. "Ref Value" also works for radial diagrams.
- Changing the "Scale/Div" modifies the value of the vertical or radial diagram divisions and thus the entire range of response values displayed.

The "Scale/Div" and the "Ref Value" are indicated in the scale section of the trace list. In the example below, a "Scale/Div" of 10 dB and a "Ref Value" of 0 dB is used.

Trc1 S21 dB Mag 10 dB / Ref 0 dB Math

To change one of the parameters use one of the following methods:

- Tap "TRACE > SCALE > Scale Values" to access the settings in the softtool tab.
- Tap and hold the scale section in the trace list for some seconds (with a mouse: right-click) and select the settings from the context menu.

- Select the settings from the "Trace > Scale > Scale Values" menu.
- Use the marker functions ("TRACE > MARKER > Marker Funct"; see [chapter 5.5.6, "Using Marker Functions"](#), on page 47).

#### 5.5.4 Auto Scale

The "Auto Scale" function adjusts the scale divisions and the reference value so that the entire trace fits into the diagram. To access "Auto Scale", use one of the following methods:

- Tap "TRACE > SCALE > Scale Values" to access the "Auto Scale..." settings in the softtool tab.
- Tap and hold the scale section in the trace list for some seconds (with a mouse: right-click) and select "Auto Scale Trace" from the context menu.
- Select "Auto Scale..." from the "Trace > Scale > Scale Values" menu.

#### 5.5.5 Circular Diagrams

The radial scale of a circular ("Polar", "Smith" or "Inverted Smith") diagram can be changed with a single linear parameter, the "Ref Value". The reference value defines the radius of the outer circumference.

- Increasing the "Ref Value" scales down the polar diagram.
- Decreasing the "Ref Value" magnifies the polar diagram.

The "Ref Value" is indicated in the scale section of the trace list.

Trc1 S21 Polar 400 mU / Ref 2 U

To change the "Ref Value" use one of the following methods:

- Tap "TRACE > SCALE > Scale Values" to access the parameter in the softtool tab.
- Tap and hold the scale section in the trace list for some seconds (with a mouse: right-click) and select the parameter from the context menu.
- Select the parameter from the "Trace > Scale > Scale Values" menu.
- Use the marker functions; see [chapter 5.5.6, "Using Marker Functions"](#), on page 47.



The "Auto Scale" function also works for polar diagrams.

#### 5.5.6 Using Marker Functions

Marker functions are a convenient tool for scaling (in particular: magnifying) diagrams without entering explicit numeric values. You simply place a marker to a trace point and use the marker values to change the sweep range or move the trace relative to the vertical axis. The touchscreen or a mouse makes it easier to activate (touch/click) or move (drag and drop) markers.





To set the sweep range use one of the following methods.

Define "Start" and "Stop" values:

1. Create two normal markers, e.g. the markers Mkr 1 (M1) and Mkr 2 (M2), and place them to the desired start and stop values of the sweep range.
2. Activate "M1" and tap "TRACE > MARKER > Marker Function > Start = Marker".
3. Activate "M2" and tap "TRACE > MARKER > Marker Function > Stop = Marker".

Use a definite "Span:"

1. Create a marker and set it to delta mode.  
The analyzer automatically creates a reference marker in addition to the delta marker.
2. Place the reference marker to the desired start value of the sweep range.
3. Set the value of the delta marker equal to the desired (positive or negative) span.
4. Activate the delta marker and tap "TRACE > MARKER > Marker Function > Span = Marker".

To move the trace relative to the vertical axis proceed as follows:

1. Create a normal marker, e.g. the marker Mkr 1 (M1), and place it to a particular trace point. E.g. you can use the "Marker Search" functions to locate a maximum or minimum on the trace.
2. Tap "TRACE > MARKER > Marker Function > Max = Marker" to move the trace towards the upper diagram edge, leaving the values of the vertical divisions ("Scale/Div") and the overall vertical scale unchanged. Analogously, tap "Min = Marker" to move the trace towards the lower diagram edge, or tap "Ref Val = Marker" to move the trace towards the "Ref Value".



You can also use marker values in the "Numeric Editor" dialog; see [chapter 5.4.2, "Using the Numeric Editor"](#), on page 42.

### 5.5.7 Enlarging a Diagram

The analyzer provides different tools for customizing the contents and size of the diagrams:

- Tapping a diagram twice (or a double click on any point in the diagram) enlarges the diagram to occupy the whole window.
- The "Menu Bar", "Status Bar", "Hard Key Panel", and the "Title Bar" are optional display elements which you can hide in order to gain space for the diagrams ("DISPLAY > View Bar").
- "DISPLAY > Config" provides optional display elements for the interior of the diagrams.

Use the context menu of the diagram, the DISPLAY key or the "Display" menu to access the display settings.

## 6 Administrative Tasks

This chapter describes various topics which you may need only occasionally or in case that you desire a special instrument configuration.

### 6.1 Windows Operating System

The analyzer is equipped with a Windows® 7 operating system which has been configured according to the instrument's features and needs. Changes in the system configuration can be necessary in order to:

- Establish a LAN connection
- Customize the properties of the external accessories connected to the analyzer
- Call up additional software tools

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#### **NOTICE**

##### **Modifications of the operating system**

The operating system is adapted to the network analyzer. To avoid impairment of instrument functions, only change the settings described in this manual. Existing software must be modified only with update software released by Rohde & Schwarz. Likewise, only programs authorized by Rohde & Schwarz for use on the instrument must be executed.

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The "Start" menu of the operating system is accessed by pressing the Windows key in the SYSTEM keypad or on an external keyboard. All necessary settings can be accessed from the "Start" menu, in particular from the "Control Panel".



##### **User accounts and password protection**

The analyzer uses a user name and password as credentials for remote access. Two user accounts with different levels of access are available on the instrument:

- "instrument" is the default account with standard rights to change system settings. Use this account for normal operation of the analyzer.
- "Administrator" is the account for administering the operating system. This account is required e.g. if you wish to install programs on the analyzer.

In the factory configuration, "894129" is preset as a password for both users. To protect the analyzer from unauthorized access, it is recommended to change the factory setting ("Control Panel > User Accounts > Change your password").

---

To change from one user account to the other, press the Windows key in the SYSTEM keypad, open the start menu, and select "Shut down > Switch User". The user accounts of your R&S ZNB are displayed as shown below.



## 6.2 Firmware Update

Upgrade versions of the analyzer firmware are supplied as single setup files \*.msi.



### Administrator account

You need administrator rights to install a new firmware version. See note on "[User accounts and password protection](#)" on page 50 for details.

To perform a firmware update,

1. Copy the setup file to any storage medium accessible from the analyzer. This may be the internal hard disk, an external storage medium (USB memory stick, external CD-ROM drive) or a network connection (LAN, GPIB bus).
2. In the Windows® Explorer, tap the setup file twice (or double-click with a mouse) and follow the instructions of the setup wizard.

Setup files can be stored and installed again. The default drive name of the internal hard disk is C:. External storage devices are automatically mapped to the next free drive, i.e. D:, E: etc.



### Factory calibration

A firmware update does not affect the factory calibration.

## NOTICE

### External accessories

The calibration unit (accessory R&S ZV-Z5x) must be disconnected during a firmware update.

## 6.3 Remote Operation in a LAN

A LAN connection is used to integrate the analyzer into a home/company network. This offers several applications, e.g.:

- Transfer data between a controller and the analyzer, e.g. in order run a remote control program.

- Control the measurement from a remote computer using Remote Desktop or a similar application.
- Use external network devices (e.g. printers).

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**NOTICE****Virus protection**

An efficient virus protection is a prerequisite for secure operation in the network. Never connect your analyzer to an unprotected network because this may cause damage to the instrument software. For useful hints refer to the application note 1EF73\_0E, which is available at:

[http://www.rohde-schwarz.de/de/service\\_support/downloads/application\\_notes?type=20&downid=5699](http://www.rohde-schwarz.de/de/service_support/downloads/application_notes?type=20&downid=5699)

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The analyzer uses a user name and password as credentials for remote access; see note on "[User accounts and password protection](#)" on page 50 for details. To protect the analyzer from unauthorized access, it is recommended to change the factory setting.

### 6.3.1 Assigning an IP Address

Depending on the network capacities, the TCP/IP address information for the analyzer can be obtained in different ways.

- If the network supports dynamic TCP/IP configuration using the Dynamic Host Configuration Protocol (DHCP), all address information can be assigned automatically.
- If the network does not support DHCP, or if the analyzer is set to use alternate TCP/IP configuration, the addresses must be set manually.

By default, the analyzer is configured to use dynamic TCP/IP configuration and obtain all address information automatically. This means that it is safe to establish a physical connection to the LAN without any previous analyzer configuration.

**Administrator account**

You need administrator rights to change the TCP/IP configuration. See note on "[User accounts and password protection](#)" on page 50 for details.

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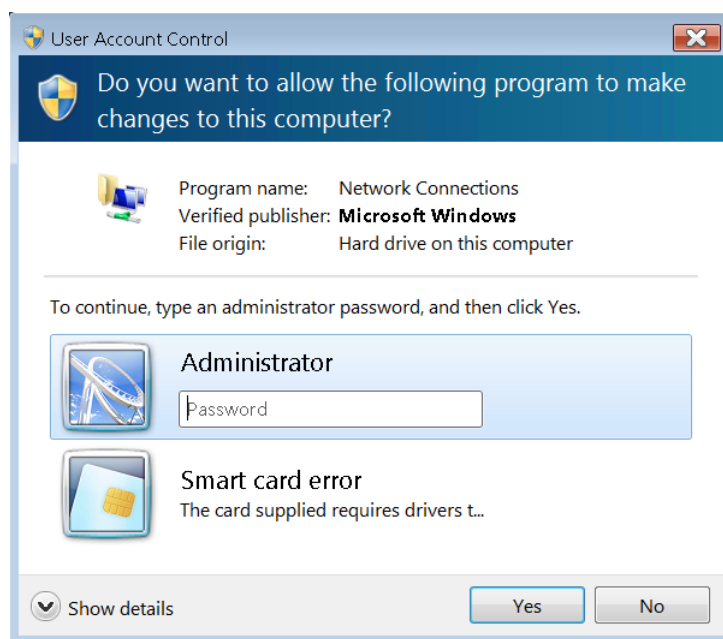
**NOTICE****Manual TCP/IP configuration**

If your network does not support DHCP, or if you choose to disable dynamic TCP/IP configuration, you must assign valid address information **before** you connect the analyzer to the LAN. Contact your network administrator to obtain a valid IP address, because connection errors can affect the entire network.

---

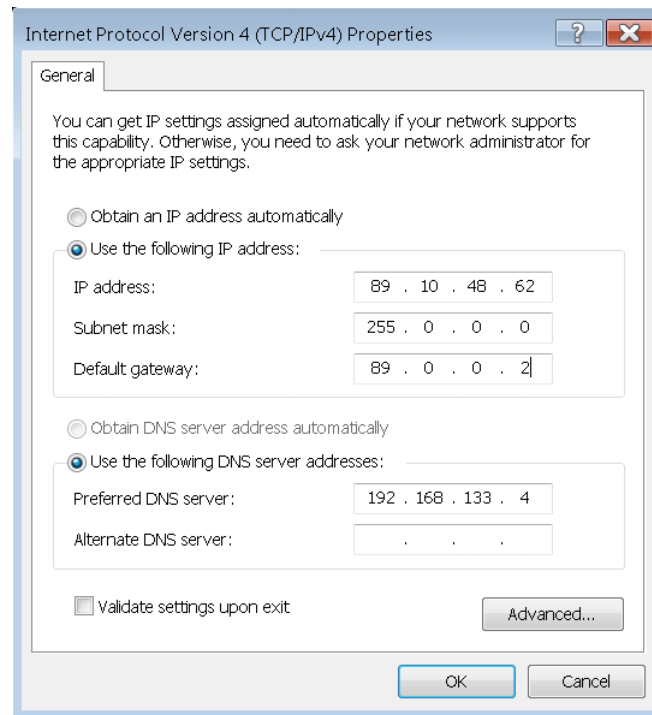
To disable dynamic TCP/IP configuration and enter the TCP/IP address information manually proceed as follows:

1. Obtain the IP address and subnet mask for the analyzer and the IP address for the local default gateway from your network administrator. If needed, also obtain the name of your DNS domain and the IP addresses of the DNS and WINS servers on your network.
2. Press the Windows key in the SYSTEM keypad or on an external keyboard to access Windows®.
3. Open the "Control Panel > Network and Internet > Network and Sharing Center > Local Area Connection Status" dialog.
4. Tap "Properties" and confirm the user account control message, depending on your current user account.
  - If your current account is an administrator account, click "Yes".
  - If your account is an account with standard user rights, enter the password of the administrator account and click "Yes".



**Fig. 6-1: Windows 7 User Account Control dialog**

5. In the "Local Area Connection Properties" dialog opened, select "Internet Protocol Version 4 (TCP/IPv4) > Properties" and enter the IP address information, e.g.:



### 6.3.2 Remote Desktop Connection

Remote Desktop is a Windows® application which you can use to access and control the analyzer from a remote computer through a LAN connection. While the measurement is running, the analyzer screen contents are displayed on the remote computer, and Remote Desktop provides access to all of the applications, files, and network resources of the analyzer.

For detailed information about Remote Desktop and the connection refer to the Windows® Help.

To establish the connection proceed as follows:

1. Connect the R&S ZNB to the network; see [chapter 3.4.5, "Connecting a LAN Cable"](#), on page 23.
2. Press the Windows button and open operating system's control panel.
3. Select "System and Security > System > Allow remote access" and open the "Remote" tab in the "System Properties" dialog. Enable "Allow connections from computers running any version of Remote Desktop". You must confirm a user account control message to allow the desired changes (see [figure 6-1](#)).
4. Tap "Select Users..." and ensure that "instrument" is added as a Remote Desktop user.

5. Tap "Control Panel > System and Security > Administrative Tools > Services". In the list of local services opened, right-click "Smart Card" and select "Stop".

This will disable the smart card service of the network analyzer for the current session.

**Tip:** Do not attempt to disable the smart card service permanently. Otherwise you have to re-logon as an administrator and re-enable the service in order to restore the proper functioning of the analyzer and its options.

6. Determine the computer name ("Control Panel > Network and Internet > Network and Sharing Center > Local Area Connection > Details") or IP address ("Control Panel > System and Security > System > Set the name of this computer" or `ipconfig` command in the command prompt) of your R&S ZNB. See also [chapter 6.3.1, "Assigning an IP Address"](#), on page 52.
7. Click "Start > Programs > Accessories > Remote Desktop Connection" on your remote computer. Establish a connection using the R&S ZNB's computer name or IP address. You can also use other utilities providing remote PC access, e.g. VNC.

### 6.3.3 Windows® Firewall Settings

A firewall protects an instrument by preventing unauthorized users from gaining access to it through a network. In the default configuration of the R&S ZNB the firewall is enabled. A remote desktop connection does not require any changes in the firewall settings.



#### Administrator account

You need administrator rights to change the firewall settings. See note on ["User accounts and password protection"](#) on page 50 above for details.

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Some actions require a different firewall configuration, e.g.:

- To transfer data with other hosts in the LAN, you have to allow "File and Printer Sharing".

To change the firewall settings proceed as follows:

1. Access the operating system by pressing the Windows® key on the external keyboard. Open the "Control Panel".
2. Select "System and Security > Windows Firewall".
  - Tap "Change Settings > Allow a program or feature through Windows Firewall" to enable "File and Printer Sharing".
  - Tap "Turn Windows Firewall on or off" to enable or disable the firewall.

You must confirm a user account control message to allow the desired changes (see [figure 6-1](#)). For detailed information about the firewall refer to the Windows® Help.



**NOTICE****Risks of changing the firewall settings**

Disabling the firewall or allowing exceptions may make your instrument more vulnerable to viruses and intruders. It is recommend to restore the default firewall configuration after completing a task which requires modified settings.

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## 7 Maintenance

The R&S ZNB vector network analyzer does not require any special maintenance.

For our support center address and a list of useful R&S contact addresses refer to the documentation CD-ROM or the "Contact" page at the beginning of the Help system.

### 7.1 Storing and Packing the Instrument

The vector network analyzer can be stored at the temperature range quoted in the data sheet. When it is stored for a longer period of time the unit should be protected against dust.

The original packing should be used when the unit is to be transported or dispatched; please also observe the notes in [chapter 2.1, "Unpacking and Checking the Instrument"](#), on page 8.

### 7.2 Replacing Fuses

The optional DC inputs BIAS <no> at the rear panel (option R&S ZNB-B1) are each protected by a fuse (0.250 A, F IEC60127-2/2, stock no. 0020.7246.00).

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**⚠ WARNING****Shock hazard**

Before replacing a fuse, make sure that the instrument is switched off and disconnected from all power supplies.

Always use fuses supplied by Rohde & Schwarz as spare parts, or fuses of the same type and rating.

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- ▶ To replace the fuses open the fuse holder by slightly turning the lid counterclockwise.

## 8 Obtaining Technical Support

The instrument generates error messages which in most cases will be sufficient for you to detect the cause of an error and find a remedy. Error message types are described in the R&S ZNB User Manual; refer to section "Error Messages and Troubleshooting".

In addition, our customer support centers are there to assist you in solving any problems that you may encounter with your network analyzer. We will find solutions more quickly and efficiently if you provide us with the information listed below. Simply open the relevant dialogs in the "Info" dialog, tap Save..., and send us the file.

- **Setup Info:** The instrument setup information ("Info > Setup Info") contains your instrument settings. You can also send us the VNA recall set file (\*.znx) that you generate after the fault occurs ("File > Recall Sets > Save...").
- **Option Info:** The option info ("Info > Option Info") informs us about the status of all software and hardware options of your analyzer.
- **Hardware Info:** The hardware info ("Info > Hardware Info") shows us the installed options and hardware assemblies.
- **Error Log:** The error log ("Info > Error Log") contains a chronological record of errors.
- **Save Report:** The system report command ("Info > Save Report") collects the setup, option, and hardware information as well as the error log and the current selftest results and writes everything to a \*.zip file. The \*.zip file also contains the current eeprom data and a screenshot of the VNA display. It is written to the report directory C:\Users\Public\Documents\Vna\Report. The file name contains the current date and time, e.g. report\_20110125\_1658.zip. "Save Report" provides the most comprehensive information, comprising all other "Info" files.

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