

R&S® Cable Rider ZPH

Handheld Cable and Antenna Analyzer

User Manual



1321.0950.02 – 02

This document describes the following R&S®Cable Rider ZPH model and options:

- R&S®ZPH (1321.1211.02)
- R&S®ZPH-B4, Frequency extension to 4 GHz, (1321.0380.02)
- R&S®ZPH-B10, GPS support, (1321.0396.02)
- R&S®ZPH-K9, Power sensor support, (1321.0415.02)
- R&S®ZPH-K19, Power meter, (1321.0409.02)
- R&S®ZPH-K29, Pulse measurements with power sensor, (1321.0421.02)

The contents of this manual correspond to firmware version 1.10 or higher.

The software contained in this product makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgement" document, which is available for download from the R&S Cable Rider ZPH product page at <http://www.rohde-schwarz.com/product/zph.html> > "Downloads" > "Firmware".

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

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Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol , e.g. R&S®Cable Rider ZPH is indicated as R&S Cable Rider ZPH.

Basic Safety Instructions

Always read through and comply with the following safety instructions!

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

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

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

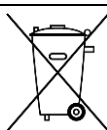
Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before and when using the product. It is also absolutely essential to observe the additional safety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

Safety labels on products

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

Symbol	Meaning	Symbol	Meaning
	Notice, general danger location Observe product documentation		ON/OFF Power
	Caution when handling heavy equipment		Standby indication
	Danger of electric shock		Direct current (DC)

Basic Safety Instructions

Symbol	Meaning	Symbol	Meaning
	Caution ! Hot surface		Alternating current (AC)
	Protective conductor terminal To identify any terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth		Direct/alternating current (DC/AC)
	Earth (Ground)		Class II Equipment to identify equipment meeting the safety requirements specified for Class II equipment (device protected by double or reinforced insulation)
	Frame or chassis Ground terminal		EU labeling for batteries and accumulators For additional information, see section "Waste disposal/Environmental protection", item 1.
	Be careful when handling electrostatic sensitive devices		EU labeling for separate collection of electrical and electronic devices For additional information, see section "Waste disposal/Environmental protection", item 2.
	Warning! Laser radiation For additional information, see section "Operation", item 7.		

Signal words and their meaning

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



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



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



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



Indicates information considered important, but not hazard-related, e.g. messages relating to property damage.

In the product documentation, the word ATTENTION is used synonymously.

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

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Operating states and operating positions

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

1. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products:
predefined operating position is always with the housing floor facing down, IP protection 2X, use only indoors, max. operating altitude 2000 m above sea level, max. transport altitude 4500 m above sea level. A tolerance of $\pm 10\%$ shall apply to the nominal voltage and $\pm 5\%$ to the nominal frequency, overvoltage category 2, pollution degree 2.
2. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves). An installation that is not carried out as described in the product documentation could result in personal injury or even death.
3. Do not place the product on heat-generating devices such as radiators or fan heaters. The ambient temperature must not exceed the maximum temperature specified in the product documentation or in the data sheet. Product overheating can cause electric shock, fire and/or serious personal injury or even death.

Electrical safety

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

1. Prior to switching on the product, always ensure that the nominal voltage setting on the product matches the nominal voltage of the mains-supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with a protective conductor contact and protective conductor.
3. Intentionally breaking the protective conductor either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
4. If there is no power switch for disconnecting the product from the mains, or if the power switch is not suitable for this purpose, use the plug of the connecting cable to disconnect the product from the mains. In such cases, always ensure that the power plug is easily reachable and accessible at all times. For example, if the power plug is the disconnecting device, the length of the connecting cable must not exceed 3 m. Functional or electronic switches are not suitable for providing disconnection from the AC supply network. If products without power switches are integrated into racks or systems, the disconnecting device must be provided at the system level.
5. Never use the product if the power cable is damaged. Check the power cables on a regular basis to ensure that they are in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by, for example, tripping over the cable or suffering an electric shock.

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6. The product may be operated only from TN/TT supply networks fuse-protected with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket provided for this purpose. Otherwise, sparks that result in fire and/or injuries may occur.
8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
9. For measurements in circuits with voltages $V_{rms} > 30$ V, suitable measures (e.g. appropriate measuring equipment, fuse protection, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC 60950-1 / EN 60950-1 or IEC 61010-1 / EN 61010-1 standards that apply in each case.
11. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
12. If a product is to be permanently installed, the connection between the protective conductor terminal on site and the product's protective conductor must be made first before any other connection is made. The product may be installed and connected only by a licensed electrician.
13. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fuse-protected in such a way that anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.
14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.
15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.
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.

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2. Before you move or transport the product, read and observe the section titled "Transport".
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.
4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal/Environmental protection", item 1.
5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.
6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.
7. Laser products are given warning labels that are standardized according to their laser class. Lasers can cause biological harm due to the properties of their radiation and due to their extremely concentrated electromagnetic power. If a laser product (e.g. a CD/DVD drive) is integrated into a Rohde & Schwarz product, absolutely no other settings or functions may be used as described in the product documentation. The objective is to prevent personal injury (e.g. due to laser beams).
8. EMC classes (in line with EN 55011/CISPR 11, and analogously with EN 55022/CISPR 22, EN 55032/CISPR 32)
 - Class A equipment:
Equipment suitable for use in all environments except residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings
Note: Class A equipment is intended for use in an industrial environment. This equipment may cause radio disturbances in residential environments, due to possible conducted as well as radiated disturbances. In this case, the operator may be required to take appropriate measures to eliminate these disturbances.
 - Class B equipment:
Equipment suitable for use in residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings

Repair and service

1. The product may be opened only by authorized, specially trained personnel. Before any work is performed on the product or before the product is opened, it must be disconnected from the AC supply network. Otherwise, personnel will be exposed to the risk of an electric shock.

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2. Adjustments, replacement of parts, maintenance and repair may be performed only by electrical experts authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, protective conductor test, insulation resistance measurement, leakage current measurement, functional test). This helps ensure the continued safety of the product.

Batteries and rechargeable batteries/cells

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

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

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.

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

Waste disposal/Environmental protection

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

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

Instrucciones de seguridad elementales

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

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

Instrucciones de seguridad elementales

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

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

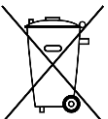
Tener en cuenta las informaciones de seguridad sirve para evitar en lo posible lesiones o daños por peligros de toda clase. Por eso es imprescindible leer detalladamente y comprender por completo las siguientes informaciones de seguridad antes de usar el producto, y respetarlas durante el uso del producto.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

Señalización de seguridad de los productos

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

Símbolo	Significado	Símbolo	Significado
	Aviso: punto de peligro general Observar la documentación del producto		Tensión de alimentación de PUESTA EN MARCHA / PARADA
	Atención en el manejo de dispositivos de peso elevado		Indicación de estado de espera (standby)
	Peligro de choque eléctrico		Corriente continua (DC)
	Advertencia: superficie caliente		Corriente alterna (AC)
	Conexión a conductor de protección		Corriente continua / Corriente alterna (DC/AC)

Instrucciones de seguridad elementales

Símbolo	Significado	Símbolo	Significado
	Conexión a tierra		El aparato está protegido en su totalidad por un aislamiento doble (reforzado)
	Conexión a masa		Distintivo de la UE para baterías y acumuladores Más información en la sección "Eliminación/protección del medio ambiente", punto 1.
	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)		Distintivo de la UE para la eliminación por separado de dispositivos eléctricos y electrónicos Más información en la sección "Eliminación/protección del medio ambiente", punto 2.
	Advertencia: rayo láser Más información en la sección "Funcionamiento", punto 7.		

Palabras de señal y su significado

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



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



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



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



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

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

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

Instrucciones de seguridad elementales

Estados operativos y posiciones de funcionamiento

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

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

Seguridad eléctrica

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

1. Antes de la puesta en marcha del producto se deberá comprobar siempre que la tensión preseleccionada en el producto coincida con la de la red de alimentación eléctrica. Si es necesario modificar el ajuste de tensión, también se deberán cambiar en caso dado los fusibles correspondientes del producto.
2. Los productos de la clase de protección I con alimentación móvil y enchufe individual solamente podrán enchufarse a tomas de corriente con contacto de seguridad y con conductor de protección conectado.
3. Queda prohibida la interrupción intencionada del conductor de protección, tanto en la toma de corriente como en el mismo producto. La interrupción puede tener como consecuencia el riesgo de que el producto sea fuente de choques eléctricos. Si se utilizan cables alargadores o regletas de enchufe, deberá garantizarse la realización de un examen regular de los mismos en cuanto a su estado técnico de seguridad.
4. Si el producto no está equipado con un interruptor para desconectarlo de la red, o bien si el interruptor existente no resulta apropiado para la desconexión de la red, el enchufe del cable de conexión se deberá considerar como un dispositivo de desconexión. El dispositivo de desconexión se debe poder alcanzar fácilmente y debe estar siempre bien accesible. Si, p. ej., el enchufe de conexión a la red es el dispositivo de desconexión, la longitud del cable de conexión no debe superar 3 m). Los interruptores selectores o electrónicos no son aptos para el corte de la red eléctrica. Si se

Instrucciones de seguridad elementales

integran productos sin interruptor en bastidores o instalaciones, se deberá colocar el interruptor en el nivel de la instalación.

5. No utilice nunca el producto si está dañado el cable de conexión a red. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegúrese, mediante las medidas de protección y de instalación adecuadas, de que el cable de conexión a red no pueda ser dañado o de que nadie pueda ser dañado por él, p. ej. al tropezar o por un choque eléctrico.
6. Solamente está permitido el funcionamiento en redes de alimentación TN/TT aseguradas con fusibles de 16 A como máximo (utilización de fusibles de mayor amperaje solo previa consulta con el grupo de empresas Rohde & Schwarz).
7. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. La no observación de estas medidas puede provocar chispas, fuego y/o lesiones.
8. No sobrecargue las tomas de corriente, los cables alargadores o las regletas de enchufe ya que esto podría causar fuego o choques eléctricos.
9. En las mediciones en circuitos de corriente con una tensión $U_{\text{eff}} > 30 \text{ V}$ se deberán tomar las medidas apropiadas para impedir cualquier peligro (p. ej. medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
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.

Instrucciones de seguridad elementales

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/protección del medio ambiente", punto 1.
5. Ciertos productos, como p. ej. las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. Deben tomarse todas las medidas necesarias para la protección de las mujeres embarazadas. También las personas con marcapasos pueden correr peligro a causa de la radiación electromagnética. El empresario/operador tiene la obligación de evaluar y señalizar 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. Los productos con láser están provistos de indicaciones de advertencia normalizadas en función de la clase de láser del que se trate. Los rayos láser pueden provocar daños de tipo biológico a causa de las propiedades de su radiación y debido a su concentración extrema de potencia electromagnética. En caso de que un producto Rohde & Schwarz contenga un producto láser (p. ej. un lector de CD/DVD), no debe usarse ninguna otra configuración o función aparte de las descritas en la documentación del producto, a fin de evitar lesiones (p. ej. debidas a irradiación láser).
8. Clases de compatibilidad electromagnética (conforme a EN 55011 / CISPR 11; y en analogía con EN 55022 / CISPR 22, EN 55032 / CISPR 32)
 - Aparato de clase A:
Aparato adecuado para su uso en todos los entornos excepto en los residenciales y en aquellos conectados directamente a una red de distribución de baja tensión que suministra corriente a edificios residenciales.
Nota: Los aparatos de clase A están destinados al uso en entornos industriales. Estos aparatos

Instrucciones de seguridad elementales

pueden causar perturbaciones radioeléctricas en entornos residenciales debido a posibles perturbaciones guiadas o radiadas. En este caso, se le podrá solicitar al operador que tome las medidas adecuadas para eliminar estas perturbaciones.

- Aparato de clase B:

Aparato adecuado para su uso en entornos residenciales, así como en aquellos conectados directamente a una red de distribución de baja tensión que suministra corriente a edificios residenciales.

Reparación y mantenimiento

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

Baterías y acumuladores o celdas

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

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

Instrucciones de seguridad elementales

8. En caso de devolver baterías de litio a las filiales de Rohde & Schwarz, debe cumplirse las normativas sobre los modos de transporte (IATA-DGR, código IMDG, ADR, RID).

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/protección del medio ambiente

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

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

Grundlegende Sicherheitshinweise

Lesen und beachten Sie unbedingt die nachfolgenden Anweisungen und Sicherheitshinweise!

Alle Werke und Standorte der Rohde & Schwarz Firmengruppe sind ständig bemüht, den Sicherheitsstandard unserer Produkte auf dem aktuellsten Stand zu halten und unseren Kunden ein höchstmögliches Maß an Sicherheit zu bieten. Unsere Produkte und die dafür erforderlichen Zusatzgeräte werden entsprechend der jeweils gültigen Sicherheitsvorschriften gebaut und geprüft. Die Einhaltung dieser Bestimmungen wird durch unser Qualitätssicherungssystem laufend überwacht. Das vorliegende Produkt ist gemäß beiliegender EU-Konformitätsbescheinigung gebaut und geprüft und hat das Werk in sicherheitstechnisch einwandfreiem Zustand verlassen. Um diesen Zustand zu erhalten und einen gefahrlosen Betrieb sicherzustellen, muss der Benutzer alle Hinweise, Warnhinweise und Warnvermerke beachten. Bei allen Fragen bezüglich vorliegender Sicherheitshinweise steht Ihnen die Rohde & Schwarz Firmengruppe jederzeit gerne zur Verfügung.

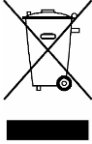
Darüber hinaus liegt es in der Verantwortung des Benutzers, das Produkt in geeigneter Weise zu verwenden. Das Produkt ist ausschließlich für den Betrieb in Industrie und Labor bzw., wenn ausdrücklich zugelassen, auch für den Feldeinsatz bestimmt und darf in keiner Weise so verwendet werden, dass einer Person/Sache Schaden zugefügt werden kann. Die Benutzung des Produkts außerhalb des bestimmungsgemäßen Gebrauchs oder unter Missachtung der Anweisungen des Herstellers liegt in der Verantwortung des Benutzers. Der Hersteller übernimmt keine Verantwortung für die Zweckentfremdung des Produkts.

Die bestimmungsgemäße Verwendung des Produkts wird angenommen, wenn das Produkt nach den Vorgaben der zugehörigen Produktdokumentation innerhalb seiner Leistungsgrenzen verwendet wird (siehe Datenblatt, Dokumentation, nachfolgende Sicherheitshinweise). Die Benutzung des Produkts erfordert Fachkenntnisse und zum Teil englische Sprachkenntnisse. Es ist daher zu beachten, dass das Produkt ausschließlich von Fachkräften oder sorgfältig eingewiesenen Personen mit entsprechenden Fähigkeiten bedient werden darf. Sollte für die Verwendung von Rohde & Schwarz-Produkten persönliche Schutzausrüstung erforderlich sein, wird in der Produktdokumentation an entsprechender Stelle darauf hingewiesen. Bewahren Sie die grundlegenden Sicherheitshinweise und die Produktdokumentation gut auf und geben Sie diese an weitere Benutzer des Produkts weiter.

Die Einhaltung der Sicherheitshinweise dient dazu, Verletzungen oder Schäden durch Gefahren aller Art auszuschließen. Hierzu ist es erforderlich, dass die nachstehenden Sicherheitshinweise vor der Benutzung des Produkts sorgfältig gelesen und verstanden sowie bei der Benutzung des Produkts beachtet werden. Sämtliche weitere Sicherheitshinweise wie z.B. zum Personenschutz, die an entsprechender Stelle der Produktdokumentation stehen, sind ebenfalls unbedingt zu beachten. In den vorliegenden Sicherheitshinweisen sind sämtliche von der Rohde & Schwarz Firmengruppe vertriebenen Waren unter dem Begriff „Produkt“ zusammengefasst, hierzu zählen u. a. Geräte, Anlagen sowie sämtliches Zubehör.

Grundlegende Sicherheitshinweise

Symbole und Sicherheitskennzeichnungen

Symbol	Bedeutung	Symbol	Bedeutung
	Achtung, allgemeine Gefahrenstelle Produktdokumentation beachten	○	EIN-/AUS (Versorgung)
	Vorsicht beim Umgang mit Geräten mit hohem Gewicht	⏻	Stand-by-Anzeige
	Gefahr vor elektrischem Schlag	≡	Gleichstrom (DC)
	Warnung vor heißer Oberfläche	~	Wechselstrom (AC)
	Schutzleiteranschluss	⎓	Gleichstrom/Wechselstrom (DC/AC)
	Erdungsanschluss		Gerät entspricht den Sicherheitsanforderungen an die Schutzklasse II (Gerät durchgehend durch doppelte / verstärkte Isolierung geschützt).
	Masseanschluss des Gestells oder Gehäuses		EU - Kennzeichnung für Batterien und Akkumulatoren. Das Gerät enthält eine Batterie bzw. einen Akkumulator. Diese dürfen nicht über unsortierten Siedlungsabfall entsorgt werden, sondern sollten getrennt gesammelt werden. Weitere Informationen siehe Seite 7.
	Achtung beim Umgang mit elektrostatisch gefährdeten Bauelementen		EU - Kennzeichnung für die getrennte Sammlung von Elektro- und Elektronikgeräten. Elektroaltgeräte dürfen nicht über unsortierten Siedlungsabfall entsorgt werden, sondern müssen getrennt gesammelt werden. Weitere Informationen siehe Seite 7.
	Warnung vor Laserstrahl Produkte mit Laser sind je nach ihrer Laser-Klasse mit genormten Warnhinweisen versehen. Laser können aufgrund der Eigenschaften ihrer Strahlung und aufgrund ihrer extrem konzentrierten elektromagnetischen Leistung biologische Schäden verursachen. Für zusätzliche Informationen siehe Kapitel „Betrieb“ Punkt 7.		

Grundlegende Sicherheitshinweise

Signalworte und ihre Bedeutung

Die folgenden Signalworte werden in der Produktdokumentation verwendet, um vor Risiken und Gefahren zu warnen.



kennzeichnet eine unmittelbare Gefährdung mit hohem Risiko, die Tod oder schwere Körperverletzung zur Folge haben wird, wenn sie nicht vermieden wird.



kennzeichnet eine mögliche Gefährdung mit mittlerem Risiko, die Tod oder (schwere) Körperverletzung zur Folge haben kann, wenn sie nicht vermieden wird.



kennzeichnet eine Gefährdung mit geringem Risiko, die leichte oder mittlere Körperverletzungen zur Folge haben könnte, wenn sie nicht vermieden wird.



weist auf die Möglichkeit einer Fehlbedienung hin, bei der das Produkt Schaden nehmen kann.

Diese Signalworte entsprechen der im europäischen Wirtschaftsraum üblichen Definition für zivile Anwendungen. Neben dieser Definition können in anderen Wirtschaftsräumen oder bei militärischen Anwendungen abweichende Definitionen existieren. Es ist daher darauf zu achten, dass die hier beschriebenen Signalworte stets nur in Verbindung mit der zugehörigen Produktdokumentation und nur in Verbindung mit dem zugehörigen Produkt verwendet werden. Die Verwendung von Signalworten in Zusammenhang mit nicht zugehörigen Produkten oder nicht zugehörigen Dokumentationen kann zu Fehlinterpretationen führen und damit zu Personen- oder Sachschäden führen.

Betriebszustände und Betriebslagen

Das Produkt darf nur in den vom Hersteller angegebenen Betriebszuständen und Betriebslagen ohne Behinderung der Belüftung betrieben werden. Werden die Herstellerangaben nicht eingehalten, kann dies elektrischen Schlag, Brand und/oder schwere Verletzungen von Personen, unter Umständen mit Todesfolge, verursachen. Bei allen Arbeiten sind die örtlichen bzw. landesspezifischen Sicherheits- und Unfallverhütungsvorschriften zu beachten.

1. Sofern nicht anders vereinbart, gilt für R&S-Produkte folgendes:
als vorgeschriebene Betriebslage grundsätzlich Gehäuseboden unten, IP-Schutzart 2X, Verschmutzungsgrad 2, Überspannungskategorie 2, nur in Innenräumen verwenden, Betrieb bis 2000 m ü. NN, Transport bis 4500 m ü. NN, für die Nennspannung gilt eine Toleranz von $\pm 10\%$, für die Nennfrequenz eine Toleranz von $\pm 5\%$.
2. Stellen Sie das Produkt nicht auf Oberflächen, Fahrzeuge, Ablagen oder Tische, die aus Gewichts- oder Stabilitätsgründen nicht dafür geeignet sind. Folgen Sie bei Aufbau und Befestigung des Produkts an Gegenständen oder Strukturen (z.B. Wände und Regale) immer den Installationshinweisen des Herstellers. Bei Installation abweichend von der Produktdokumentation können Personen verletzt, unter Umständen sogar getötet werden.
3. Stellen Sie das Produkt nicht auf hitzeerzeugende Gerätschaften (z.B. Radiatoren und Heizlüfter). Die Umgebungstemperatur darf nicht die in der Produktdokumentation oder im Datenblatt spezifizierte Maximaltemperatur überschreiten. Eine Überhitzung des Produkts kann elektrischen Schlag, Brand und/oder schwere Verletzungen von Personen, unter Umständen mit Todesfolge, verursachen.

Elektrische Sicherheit

Werden die Hinweise zur elektrischen Sicherheit nicht oder unzureichend beachtet, kann dies elektrischen Schlag, Brand und/oder schwere Verletzungen von Personen, unter Umständen mit Todesfolge, verursachen.

1. Vor jedem Einschalten des Produkts ist sicherzustellen, dass die am Produkt eingestellte Nennspannung und die Netznennspannung des Versorgungsnetzes übereinstimmen. Ist es erforderlich, die Spannungseinstellung zu ändern, so muss ggf. auch die dazu gehörige Netzsicherung des Produkts geändert werden.
2. Bei Produkten der Schutzklasse I mit beweglicher Netzzuleitung und Gerätesteckvorrichtung ist der Betrieb nur an Steckdosen mit Schutzkontakt und angeschlossenem Schutzleiter zulässig.
3. Jegliche absichtliche Unterbrechung des Schutzleiters, sowohl in der Zuleitung als auch am Produkt selbst, ist unzulässig. Es kann dazu führen, dass von dem Produkt die Gefahr eines elektrischen Schlags ausgeht. Bei Verwendung von Verlängerungsleitungen oder Steckdosenleisten ist sicherzustellen, dass diese regelmäßig auf ihren sicherheitstechnischen Zustand überprüft werden.
4. Sofern das Produkt nicht mit einem Netzschalter zur Netztrennung ausgerüstet ist, beziehungsweise der vorhandene Netzschalter zu Netztrennung nicht geeignet ist, so ist der Stecker des Anschlusskabels als Trennvorrichtung anzusehen.
Die Trennvorrichtung muss jederzeit leicht erreichbar und gut zugänglich sein. Ist z.B. der Netzstecker die Trennvorrichtung, darf die Länge des Anschlusskabels 3 m nicht überschreiten.
Funktionsschalter oder elektronische Schalter sind zur Netztrennung nicht geeignet. Werden Produkte ohne Netzschalter in Gestelle oder Anlagen integriert, so ist die Trennvorrichtung auf Anlagenebene zu verlagern.
5. Benutzen Sie das Produkt niemals, wenn das Netzkabel beschädigt ist. Überprüfen Sie regelmäßig den einwandfreien Zustand der Netzkabel. Stellen Sie durch geeignete Schutzmaßnahmen und Verlegearten sicher, dass das Netzkabel nicht beschädigt werden kann und niemand z.B. durch Stolperfallen oder elektrischen Schlag zu Schaden kommen kann.
6. Der Betrieb ist nur an TN/TT Versorgungsnetzen gestattet, die mit höchstens 16 A abgesichert sind (höhere Absicherung nur nach Rücksprache mit der Rohde & Schwarz Firmengruppe).
7. Stecken Sie den Stecker nicht in verstaubte oder verschmutzte Steckdosen/-buchsen. Stecken Sie die Steckverbindung/-vorrichtung fest und vollständig in die dafür vorgesehenen Steckdosen/-buchsen. Missachtung dieser Maßnahmen kann zu Funken, Feuer und/oder Verletzungen führen.
8. Überlasten Sie keine Steckdosen, Verlängerungskabel oder Steckdosenleisten, dies kann Feuer oder elektrische Schläge verursachen.
9. Bei Messungen in Stromkreisen mit Spannungen $U_{\text{eff}} > 30 \text{ V}$ ist mit geeigneten Maßnahmen Vorsorge zu treffen, dass jegliche Gefährdung ausgeschlossen wird (z.B. geeignete Messmittel, Absicherung, Strombegrenzung, Schutztrennung, Isolierung usw.).
10. Bei Verbindungen mit informationstechnischen Geräten, z.B. PC oder Industrierechner, ist darauf zu achten, dass diese der jeweils gültigen IEC 60950-1 / EN 60950-1 oder IEC 61010-1 / EN 61010-1 entsprechen.
11. Sofern nicht ausdrücklich erlaubt, darf der Deckel oder ein Teil des Gehäuses niemals entfernt werden, wenn das Produkt betrieben wird. Dies macht elektrische Leitungen und Komponenten zugänglich und kann zu Verletzungen, Feuer oder Schaden am Produkt führen.

Grundlegende Sicherheitshinweise

12. Wird ein Produkt ortsfest angeschlossen, ist die Verbindung zwischen dem Schutzleiteranschluss vor Ort und dem Geräteschutzleiter vor jeglicher anderer Verbindung herzustellen. Aufstellung und Anschluss darf nur durch eine Elektrofachkraft erfolgen.
13. Bei ortsfesten Geräten ohne eingebaute Sicherung, Selbstschalter oder ähnliche Schutzeinrichtung muss der Versorgungskreis so abgesichert sein, dass alle Personen, die Zugang zum Produkt haben, sowie das Produkt selbst ausreichend vor Schäden geschützt sind.
14. Jedes Produkt muss durch geeigneten Überspannungsschutz vor Überspannung (z.B. durch Blitzschlag) geschützt werden. Andernfalls ist das bedienende Personal durch elektrischen Schlag gefährdet.
15. Gegenstände, die nicht dafür vorgesehen sind, dürfen nicht in die Öffnungen des Gehäuses eingebracht werden. Dies kann Kurzschlüsse im Produkt und/oder elektrische Schläge, Feuer oder Verletzungen verursachen.
16. Sofern nicht anders spezifiziert, sind Produkte nicht gegen das Eindringen von Flüssigkeiten geschützt, siehe auch Abschnitt "Betriebszustände und Betriebslagen", Punkt 1. Daher müssen die Geräte vor Eindringen von Flüssigkeiten geschützt werden. Wird dies nicht beachtet, besteht Gefahr durch elektrischen Schlag für den Benutzer oder Beschädigung des Produkts, was ebenfalls zur Gefährdung von Personen führen kann.
17. Benutzen Sie das Produkt nicht unter Bedingungen, bei denen Kondensation in oder am Produkt stattfinden könnte oder ggf. bereits stattgefunden hat, z.B. wenn das Produkt von kalter in warme Umgebung bewegt wurde. Das Eindringen von Wasser erhöht das Risiko eines elektrischen Schlages.
18. Trennen Sie das Produkt vor der Reinigung komplett von der Energieversorgung (z.B. speisendes Netz oder Batterie). Nehmen Sie bei Geräten die Reinigung mit einem weichen, nicht fasernden Staublappen vor. Verwenden Sie keinesfalls chemische Reinigungsmittel wie z.B. Alkohol, Aceton, Nitroverdünnung.

Betrieb

1. Die Benutzung des Produkts erfordert spezielle Einweisung und hohe Konzentration während der Benutzung. Es muss sichergestellt sein, dass Personen, die das Produkt bedienen, bezüglich ihrer körperlichen, geistigen und seelischen Verfassung den Anforderungen gewachsen sind, da andernfalls Verletzungen oder Sachschäden nicht auszuschließen sind. Es liegt in der Verantwortung des Arbeitsgebers/Betreibers, geeignetes Personal für die Benutzung des Produkts auszuwählen.
2. Bevor Sie das Produkt bewegen oder transportieren, lesen und beachten Sie den Abschnitt "Transport".
3. Wie bei allen industriell gefertigten Gütern kann die Verwendung von Stoffen, die Allergien hervorrufen - so genannte Allergene (z.B. Nickel) - nicht generell ausgeschlossen werden. Sollten beim Umgang mit R&S-Produkten allergische Reaktionen, z.B. Hautausschlag, häufiges Niesen, Bindehautreizung oder Atembeschwerden auftreten, ist umgehend ein Arzt aufzusuchen, um die Ursachen zu klären und Gesundheitsschäden bzw. -belastungen zu vermeiden.
4. Vor der mechanischen und/oder thermischen Bearbeitung oder Zerlegung des Produkts beachten Sie unbedingt Abschnitt "Entsorgung", Punkt 1.

Grundlegende Sicherheitshinweise

5. Bei bestimmten Produkten, z.B. HF-Funkanlagen, können funktionsbedingt erhöhte elektromagnetische Strahlungen auftreten. Unter Berücksichtigung der erhöhten Schutzwürdigkeit des ungeborenen Lebens müssen Schwangere durch geeignete Maßnahmen geschützt werden. Auch Träger von Herzschrittmachern können durch elektromagnetische Strahlungen gefährdet sein. Der Arbeitgeber/Betreiber ist verpflichtet, Arbeitsstätten, bei denen ein besonderes Risiko einer Strahlenexposition besteht, zu beurteilen und zu kennzeichnen und mögliche Gefahren abzuwenden.
6. Im Falle eines Brandes entweichen ggf. giftige Stoffe (Gase, Flüssigkeiten etc.) aus dem Produkt, die Gesundheitsschäden verursachen können. Daher sind im Brandfall geeignete Maßnahmen wie z.B. Atemschutzmasken und Schutzkleidung zu verwenden.
7. Falls ein Laser-Produkt in ein R&S-Produkt integriert ist (z.B. CD/DVD-Laufwerk), dürfen keine anderen Einstellungen oder Funktionen verwendet werden, als in der Produktdokumentation beschrieben, um Personenschäden zu vermeiden (z.B. durch Laserstrahl).
8. EMV Klassen (nach EN 55011 / CISPR 11; sinngemäß EN 55022 / CISPR 22, EN 55032 / CISPR 32)

Gerät der Klasse A:

Ein Gerät, das sich für den Gebrauch in allen anderen Bereichen außer dem Wohnbereich und solchen Bereichen eignet, die direkt an ein Niederspannungs-Versorgungsnetz angeschlossen sind, das Wohngebäude versorgt.

Hinweis: Diese Einrichtung kann wegen möglicher auftretender leitungsgebundener als auch gestrahlten Störgrößen im Wohnbereich Funkstörungen verursachen. In diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen.

Gerät der Klasse B:

Ein Gerät, das sich für den Betrieb im Wohnbereich sowie in solchen Bereichen eignet, die direkt an ein Niederspannungs-Versorgungsnetz angeschlossen sind, das Wohngebäude versorgt.

Reparatur und Service

1. Das Produkt darf nur von dafür autorisiertem Fachpersonal geöffnet werden. Vor Arbeiten am Produkt oder Öffnen des Produkts ist dieses von der Versorgungsspannung zu trennen, sonst besteht das Risiko eines elektrischen Schlages.
2. Abgleich, Auswechseln von Teilen, Wartung und Reparatur darf nur von R&S-autorisierten Elektrofachkräften ausgeführt werden. Werden sicherheitsrelevante Teile (z.B. Netzschalter, Netztrafos oder Sicherungen) ausgewechselt, so dürfen diese nur durch Originalteile ersetzt werden. Nach jedem Austausch von sicherheitsrelevanten Teilen ist eine Sicherheitsprüfung durchzuführen (Sichtprüfung, Schutzleitertest, Isolationswiderstand-, Ableitstrommessung, Funktionstest). Damit wird sichergestellt, dass die Sicherheit des Produkts erhalten bleibt.

Batterien und Akkumulatoren/Zellen

Werden die Hinweise zu Batterien und Akkumulatoren/Zellen nicht oder unzureichend beachtet, kann dies Explosion, Brand und/oder schwere Verletzungen von Personen, unter Umständen mit Todesfolge, verursachen. Die Handhabung von Batterien und Akkumulatoren mit alkalischen Elektrolyten (z.B. Lithiumzellen) muss der EN 62133 entsprechen.

1. Zellen dürfen nicht zerlegt, geöffnet oder zerkleinert werden.
2. Zellen oder Batterien dürfen weder Hitze noch Feuer ausgesetzt werden. Die Lagerung im direkten Sonnenlicht ist zu vermeiden. Zellen und Batterien sauber und trocken halten. Verschmutzte Anschlüsse mit einem trockenen, sauberen Tuch reinigen.

Grundlegende Sicherheitshinweise

3. Zellen oder Batterien dürfen nicht kurzgeschlossen werden. Zellen oder Batterien dürfen nicht gefahrbringend in einer Schachtel oder in einem Schubfach gelagert werden, wo sie sich gegenseitig kurzschließen oder durch andere leitende Werkstoffe kurzgeschlossen werden können. Eine Zelle oder Batterie darf erst aus ihrer Originalverpackung entnommen werden, wenn sie verwendet werden soll.
4. Zellen oder Batterien dürfen keinen unzulässig starken, mechanischen Stößen ausgesetzt werden.
5. Bei Undichtheit einer Zelle darf die Flüssigkeit nicht mit der Haut in Berührung kommen oder in die Augen gelangen. Falls es zu einer Berührung gekommen ist, den betroffenen Bereich mit reichlich Wasser waschen und ärztliche Hilfe in Anspruch nehmen.
6. Werden Zellen oder Batterien, die alkalische Elektrolyte enthalten (z.B. Lithiumzellen), unsachgemäß ausgewechselt oder geladen, besteht Explosionsgefahr. Zellen oder Batterien nur durch den entsprechenden R&S-Typ ersetzen (siehe Ersatzteilliste), um die Sicherheit des Produkts zu erhalten.
7. Zellen oder Batterien müssen wiederverwertet werden und dürfen nicht in den Restmüll gelangen. Akkumulatoren oder Batterien, die Blei, Quecksilber oder Cadmium enthalten, sind Sonderabfall. Beachten Sie hierzu die landesspezifischen Entsorgungs- und Recycling-Bestimmungen.
8. Bei Rücksendungen von Lithiumbatterien zu Rohde & Schwarz - Niederlassungen müssen die Transportvorschriften der Verkehrsträger (IATA-DGR, IMDG-Code, ADR, RID) befolgt werden.

Transport

1. Das Produkt kann ein hohes Gewicht aufweisen. Daher muss es vorsichtig und ggf. unter Verwendung eines geeigneten Hebmittels (z.B. Hubwagen) bewegt bzw. transportiert werden, um Rückenschäden oder Verletzungen zu vermeiden.
2. Griffe an den Produkten sind eine Handhabungshilfe, die ausschließlich für den Transport des Produkts durch Personen vorgesehen ist. Es ist daher nicht zulässig, Griffe zur Befestigung an bzw. auf Transportmitteln, z.B. Kränen, Gabelstaplern, Karren etc. zu verwenden. Es liegt in Ihrer Verantwortung, die Produkte sicher an bzw. auf geeigneten Transport- oder Hebmitteln zu befestigen. Beachten Sie die Sicherheitsvorschriften des jeweiligen Herstellers eingesetzter Transport- oder Hebmittel, um Personenschäden und Schäden am Produkt zu vermeiden.
3. Falls Sie das Produkt in einem Fahrzeug benutzen, liegt es in der alleinigen Verantwortung des Fahrers, das Fahrzeug in sicherer und angemessener Weise zu führen. Der Hersteller übernimmt keine Verantwortung für Unfälle oder Kollisionen. Verwenden Sie das Produkt niemals in einem sich bewegenden Fahrzeug, sofern dies den Fahrzeugführer ablenken könnte. Sichern Sie das Produkt im Fahrzeug ausreichend ab, um im Falle eines Unfalls Verletzungen oder Schäden anderer Art zu verhindern.

Entsorgung

1. Batterien bzw. Akkumulatoren, die nicht mit dem Hausmüll entsorgt werden dürfen, darf nach Ende der Lebensdauer nur über eine geeignete Sammelstelle oder eine Rohde & Schwarz-Kundendienststelle entsorgt werden.
2. Am Ende der Lebensdauer des Produktes darf dieses Produkt nicht über den normalen Hausmüll entsorgt werden, sondern muss getrennt gesammelt werden.
Rohde & Schwarz GmbH & Co.KG ein Entsorgungskonzept entwickelt und übernimmt die Pflichten der Rücknahme- und Entsorgung für Hersteller innerhalb der EU in vollem Umfang. Wenden Sie sich bitte an Ihre Rohde & Schwarz-Kundendienststelle, um das Produkt umweltgerecht zu entsorgen.

Grundlegende Sicherheitshinweise

3. Werden Produkte oder ihre Bestandteile über den bestimmungsgemäßen Betrieb hinaus mechanisch und/oder thermisch bearbeitet, können ggf. gefährliche Stoffe (schwermetallhaltiger Staub wie z.B. Blei, Beryllium, Nickel) freigesetzt werden. Die Zerlegung des Produkts darf daher nur von speziell geschultem Fachpersonal erfolgen. Unsachgemäßes Zerlegen kann Gesundheitsschäden hervorrufen. Die nationalen Vorschriften zur Entsorgung sind zu beachten.
4. Falls beim Umgang mit dem Produkt Gefahren- oder Betriebsstoffe entstehen, die speziell zu entsorgen sind, z.B. regelmäßig zu wechselnde Kühlmittel oder Motorenöle, sind die Sicherheitshinweise des Herstellers dieser Gefahren- oder Betriebsstoffe und die regional gültigen Entsorgungsvorschriften einzuhalten. Beachten Sie ggf. auch die zugehörigen speziellen Sicherheitshinweise in der Produktdokumentation. Die unsachgemäße Entsorgung von Gefahren- oder Betriebsstoffen kann zu Gesundheitsschäden von Personen und Umweltschäden führen.

Weitere Informationen zu Umweltschutz finden Sie auf der Rohde & Schwarz Home Page.

Consignes de sécurité fondamentales

Lisez et respectez impérativement les instructions et consignes de sécurité suivantes

Les usines et sites du groupe Rohde & Schwarz veillent à la conformité des produits du groupe avec les normes de sécurité en vigueur dans un souci constant de garantir aux clients le plus haut niveau de sécurité possible. Nos produits ainsi que les accessoires nécessaires sont fabriqués et testés conformément aux règles de sécurité en vigueur. Le respect de ces règles est vérifié régulièrement par notre système d'assurance qualité. Le présent produit a été fabriqué et contrôlé conformément au certificat de conformité CE ci-joint et a quitté l'usine dans un parfait état de sécurité. Pour le maintenir dans cet état et en garantir une utilisation sans danger, l'utilisateur doit respecter l'ensemble des consignes, remarques de sécurité et avertissements qui se trouvent dans ce manuel. Le groupe Rohde & Schwarz se tient à votre disposition pour toutes questions relatives aux présentes consignes de sécurité.

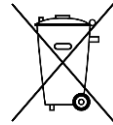
Il incombe à l'utilisateur d'employer ce produit de manière appropriée. Le produit est exclusivement destiné à l'utilisation en industrie et en laboratoire et/ou, si cela a été expressément autorisé, également aux travaux extérieurs ; il ne peut en aucun cas être utilisé à des fins pouvant causer des dommages corporels ou matériels. L'exploitation du produit en dehors de son utilisation prévue ou le non-respect des consignes du fabricant se font sous la responsabilité de l'utilisateur. Le fabricant décline toute responsabilité en cas d'utilisation non conforme du produit.

Le produit est présumé faire l'objet d'une utilisation conforme lorsqu'il est utilisé conformément aux consignes de la documentation produit correspondante et dans la limite de ses performances (voir fiche technique, documentation, consignes de sécurité ci-après). L'utilisation du produit exige des compétences en la matière et des connaissances de base de l'anglais. Par conséquent, le produit ne devra être utilisé que par un personnel qualifié ou des personnes formées de manière approfondie et possédant les compétences requises. Si, pour l'utilisation des produits Rohde & Schwarz, l'emploi d'un équipement personnel de protection s'avère nécessaire, il en est fait mention dans la documentation produit à l'emplacement correspondant. Conservez les consignes de sécurité fondamentales et la documentation produit dans un lieu sûr et transmettez ces documents aux autres utilisateurs du produit.

La stricte observation des consignes de sécurité a pour but d'exclure des blessures ou dommages causés par des dangers de toutes sortes. A cet effet, il est nécessaire de lire avec soin et de bien comprendre les consignes de sécurité ci-dessous avant l'utilisation du produit et de les respecter lors de l'utilisation du produit. Toutes les autres consignes de sécurité présentées à l'emplacement correspondant de la documentation produit, par exemple, celles concernant la protection des personnes, doivent également être impérativement respectées. Dans les présentes consignes de sécurité, toutes les marchandises commercialisées par le groupe Rohde & Schwarz, notamment les appareils, les systèmes ainsi que les accessoires, sont dénommés « produit ».

Consignes de sécurité fondamentales

Symboles et marquages de sécurité

Symbole	Signification	Symbole	Signification
	Avis, source générale de danger Se référer à la documentation produit	○	MARCHE / ARRET (tension d'alimentation)
	Attention lors de la manipulation d'appareils ayant un poids élevé	⏻	Indicateur de veille
	Risque de choc électrique	≡	Courant continu (CC)
	Avertissement, surface chaude	~	Courant alternatif (CA)
	Borne de conducteur de protection	⎓	Courant continu/alternatif (CC/CA)
	Borne de mise à la terre		L'appareil est conforme aux exigences de sécurité du degré de protection II (appareil entièrement protégé par isolation double/renforcée).
	Borne de mise à la masse du bâti ou du boîtier		Marquage UE pour batteries et accumulateurs. L'appareil contient une batterie ou un accumulateur. Ces pièces ne peuvent pas être éliminées avec les déchets urbains non triés, mais doivent faire l'objet d'une collecte séparée. Pour plus d'informations, voir la page 7.
	Avis : prudence lors de la manipulation de composants sensibles aux décharges électrostatiques		Marquage UE pour la collecte séparée d'équipements électriques et électroniques. Les déchets d'équipements électriques et électroniques ne peuvent pas être éliminés avec les déchets urbains non triés, mais doivent faire l'objet d'une collecte séparée. Pour plus d'informations, voir la page 7.
	Avertissement, rayon laser Les produits laser sont munis d'avertissements normalisés d'après leur catégorie laser. En raison des caractéristiques de leur rayonnement ainsi que de leur puissance électromagnétique extrêmement concentrée, les lasers peuvent causer des dommages biologiques. Pour plus d'informations, voir le chapitre « Fonctionnement », point 7.		

Consignes de sécurité fondamentales

Mots d'alerte et significations

Les mots d'alerte suivants sont utilisés dans la documentation produit pour avertir des risques et dangers.



Indique une situation dangereuse immédiate qui, si elle n'est pas évitée, comporte un risque élevé de blessures graves ou mortelles.



Indique une situation dangereuse possible qui, si elle n'est pas évitée, comporte un risque modéré de blessures (graves) ou mortelles.



Indique une situation dangereuse qui, si elle n'est pas évitée, comporte un risque faible de blessures mineures ou modérées.



Indique la possibilité d'une fausse manœuvre susceptible d'endommager le produit.

Ces mots d'alerte correspondent à la définition habituelle utilisée pour des applications civiles dans l'espace économique européen. Des définitions divergentes peuvent cependant exister dans d'autres espaces économiques ou dans le cadre d'applications militaires. Il faut donc veiller à ce que les mots d'alerte décrits ici ne soient utilisés qu'en relation avec la documentation produit correspondante et seulement avec le produit correspondant. L'utilisation des mots d'alerte en relation avec des produits ou des documentations non correspondants peut conduire à des erreurs d'interprétation et par conséquent à des dommages corporels ou matériels.

États et positions de fonctionnement

L'appareil ne doit être utilisé que dans les états et positions de fonctionnement indiqués par le fabricant. Tout obstacle à la ventilation doit être empêché. Le non-respect des indications du fabricant peut provoquer des chocs électriques, des incendies et/ou des blessures graves pouvant éventuellement entraîner la mort. Pour tous les travaux, les règles locales et/ou nationales de sécurité et de prévention des accidents doivent être respectées.

1. Sauf stipulations contraires, les produits Rohde & Schwarz répondent aux exigences ci-après : faire fonctionner le produit avec le fond du boîtier toujours en bas, degré de protection IP 2X, degré de pollution 2, catégorie de surtension 2, utilisation uniquement à l'intérieur, fonctionnement à une altitude max. de 2000 m au-dessus du niveau de la mer, transport à une altitude max. de 4500 m au-dessus du niveau de la mer, tolérance de $\pm 10\%$ pour la tension nominale et de $\pm 5\%$ pour la fréquence nominale.
2. Ne jamais placer le produit sur des surfaces, véhicules, dépôts ou tables non appropriés pour raisons de stabilité ou de poids. Suivre toujours strictement les indications d'installation du fabricant pour le montage et la fixation du produit sur des objets ou des structures (par exemple parois et étagères). En cas d'installation non conforme à la documentation produit, il y a risque de blessures, voire de mort.
3. Ne jamais placer le produit sur des dispositifs générant de la chaleur (par exemple radiateurs et appareils de chauffage soufflants). La température ambiante ne doit pas dépasser la température maximale spécifiée dans la documentation produit ou dans la fiche technique. Une surchauffe du produit peut provoquer des chocs électriques, des incendies et/ou des blessures graves pouvant éventuellement entraîner la mort.

Consignes de sécurité fondamentales

Sécurité électrique

Si les consignes relatives à la sécurité électrique ne sont pas ou sont insuffisamment respectées, il peut s'ensuivre des chocs électriques, des incendies et/ou des blessures graves pouvant éventuellement entraîner la mort.

1. Avant chaque mise sous tension du produit, il faut s'assurer que la tension nominale réglée sur le produit correspond à la tension nominale du réseau électrique. S'il est nécessaire de modifier le réglage de la tension, il faut remplacer le fusible du produit, le cas échéant.
2. L'utilisation des produits du degré de protection I pourvus d'un câble d'alimentation mobile et d'un connecteur n'est autorisée qu'avec des prises munies d'un contact de protection et d'un conducteur de protection raccordé.
3. Toute déconnexion intentionnelle du conducteur de protection, dans le câble ou dans le produit lui-même, est interdite. Elle entraîne un risque de choc électrique au niveau du produit. En cas d'utilisation de câbles prolongateurs ou de multiprises, ceux-ci doivent être examinés régulièrement quant à leur état de sécurité technique.
4. Si le produit n'est pas doté d'un interrupteur d'alimentation pour le couper du réseau électrique ou si l'interrupteur d'alimentation disponible n'est pas approprié pour couper le produit du réseau électrique, le connecteur mâle du câble de raccordement est à considérer comme dispositif de séparation. Le dispositif de séparation doit être à tout moment facilement accessible. Si, par exemple, le connecteur d'alimentation sert de dispositif de séparation, la longueur du câble de raccordement ne doit pas dépasser 3 m.
Les commutateurs fonctionnels ou électroniques ne sont pas appropriés pour couper l'appareil du réseau électrique. Si des produits sans interrupteur d'alimentation sont intégrés dans des bâtis ou systèmes, le dispositif de séparation doit être reporté au niveau du système.
5. Ne jamais utiliser le produit si le câble d'alimentation est endommagé. Vérifier régulièrement le parfait état du câble d'alimentation. Prendre les mesures préventives appropriées et opter pour des types de pose tels que le câble d'alimentation ne puisse pas être endommagé et que personne ne puisse subir de préjudice, par exemple en trébuchant sur le câble ou par des chocs électriques.
6. L'utilisation des produits est uniquement autorisée sur des réseaux d'alimentation de type TN/TT protégés par des fusibles d'une intensité max. de 16 A (pour toute intensité supérieure, consulter le groupe Rohde & Schwarz).
7. Ne pas brancher le connecteur dans des prises d'alimentation sales ou poussiéreuses. Enfoncer fermement le connecteur jusqu'au bout de la prise. Le non-respect de cette mesure peut provoquer des étincelles, incendies et/ou blessures.
8. Ne pas surcharger les prises, les câbles prolongateurs ou les multiprises, cela pouvant provoquer des incendies ou chocs électriques.
9. En cas de mesures sur les circuits électriques d'une tension efficace > 30 V, prendre les précautions nécessaires pour éviter tout risque (par exemple équipement de mesure approprié, fusibles, limitation de courant, coupe-circuit, isolation, etc.).
10. En cas d'interconnexion avec des équipements informatiques comme par exemple un PC ou un ordinateur industriel, veiller à ce que ces derniers soient conformes aux normes IEC 60950-1 / EN 60950-1 ou IEC 61010-1 / EN 61010-1 en vigueur.
11. Sauf autorisation expresse, il est interdit de retirer le couvercle ou toute autre pièce du boîtier lorsque le produit est en cours de service. Les câbles et composants électriques seraient ainsi accessibles, ce qui peut entraîner des blessures, des incendies ou des dégâts sur le produit.

Consignes de sécurité fondamentales

12. Si un produit est connecté de façon stationnaire, établir avant toute autre connexion le raccordement du conducteur de protection local et du conducteur de protection du produit. L'installation et le raccordement ne peuvent être effectués que par un électricien ou électronicien qualifié.
13. Sur les appareils stationnaires sans fusible ni disjoncteur automatique ou dispositif de protection similaire intégrés, le circuit d'alimentation doit être sécurisé de sorte que toutes les personnes ayant accès au produit et le produit lui-même soient suffisamment protégés contre tout dommage.
14. Chaque produit doit être protégé de manière appropriée contre les éventuelles surtensions (par exemple dues à un coup de foudre). Sinon, les utilisateurs sont exposés à des risques de choc électrique.
15. Ne jamais introduire d'objets non prévus à cet effet dans les ouvertures du boîtier, étant donné que cela peut entraîner des courts-circuits dans le produit et/ou des chocs électriques, incendies ou blessures.
16. Sauf spécification contraire, les produits ne sont pas protégés contre l'infiltration de liquides, voir aussi la section « États et positions de fonctionnement », point 1. Il faut donc protéger les produits contre l'infiltration de liquides. La non-observation de cette consigne entraîne le risque de choc électrique pour l'utilisateur ou d'endommagement du produit, ce qui peut également mettre les personnes en danger.
17. Ne pas utiliser le produit dans des conditions pouvant occasionner ou ayant déjà occasionné, le cas échéant, des condensations dans ou sur le produit, par exemple lorsque celui-ci est déplacé d'un environnement froid dans un environnement chaud. L'infiltration d'eau augmente le risque de choc électrique.
18. Avant le nettoyage, débrancher le produit de l'alimentation (par exemple réseau électrique ou batterie). Pour le nettoyage des appareils, utiliser un chiffon doux non pelucheux. N'utiliser en aucun cas de produit de nettoyage chimique, tel que de l'alcool, de l'acétone ou un diluant nitrocellulosique.

Fonctionnement

1. L'utilisation du produit exige une formation spécifique ainsi qu'une grande concentration. Il est impératif que les personnes qui utilisent le produit présentent les aptitudes physiques, mentales et psychiques requises, vu qu'autrement des dommages corporels ou matériels ne peuvent pas être exclus. Le choix du personnel qualifié pour l'utilisation du produit est sous la responsabilité de l'employeur/l'exploitant.
2. Avant de déplacer ou de transporter le produit, lire et respecter la section « Transport ».
3. Comme pour tous les biens produits de façon industrielle, l'utilisation de matériaux pouvant causer des allergies (allergènes, comme par exemple le nickel) ne peut être totalement exclue. Si, lors de l'utilisation de produits Rohde & Schwarz, des réactions allergiques surviennent, telles qu'éruption cutanée, éternuements fréquents, rougeur de la conjonctive ou difficultés respiratoires, il faut immédiatement consulter un médecin pour en clarifier la cause et éviter toute atteinte à la santé.
4. Avant le traitement mécanique et/ou thermique ou le démontage du produit, il faut impérativement observer la section « Élimination des déchets », point 1.

Consignes de sécurité fondamentales

5. Selon les fonctions, certains produits, tels que des systèmes de radiocommunication RF, peuvent produire des niveaux élevés de rayonnement électromagnétique. Étant donné la vulnérabilité de l'enfant à naître, les femmes enceintes doivent être protégées par des mesures appropriées. Les porteurs de stimulateurs cardiaques peuvent également être menacés par les rayonnements électromagnétiques. L'employeur/l'exploitant est tenu d'évaluer et de repérer les lieux de travail soumis à un risque particulier d'exposition aux rayonnements et de prévenir les dangers éventuels.
6. En cas d'incendie, il se peut que le produit dégage des matières toxiques (gaz, liquides, etc.) susceptibles de nuire à la santé. Il faut donc, en cas d'incendie, prendre des mesures adéquates comme par exemple le port de masques respiratoires et de vêtements de protection.
7. Si un produit laser est intégré dans un produit Rohde & Schwarz (par exemple lecteur CD/DVD), il ne faut pas utiliser de réglages ou fonctions autres que ceux décrits dans la documentation produit pour éviter tout dommage corporel (par exemple causé par rayon laser).
8. Classes CEM (selon EN 55011 / CISPR 11 ; selon EN 55022 / CISPR 22, EN 55032 / CISPR 32 par analogie)
 - Appareil de la classe A :
Appareil approprié à un usage dans tous les environnements autres que l'environnement résidentiel et les environnements raccordés directement à un réseau d'alimentation basse tension qui alimente des bâtiments résidentiels.
Remarque : ces appareils peuvent provoquer des perturbations radioélectriques dans l'environnement résidentiel en raison de perturbations conduites ou rayonnées. Dans ce cas, on peut exiger que l'exploitant mette en œuvre des mesures appropriées pour éliminer ces perturbations.
 - Appareil de la classe B :
Appareil approprié à un usage dans l'environnement résidentiel ainsi que dans les environnements raccordés directement à un réseau d'alimentation basse tension qui alimente des bâtiments résidentiels.

Réparation et service après-vente

1. Le produit ne doit être ouvert que par un personnel qualifié et autorisé. Avant de travailler sur le produit ou de l'ouvrir, il faut le couper de la tension d'alimentation ; sinon il y a risque de choc électrique.
2. Les travaux d'ajustement, le remplacement des pièces, la maintenance et la réparation ne doivent être effectués que par des électroniciens qualifiés et autorisés par Rohde & Schwarz. En cas de remplacement de pièces concernant la sécurité (notamment interrupteur d'alimentation, transformateur d'alimentation réseau ou fusibles), celles-ci ne doivent être remplacées que par des pièces d'origine. Après chaque remplacement de pièces concernant la sécurité, une vérification de sécurité doit être effectuée (contrôle visuel, vérification du conducteur de protection, mesure de la résistance d'isolement et du courant de fuite, essai de fonctionnement). Cela permet d'assurer le maintien de la sécurité du produit.

Consignes de sécurité fondamentales

Batteries et accumulateurs/cellules

Si les instructions concernant les batteries et accumulateurs/cellules ne sont pas ou sont insuffisamment respectées, cela peut provoquer des explosions, des incendies et/ou des blessures graves pouvant entraîner la mort. La manipulation de batteries et accumulateurs contenant des électrolytes alcalins (par exemple cellules de lithium) doit être conforme à la norme EN 62133.

1. Les cellules ne doivent être ni démontées, ni ouvertes, ni réduites en morceaux.
2. Ne jamais exposer les cellules ou batteries à la chaleur ou au feu. Ne pas les stocker dans un endroit où elles sont exposées au rayonnement direct du soleil. Tenir les cellules et batteries au sec. Nettoyer les raccords sales avec un chiffon sec et propre.
3. Ne jamais court-circuiter les cellules ou batteries. Les cellules ou batteries ne doivent pas être gardées dans une boîte ou un tiroir où elles peuvent se court-circuiter mutuellement ou être court-circuitées par d'autres matériaux conducteurs. Une cellule ou batterie ne doit être retirée de son emballage d'origine que lorsqu'on l'utilise.
4. Les cellules ou batteries ne doivent pas être exposées à des chocs mécaniques de force non admissible.
5. En cas de manque d'étanchéité d'une cellule, le liquide ne doit pas entrer en contact avec la peau ou les yeux. S'il y a contact, rincer abondamment à l'eau l'endroit concerné et consulter un médecin.
6. Il y a danger d'explosion en cas de remplacement ou chargement incorrect des cellules ou batteries qui contiennent des électrolytes alcalins (par exemple cellules de lithium). Remplacer les cellules ou batteries uniquement par le type Rohde & Schwarz correspondant (voir la liste des pièces de rechange) pour maintenir la sécurité du produit.
7. Il faut recycler les cellules ou batteries et il est interdit de les éliminer comme déchets normaux. Les accumulateurs ou batteries qui contiennent du plomb, du mercure ou du cadmium sont des déchets spéciaux. Observer les règles nationales d'élimination et de recyclage.
8. Lors des renvois de batteries au lithium à des filiales Rohde & Schwarz, il convient de respecter les prescriptions de transport (IATA-DGR, code IMDG, ADR, RID) fixées par les transporteurs.

Transport

1. Le produit peut avoir un poids élevé. Il faut donc le déplacer ou le transporter avec précaution et en utilisant le cas échéant un moyen de levage approprié (par exemple, chariot élévateur) pour éviter des dommages au dos ou des blessures.
2. Les poignées des produits sont une aide de manipulation exclusivement réservée au transport du produit par des personnes. Il est donc proscrit d'utiliser ces poignées pour attacher le produit à ou sur des moyens de transport, tels que grues, chariots et chariots élévateurs, etc. Vous êtes responsable de la fixation sûre des produits à ou sur des moyens de transport et de levage appropriés. Observer les consignes de sécurité du fabricant des moyens de transport ou de levage utilisés pour éviter des dommages corporels et des dégâts sur le produit.
3. L'utilisation du produit dans un véhicule se fait sous l'unique responsabilité du conducteur qui doit piloter le véhicule de manière sûre et appropriée. Le fabricant décline toute responsabilité en cas d'accidents ou de collisions. Ne jamais utiliser le produit dans un véhicule en mouvement si cela pouvait détourner l'attention du conducteur. Sécuriser suffisamment le produit dans le véhicule pour empêcher des blessures ou dommages de tout type en cas d'accident.

Consignes de sécurité fondamentales

Élimination des déchets

1. Au terme de leur durée de vie, les batteries ou accumulateurs qui ne peuvent pas être éliminés avec les déchets ménagers peuvent uniquement être éliminés par des points de collecte appropriés ou par un centre de service après-vente Rohde & Schwarz.
2. Au terme de sa durée de vie, un produit ne peut pas être éliminé avec les déchets ménagers normaux, mais doit être collecté séparément.
Rohde & Schwarz GmbH & Co. KG a développé un concept d'élimination des déchets et assume toutes les obligations en matière de reprise et d'élimination, valables pour les fabricants au sein de l'UE. Veuillez vous adresser à votre centre de service après-vente Rohde & Schwarz pour éliminer le produit de manière écologique.
3. Si les produits ou leurs composants sont travaillés mécaniquement et/ou thermiquement au-delà de l'utilisation prévue, ils peuvent, le cas échéant, libérer des substances dangereuses (poussières contenant des métaux lourds comme par exemple du plomb, du béryllium ou du nickel). Le démontage du produit ne doit donc être effectué que par un personnel qualifié et spécialement formé. Le démontage inadéquat peut nuire à la santé. Les règles nationales concernant l'élimination des déchets doivent être observées.
4. Si, lors de l'utilisation du produit, des substances dangereuses ou combustibles exigeant une élimination spéciale sont dégagées, comme par exemple liquides de refroidissement ou huiles moteurs qui sont à changer régulièrement, les consignes de sécurité du fabricant de ces substances dangereuses ou combustibles ainsi que les règles sur l'élimination en vigueur au niveau régional doivent être respectées. Les consignes de sécurité spéciales correspondantes dans la documentation produit doivent également être respectées, le cas échéant. L'élimination non conforme des substances dangereuses ou combustibles peut provoquer des atteintes à la santé et des dommages écologiques.

Pour plus d'informations concernant la protection de l'environnement, voir la page d'accueil de Rohde & Schwarz.

Safety instructions for rechargeable lithium ion batteries

WARNING

Risk of serious personal injury or even death.

You must fully observe the following instructions in order to avoid serious personal injury – or even death – due to an explosion and/or fire.

1. Do not dismantle, open or crush the batteries or drop them from a great height. If mechanical damage occurs, there is a risk that chemicals may be released. Gases that are released can cause breathing difficulties. Immediately ventilate the area and in serious cases consult a doctor.
Irritation can occur if the chemicals that are released come in contact with the skin or eyes. If this happens, immediately and thoroughly rinse the skin or eyes with water and consult a doctor.
2. Do not expose cells or batteries to heat or fire. Do not store them in direct sunlight. If overheating occurs, there is the risk of an explosion or a fire, which can lead to serious personal injuries.
3. Keep the batteries clean and dry. If the terminals become soiled, clean them with a dry, clean cloth.
4. Charge the batteries prior to using them.
Only use the appropriate Rohde & Schwarz charger to charge the batteries. See the device manual or data sheet for the exact designation of the charger.
If the batteries are improperly charged, there is a risk of explosion, which can cause serious personal injury.
5. The charging temperature must be between 0 °C and 45 °C
(see manual for information on possible restrictions).
6. Discharging may take place only at temperatures between 0 °C and 50 °C
(see manual for information on possible restrictions).
7. Only charge batteries until they are fully charged. Frequent overcharging can reduce the battery lifetime.
8. Remove the battery from the device when the battery is not being used. Following a longer period of storage, it may be necessary to charge and discharge the battery several times in order to obtain the full capacity.
9. Only use the battery with designated Rohde & Schwarz devices. See the device manual for details.
10. Do not dispose of the batteries with unsorted municipal waste. The batteries must be collected separately. After the end of their life, dispose of the batteries at a suitable collection point or via a Rohde & Schwarz customer service center.



EU labeling for batteries and secondary cells

11. Follow the transport stipulations of the carrier (IATA-DGR, IMDG-Code, ADR, RID) when returning lithium batteries to Rohde & Schwarz subsidiaries.
12. Keep this safety information for future reference.

Instrucciones de seguridad para baterías recargables de ión litio

ADVERTENCIA

Posibilidad de lesiones graves que en determinadas circunstancias puede causar la muerte.

Tenga en cuenta los siguientes avisos en caso de explosión y/o incendio para impedir lesiones graves en personas que, en determinadas circunstancias, podrían incluso causar la muerte.

1. No desarme las baterías, no las abra, no las triture ni las deje caer desde una gran altura.
En caso de daños mecánicos existe el riesgo de salida de sustancias químicas. En caso de salida de gases pueden producirse dificultades respiratorias. Ventile inmediatamente la habitación y acuda a un médico en casos graves.
Si sustancias químicas provenientes de la batería entran en contacto con la piel o los ojos pueden producirse irritaciones. Enjuague en estos casos la piel y los ojos inmediatamente con abundante agua y acuda a un médico.
2. No exponga las celdas o baterías al calor ni al fuego. No las almacene bajo la luz solar directa. En caso de sobrecalentamiento existe peligro de explosión o de incendio, lo que puede provocar lesiones graves en personas.
3. Mantenga las baterías limpias y secas. Si los conectores están sucios, límpielos con un paño seco y limpio.
4. Cargue las baterías antes de su uso.
Solamente está permitido cargar la batería con el correspondiente cargador de Rohde & Schwarz. Consulte en el manual o en las especificaciones técnicas del equipo la denominación exacta del cargador.
Si las baterías se cargan de forma incorrecta existe peligro de explosión, lo que podría causar lesiones graves en personas.
5. La temperatura de carga debe encontrarse entre 0 °C y 45 °C (consulte el manual para posibles restricciones).
6. La descarga solamente puede efectuarse entre 0 °C y 50°C (consulte el manual para posibles restricciones).
7. Cargue las baterías solamente el tiempo necesario hasta que se hayan cargado por completo. La sobrecarga frecuente reduce la vida útil de la batería.
8. Extraiga la batería del equipo si no se va a utilizar. Después de un periodo de almacenamiento prolongado puede ser necesario cargar y descargar varias veces la batería para recuperar su capacidad completa.
9. Utilice la batería exclusivamente con los equipos Rohde & Schwarz correspondientes. Consulte para ello el manual del equipo.
10. No elimine las baterías junto con los residuos urbanos sin clasificar, sino por separado. Para eliminar la batería una vez finalizada su vida útil, diríjase a un punto de recogida de residuos adecuado o a una oficina de representación de Rohde & Schwarz.
Etiquetado de la UE para baterías y acumuladores
11. En caso de devolver baterías de litio a las filiales de Rohde & Schwarz, debe cumplirse las normativas sobre los modos de transporte (IATA-DGR, código IMDG, ADR, RID).
12. Conserve estas instrucciones de seguridad para fines de información y consulta posterior.

Sicherheitshinweise für wiederaufladbare Li-Ion-Batterien



Mögliche schwere Verletzungen, unter Umständen mit Todesfolge.

Beachten Sie die folgenden Hinweise vollständig, um schwere Verletzungen von Personen - unter Umständen mit Todesfolge - durch Explosion und/oder Brand zu verhindern.

1. Batterien nicht zerlegen, öffnen, zerkleinern oder aus großer Höhe fallen lassen. Bei mechanischer Beschädigung besteht die Gefahr des Austritts von Chemikalien. Austretende Gase können zu Atembeschwerden führen. Sofort lüften, in schweren Fällen einen Arzt konsultieren.
Bei Haut- oder Augenkontakt mit austretenden Chemikalien können Hautirritationen und Reizungen auftreten. In diesen Fällen die Haut oder Augen sofort gründlich mit Wasser ausspülen und einen Arzt konsultieren.
2. Zellen oder Batterien weder Hitze noch Feuer aussetzen. Nicht im direkten Sonnenlicht lagern. Bei Überhitzung besteht die Gefahr einer Explosion oder eines Brandes, was zu schweren Verletzungen bei Personen führen kann.
3. Batterien sauber und trocken halten. Falls die Anschlüsse verschmutzt sind, mit einem trockenen, sauberen Tuch reinigen.
4. Batterien vor dem Gebrauch laden.
Die Batterie darf ausschließlich mit dem entsprechenden Rohde & Schwarz Ladegerät geladen werden. Siehe Handbuch oder Datenblatt des Gerätes für die genaue Bezeichnung des Ladegerätes.
Wenn Batterien unsachgemäß geladen werden, besteht Explosionsgefahr, was zu schweren Verletzungen bei Personen führen kann.
5. Die Ladetemperatur muss zwischen 0 °C und 45 °C betragen (für mögliche Einschränkungen siehe Handbuch).
6. Ein Entladen darf nur zwischen 0 °C und 50 °C erfolgen (für mögliche Einschränkungen siehe Handbuch).
7. Batterien nur so lange laden, bis sie vollständig aufgeladen sind. Ein häufiges Überladen führt zu einer geringeren Lebensdauer der Batterie.
8. Die Batterie aus dem Gerät entfernen, wenn sie nicht benutzt wird. Nach längerer Lagerzeit kann es erforderlich sein, die Batterie mehrmals zu laden und zu entladen, um die volle Leistungsfähigkeit zu erlangen.
9. Die Batterie nur mit dafür vorgesehenen Rohde & Schwarz-Geräten betreiben. Siehe dazu das Handbuch des Gerätes.
10. Die Batterien nicht über unsortierten Siedlungsabfall entsorgen, sondern getrennt sammeln. Nach Ende der Lebensdauer über eine geeignete Sammelstelle oder eine Rohde&Schwarz-Kundendienststelle entsorgen.
EU - Kennzeichnung für Batterien und Akkumulatoren
11. Bei Rücksendungen von Lithiumbatterien zu Rohde & Schwarz - Niederlassungen müssen die Transportvorschriften der Verkehrsträger (IATA-DGR, IMDG-Code, ADR, RID) befolgt werden.
12. Diese Sicherheitsinformationen für zukünftige Informations- und Nachschlagezwecke aufbewahren.



Consignes de sécurité pour batteries rechargeables lithium-ion

AVERTISSEMENT

Risque de blessures graves pouvant entraîner la mort.

Respecter intégralement les consignes ci-dessous afin d'éliminer tout risque de blessures graves voire mortelles par suite d'explosion et/ou d'incendie.

1. Ne pas démonter, ouvrir ou découper les batteries ni les faire tomber d'une hauteur importante. Des produits chimiques peuvent s'écouler en cas de détérioration mécanique et les gaz libérés peuvent provoquer des difficultés respiratoires. Aérer immédiatement les locaux. Dans les cas graves, consulter un médecin. Si la peau ou les yeux entrent en contact avec les produits chimiques libérés, des irritations peuvent se produire. Rincer immédiatement et abondamment la peau ou les yeux à l'eau claire et consulter un médecin.
2. Ne pas exposer les cellules ou les batteries à la chaleur ou au feu. Ne pas les stocker dans un endroit exposé à la lumière directe du soleil. Toute surchauffe risque de provoquer une explosion ou un incendie, ce qui peut entraîner des blessures graves.
3. Conserver les batteries dans un lieu sec et propre. Nettoyer les points de contact sales à l'aide d'un chiffon sec et propre.
4. Charger les batteries avant utilisation. Utiliser seulement le chargeur Rohde & Schwarz approprié pour recharger les batteries. Les références exactes du chargeur sont indiquées dans le manuel ou la fiche technique de l'appareil. Une recharge incorrecte des batteries peut entraîner des explosions susceptibles de causer des blessures graves.
5. Recharger impérativement à des températures comprises entre 0 °C et 45 °C (restrictions éventuelles : voir le manuel).
6. Décharger impérativement à des températures comprises entre 0 °C et 50 °C (restrictions éventuelles : voir le manuel).
7. Terminer la charge dès que les batteries sont complètement rechargées. Une surcharge répétée diminue la longévité des batteries.
8. Retirer les batteries de l'appareil lorsqu'elles ne sont pas utilisées. Après un stockage prolongé, plusieurs cycles de recharge et de décharge peuvent s'avérer nécessaires pour rétablir la pleine capacité des batteries.
9. Utiliser les batteries exclusivement dans les appareils Rohde & Schwarz auxquels elles sont destinées. Voir le manuel fourni avec chaque appareil.



10. Ne pas éliminer les batteries avec les déchets municipaux non triés mais s'assurer qu'elles soient collectées séparément. Recycler les batteries en fin de vie en les confiant à un point de collecte compétent ou à un point de service après-vente Rohde & Schwarz.

Marquage UE pour batteries et accumulateurs

11. Lors des renvois de batteries au lithium à des filiales Rohde & Schwarz, il convient de respecter les prescriptions de transport (IATA-DGR, code IMDG, ADR, RID) fixées par les transporteurs.
12. Conserver ces consignes de sécurité de sorte à pouvoir vous y reporter ou vérifier ultérieurement certains points.

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

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customersupport@rohde-schwarz.com

North America

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1 Preface

1.1 Documentation Overview

This section provides an overview of the R&S Cable Rider ZPH user documentation. You find it on the product page at:

<http://www.rohde-schwarz.com/product/zph.html> > "Downloads"

Getting started manual

Introduces the R&S Cable Rider ZPH and describes how to set up and start working with the product. A printed version is included in the delivery.

User manual

The user manual contains the description of all instrument modes and functions. It also provides an introduction to remote control, a complete description of the remote control commands with programming examples, and information on maintenance, instrument interfaces and error messages.

In addition to the R&S Cable Rider ZPH user manual, there is a separate user manual for the InstrumentView software package. This manual contains a description of all features of the InstrumentView software package.

Service manual

Describes the performance test for checking the rated specifications, module replacement and repair, firmware update, troubleshooting and fault elimination, and contains mechanical drawings and spare part lists.

The service manual is available for registered users on the global Rohde & Schwarz information system (GLORIS, <https://gloris.rohde-schwarz.com>).

Basic safety instructions

Contains safety instructions, operating conditions and further important information. The printed document is included in the delivery.

Data sheet and brochure

The data sheet contains the technical specifications of the R&S Cable Rider ZPH. It also lists the options and their order numbers as well as optional accessories.

The brochure provides an overview of the R&S Cable Rider ZPH and shows its specific characteristics.

Calibration certificate

The document is available on <https://gloris.rohde-schwarz.com/calcert>.

Release notes and open source acknowledgment (OSA)

The release notes list new features, improvements and known issues of the current firmware version, and describe the firmware installation.

The open source acknowledgment document provides verbatim license texts of the used open source software.

See <http://www.rohde-schwarz.com/product/zph.html> > "Downloads" > "Firmware".

Application notes, application cards, white papers, etc.

These documents contain information about possible applications and background information on various topics, see www.rohde-schwarz.com/appnotes.

1.2 Conventions Used in the Documentation

The following conventions are used throughout the R&S Cable Rider ZPH manual.

1.2.1 Typographical Conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialog boxes, menus, options, buttons, and softkeys are enclosed by quotation marks.
KEYS	Key names are written in capital letters.
File names, commands, program code	Filenames, commands, coding samples and screen output are distinguished by their font.
<i>Input</i>	Input to be entered by the user is displayed in italics.
Links	Links that you can click are displayed in underline blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

1.2.2 Conventions for Procedure Descriptions

When describing how to operate the instrument, several alternative methods may be available to perform the same task. In this case, the procedure using the touchscreen is described. The alternative procedure using the keys on the instrument or the on-screen keyboard is only described if it deviates from the standard operating procedures.

The term "select" may refer to any of the described methods, i.e. using a finger on the touchscreen or a key on the instrument or on a keyboard.

1.2.3 Other Conventions

Remote commands may include abbreviations to simplify input. In the description of such commands, all parts that have to be entered are written in capital letters. Additional text in lower-case characters is for information only.

2 Welcome to the R&S Cable Rider ZPH

The R&S Cable Rider ZPH is a new generation Rohde & Schwarz cable and antenna analyzer developed to meet demanding customer requirements. Offering touchscreen input, the analyzer enhances user experience in making measurements fast and easy.

This user manual contains a description of the functionality that the instrument provides. The latest version is available for download at the product homepage (<http://www.rohde-schwarz.com/product/zph.html>).

3 Getting Started

The following chapters are identical to those in the printed R&S Cable Rider ZPH Getting Started manual.

- [Preparing for Use](#)..... 13
- [Instrument Tour](#).....21

3.1 Preparing for Use

3.1.1 Putting into Operation

This chapter describes the basic steps to be taken when setting up the R&S Cable Rider ZPH for the first time.

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" delivered as a printed brochure with the instrument.

In addition, read and observe the safety instructions in the following sections.

Notice that the data sheet may specify additional operating conditions.

NOTICE

Risk of instrument damage

Note that the general safety instructions also contain information on operating conditions that prevent damage to the instrument. The instrument's data sheet may contain additional operating conditions.

NOTICE**Risk of electrostatic discharge (ESD)**

Electrostatic discharge (ESD) can cause damage to the electronic components of the instrument and the device under test (DUT). ESD is most likely to occur when you connect or disconnect a DUT or test fixture to the instrument's test ports. To prevent ESD, use a wrist strap and cord and connect yourself to the ground, or use a conductive floor mat and heel strap combination.

For details, refer to the basic safety instructions delivered as a printed brochure with the instrument.

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:

- 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.

**EMI impact on measurement results**

Electromagnetic interference (EMI) may affect the measurement results.

To suppress generated electromagnetic interference (EMI):

- Use suitable shielded cables of high quality. For example, use double-shielded RF and LAN cables.
- Always terminate open cable ends.
- Note the EMC classification in the data sheet.

3.1.1.1 Unpacking and Checking the Instrument

Unpack the R&S Cable Rider ZPH carefully and check the contents of the package.

- Check the equipment for completeness using the delivery note and the accessory lists for the various items.
- Check the instrument for any damage. If there is damage, immediately contact the carrier who delivered the instrument.
- Keep the box and packing material.

NOTICE**Risk of 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 you do not have the original packaging, use 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.

**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.

3.1.1.2 Accessory List

The instrument comes with the following accessories:

- Power supply cable and adapter set
- Li-ion rechargeable battery
- USB2.0 cable A-Mini
- Side strap
- Printed Getting Started manual
- Document folder containing safety instructions and calibration certificate

Optional accessories and their order numbers are listed in the data sheet.

3.1.1.3 Setting up the R&S Cable Rider ZPH

The R&S Cable Rider ZPH is mainly used for diagnostic purpose during the installation of RF feeder cables and antennas for all kinds of radio transmitters.

Depending on the environment, you can adjust the viewing angle of the display and either lay it out horizontally or prop it up using the support on the back of the R&S Cable Rider ZPH.

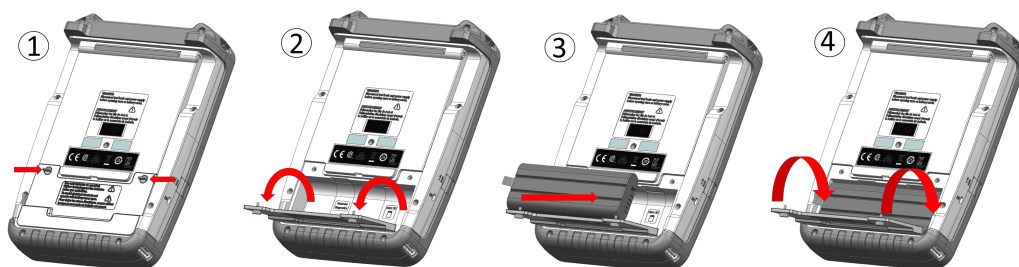


When laid out horizontally for operation from above, the R&S Cable Rider ZPH is tilted slightly due to the micro-stand at the back. This position provides the optimum viewing angle for the display.

To allow easy operation from the front and still be able to read the display, you can swing out the support on the back of the R&S Cable Rider ZPH.

Before you turn on the R&S Cable Rider ZPH, you should insert the lithium ion battery included in the delivery into the battery compartment located at the back of the R&S Cable Rider ZPH.

Insert battery



1. Unscrew the two thumb screws located on the battery compartment.
2. Open the cover.
3. Insert the battery into the R&S Cable Rider ZPH.
4. Close the cover and screw back the thumb screws.

You can operate the R&S Cable Rider ZPH with the AC adapter or the battery. Both are included in the delivery.

3.1.1.4 Using the AC Adapter

NOTICE

Risk of instrument damage

To avoid instrument damage,

- Only use the power supply (R&S HA-Z301, order number 1321.1386.02) included in the delivery.
- Make sure that the AC supply voltage is compatible to the voltage specified on the power supply unit.
- Attach the appropriate adapter to the power supply.

Connect the AC adapter to the DC port on the left side of the R&S Cable Rider ZPH (item 1 of [Figure 3-1](#)). Make sure to fully insert the AC adapter plug into the DC port.

Depending on the system you need, firmly connect the appropriate power cable included in the delivery to the AC adapter (item 2 of [Figure 3-1](#)).

Finally, connect the power cable plug to an AC power outlet.



Figure 3-1: AC adapter

1 = AC adapter

2 = Power cable

The voltage range of the AC power supply is 100 V to 240 V AC.

After the R&S Cable Rider ZPH is connected to the power supply, you can turn it on with the POWER key on the front panel.

3.1.1.5 Battery Operation

The R&S Cable Rider ZPH has a smart battery indicator which displays the battery charging status on the POWER key as well as the battery icon shown at the top right corner of the display screen. See [Chapter 3.2.6, "Display Overview"](#), on page 24.

The lithium ion battery has a capacity of 6.4 Ah and it allows operation of up to nine hours when it is fully charged.

The actual operation time depends on the current charged status (see [Figure 3-2](#)), the ambient temperature and the operating mode of the R&S Cable Rider ZPH.

For a summary of the LED indication of the POWER key, see [Table 3-1](#).

The battery charging and discharging process of the battery icon indicated in the display screen is illustrated below:

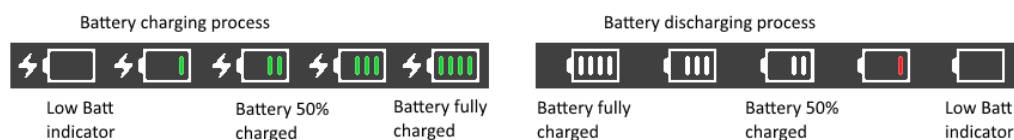


Figure 3-2: Battery charging and discharging process

Charging time is about three hours when the R&S Cable Rider ZPH is in inactive mode (i.e. R&S Cable Rider ZPH is switched off). If the instrument is in active mode (i.e. R&S Cable Rider ZPH is switched on), the charging time is extended to about four hours because the charging current is reduced as the power is partially drained by the usage of the R&S Cable Rider ZPH.

During operation in the field, you can also charge the battery with the car adapter (R&S HA-Z302, order number 1321.1340.02). You can connect the car adapter to the DC port. With the car adapter, you are able to charge the R&S Cable Rider ZPH via the car's cigarette lighter socket. A replacement battery (R&S HA-Z306, order number 1321.1334.02) with the same capacity and charging time as the battery included in the standard delivery is also available if necessary.



Battery dispatched during delivery is not fully charged, for battery operation you have to charge it first.

To charge the battery, connect the charger to AC power adapter included in the delivery. For more information, see ["Using an external battery charger"](#) on page 18.

Using an external battery charger

You can also use an external battery charger (R&S HA-Z303, order number 1321.1328.02) to charge the battery.

To charge the battery externally, put the battery into the external charger and supply it with power via the AC power adapter.

An amber LED on the charger indicates the charging process. The LED turns to green when the battery is fully charged. A red LED on the charger indicates that the battery is not charging or the charging failed.

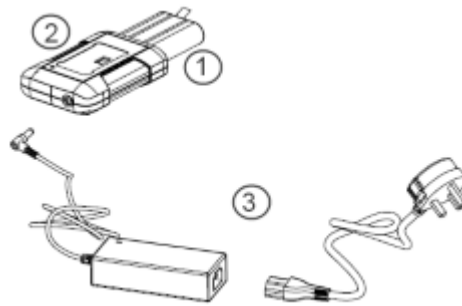


Figure 3-3: External battery charger

1 = Lithium ion battery R&S HA-Z306

2 = External charger R&S HA-Z303

3 = Power supply unit R&S HA-Z301 or car adapter R&S HA-Z302

⚠ WARNING

Risk of traffic accidents, physical injury and property damage

- Turn off the R&S Cable Rider ZPH while driving or while the engine is on.
- Operation of the R&S Cable Rider ZPH via the cigarette lighter socket while driving or while the engine on is prohibited.

3.1.1.6 Battery Maintenance

The R&S Cable Rider ZPH comes with a lithium-ion battery. In general, these batteries are easy to handle. When you handle the battery, follow the instruction mentioned in the safety instructions and in the following chapters.

Handling

- The battery has been designed for a specific application. Do not use it for any other applications.
- Do not connect batteries in series or parallel as it can cause serious damage.
- Observe correct polarities during installation and charging.
- Do not heat over 70°C. The battery contains thermal fuses that could activate and render the battery inoperable.
- The battery contains an electronic device for protection against deep discharge, overcharge and short-circuiting between the terminals.
 - If you cannot discharge the battery, it may be deep discharged. Charge the battery for 0.5 hours and check again.
 - If you cannot charge the battery, it may be overcharged. Discharge the battery and check again.
 - If the battery has been short-circuited, charge it to reset the electronics.
 - If the battery still does not work, contact the Rohde & Schwarz customer support.
- Do not allow metallic objects to come into contact with the terminals.

- Do not solder directly to the battery.

Storage

The battery self-discharges while not in use. When storing the battery for an extended period of time, make sure to

- Handle the battery carefully to avoid short circuits. Make sure that leads and terminals are insulated.
- Keep the battery in the supplied packaging before use. The temperature should not exceed 30°C.
- Store the battery at an initial state of charge between 15% and 50% of its capacity. When calculating the initial state of charge, consider
 - The maximum consumption of electronic devices
 - The self-discharge of the battery - the higher the state of charge, the higher the rate of self-discharge
- Avoid a deep discharge of the battery. A deep discharge occurs when the state of charge falls below 5% of the battery's capacity.
- Recharge the battery at least every six months.

Should the battery voltage be low or even 0 V, the battery protection circuit may have gone into a sleep mode. In that case, reset the battery with an approved charger.

Transportation

No special regulations apply for transporting the battery. The battery cells contain no metallic lithium.

End of Life

The capacity of the battery decreases after it has gone through numerous charge cycles and nearing its end of life. When the battery is dead, do not open the battery. Do not dispose battery in fire.

3.1.2 Switching the Instrument On and Off

The instrument can be powered with an AC or DC (battery operated or via car adapter) input. See [Chapter 3.1.1.4, "Using the AC Adapter"](#), on page 17.

- ▶ Press the POWER key to switch on the instrument.
During booting, the R&S Cable Rider ZPH displays a splash screen to indicate the operable frequency range of the instrument. Depending on the frequency upgrade option installed, the respective splash screen is loaded.
After booting, the instrument is ready for operation.
Refer to the instrument brochure for the list of options available.
- ▶ Press the POWER key to switch off the instrument.

NOTICE**Risk of losing data**

If a running instrument (without battery) is disconnected directly from the power cord, the instrument loses its current settings. Furthermore, program data may be lost.

Press the POWER key first to shut down the application properly.

The following shows the POWER key behavior in different operation modes.

Table 3-1: Summary of LED indication on POWER key

LED indication on POWER key		Descriptions
Green LED		Instrument is in operation mode.
Blue LED		Instrument is in switch off mode with a fully charged battery. A blinking blue LED indicates that the battery charging is in process.
Amber LED		Instrument is in switch off mode with AC supply and there is no battery in it.
Red LED		There is an error in the battery charging.
LED "OFF"		This is an indication that there is no AC or DC supply to the instrument. The instrument is in a switch off mode.

3.2 Instrument Tour

This chapter describes the instrument in different views.

3.2.1 Front View



- 1 = Power meter input (N-connector)
- 2 = USB ports
- 3 = Signal source output / Reflection (N-connector)
- 4 = Touch-sensitive screen area
- 5 = Softkey labels (on display)
- 6 = Softkey
- 7 = Systems keys
- 8 = DC port (behind protective cap)
- 9 = Kensington lock
- 10 = Function keys
- 11 = On/off key
- 12 = Alphanumeric key
- 13 = Unit keys
- 14 = Back key
- 15 = Cancel key
- 16 = Rotary knob
- 17 = Screenshot key
- 18 = LAN and mini USB port (behind protective cap)
- 19 = Micro-SD card slot (not visible as it is located behind the battery compartment)

For a description of the keys, see R&S Cable Rider ZPH user manual.

NOTICE

Instrument damage caused by cleaning agents

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

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, lintfree dust cloth.

3.2.2 Top View



Power meter input

The build-in power-meter provides a maximum power measurement of 30 dBm (or 1 W) at the RF input port. Connect a cable or DUT to the RF input with an N-type connector. Use a cable to connect the DUT to the R&S Cable Rider ZPH, if necessary.

USB type A connector

The USB port provides the USB interface to connect a memory stick and store data sets or screenshots. It can also be used to control the operation of the external power sensor.

RF out / Reflection

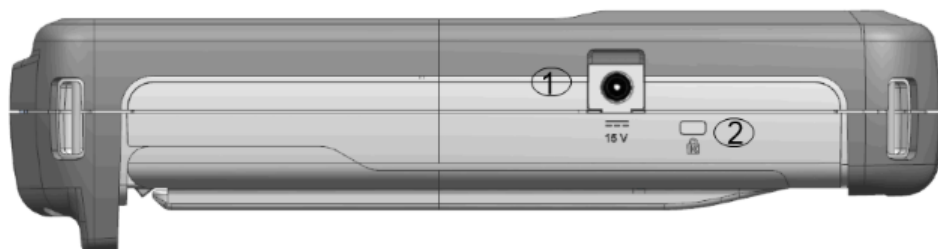
The RF out connector provides a signal source output power of the R&S Cable Rider ZPH at -10.00 dBm nominal. It is also used as a 1-port reflection measurement.

⚠ WARNING**Risk of electrical shock**

To avoid electrical shock, the DC input voltage must never exceed the value specified on the housing.

NOTICE**Risk of instrument damage**

- Make sure not to overload the RF input and keep within the maximum allowed signal levels. Refer to the datasheet for the maximum allowed signal levels.
- To avoid damage to the coupling capacitor, input attenuator or the mixer, the DC input voltage of 50 V must never be exceeded.

3.2.3 Left View

- 1 = DC input
2 = Kensington lock slot

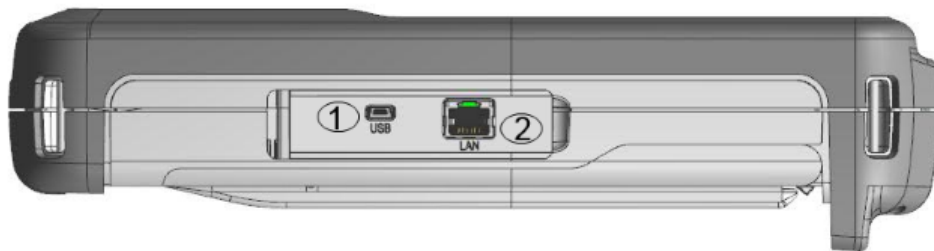
DC input

The R&S Cable Rider ZPH is supplied with power by the AC/DC transformer power supply via the DC connector. You can also use the DC connector to charge the battery.

Kensington lock slot

A Kensington lock can be anchored to the R&S Cable Rider ZPH housing to secure it to a workstation mechanically.

3.2.4 Right View



1 = Min USB port

2 = LAN port

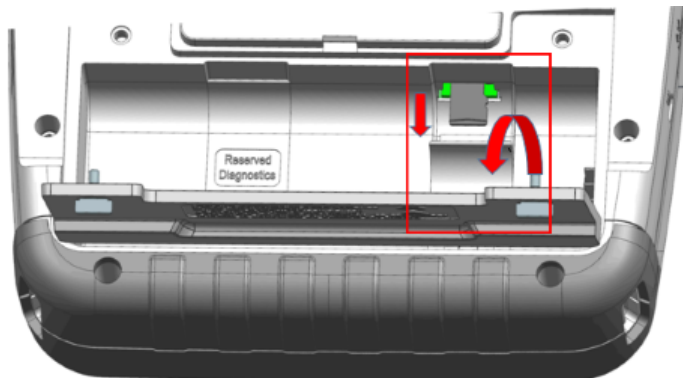
LAN connector

RJ-45 connector to connect the instrument to a Local Area Network (LAN) and transfer data in both directions. It supports up to 100 Mbit/s.

USB type B connector (mini USB)

Mini USB connector to connect a computer for remote control of the instrument and transfer data in both directions.

3.2.5 Rear View



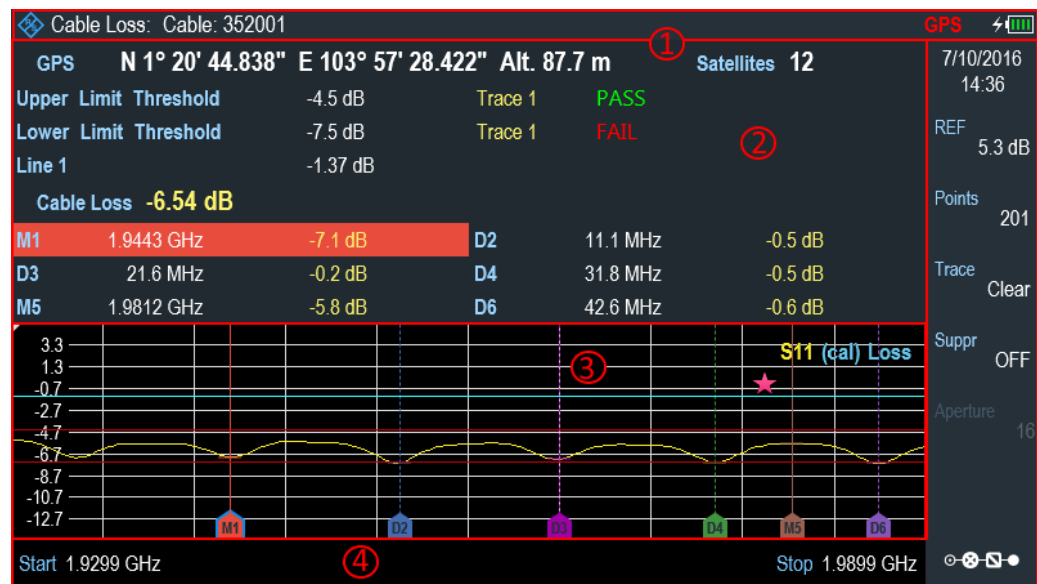
The micro-SD card slot is located behind the battery compartment of the R&S Cable Rider ZPH.

Peel open the micro-SD card protective cap to access to the micro-SD card slot. You can use the micro-SD card to store datasets or screenshots.

3.2.6 Display Overview

The display area has a touch-sensitive screen, the touch functionality can be turned on or off in the instrument setup menu.

For information of the display areas and touchscreen gestures, see the R&S Cable Rider ZPH user manual.



- 1 = Title bar
 2 = Measurement result view
 3 = Measurement trace window
 4 = Parameter view

NOTICE

Risk of touchscreen damage during operation

- Never touch the screen with ball point pens or other pointed objects with sharp edges.
- It is recommended that you operate the touchscreen by finger only. As an alternative, you may use a stylus pen with a smooth soft tip.
- Never apply excessive force to the screen. Touch it gently.
- Never scratch the screen surface, e.g. with a finger nail. Never rub it strongly, for example with a dust cloth.

4 Basic Operation

The following chapters provide an overview on the measurements that you can perform with the R&S Cable Rider ZPH.

- [Screen Layout and Elements](#).....26
- [Configuring the R&S Cable Rider ZPH](#).....32
- [Connecting the R&S Cable Rider ZPH to a PC](#).....43
- [Managing Options](#).....49
- [Identifying Cable Faults](#).....52
- [Using Power Meter](#)57
- [Saving and Recalling Results and Settings](#).....64

4.1 Screen Layout and Elements

The following figure shows the screen layout in the cable and antenna test operating mode. Screen layouts that show specifics for each operating mode or measurement are provided in the corresponding sections of this manual.

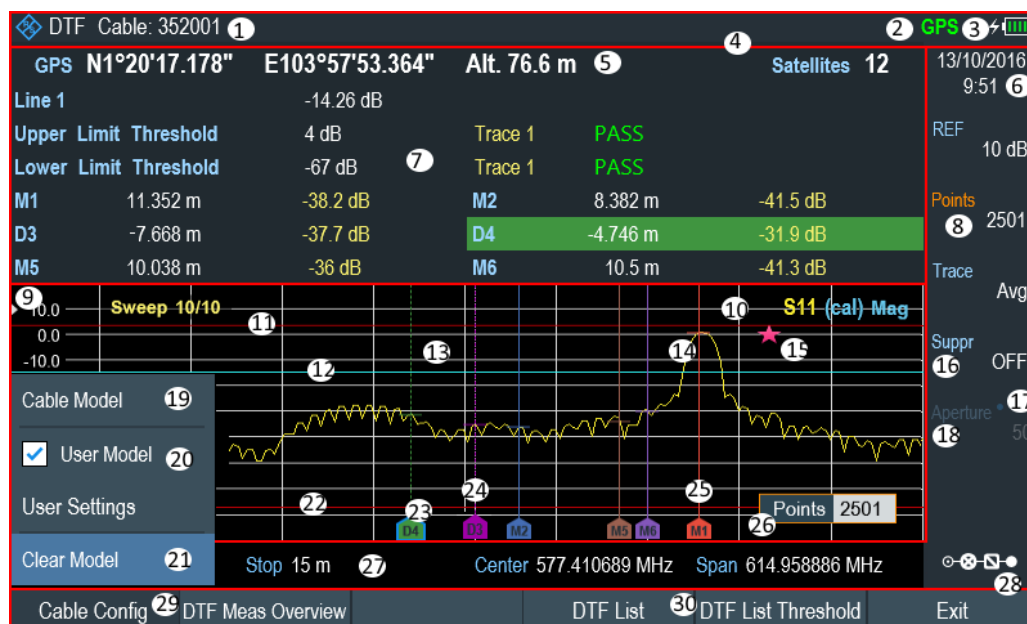


Figure 4-1: R&S Cable Rider ZPH screen layout

- 1 = Measurement information
- 2 = GPS status
- 3 = Battery status
- 4 = Title bar
- 5 = GPS information
- 6 = Date and time
- 7 = Measurement result view
- 8 = Currently selected button
- 9 = Reference position
- 10 = Measurement format and calibration status

- 11 = Upper limit line threshold
- 12 = Display Line
- 13 = [Measurement trace window](#)
- 14 = Trace
- 15 = [Invalid trace indicator](#)
- 16 = Selectable toggle button
- 17 = Blue dot implies setting not coupled to another hardware setting
- 18 = Unavailable button function
- 19 = Available menu item
- 20 = Active menu item
- 21 = Current selected menu item
- 22 = Lower limit line threshold
- 23 = Currently selected marker
- 24 = Delta marker
- 25 = Marker
- 26 = Entry box
- 27 = [Parameter view](#)
- 28 = [Configuration overview](#)
- 29 = Currently selected softkey function
- 30 = Available softkey function

4.1.1 Title Bar

The "Title bar" is located at the top of the screen layout.



It is used to display static content:

- Basic information such as R&S logo, measurement mode name (i.e. DTF, Channel Power Meter), GPS and battery status.
- Accessories name connected to the instrument, i.e power sensor.
- Standard information such as cable model and channel table name.

4.1.2 Measurement Result View



Special touchscreen gesture

You can swipe vertically up or down in the "Measurement result view" to hide or unhide the measurement result view display.

The "Measurement result view" is located below the "Title bar".

GPS	N1°20'17.178"	E103°57'53.364"	Alt. 76.6 m	Satellites	12
Upper Limit Threshold	-4.5 dB	Trace 1	PASS		
Lower Limit Threshold	-7.5 dB	Trace 1	FAIL		
Line 1	-1.37 dB				
Cable Loss	-6.54 dB				
M1	1.9443 GHz	-7.1 dB	D2	11.1 MHz	-0.5 dB
D3	21.6 MHz	-0.2 dB	D4	31.8 MHz	-0.5 dB
M5	1.9812 GHz	-5.8 dB	D6	42.6 MHz	-0.6 dB

It displays measurement results of the followings:

- GPS information
- Cable loss result
- Display lines value
- Limit lines result
- Marker values

When the marker is selected in the "Measurement result view", an entry box for marker positioning is displayed on the [measurement trace window](#). The selected marker is also highlighted with a blue frame around the marker icon in the "Measurement trace window".

Table 4-1: Selected marker

Selected marker in the "Measurement result view"	Selected marker in the "Measurement trace window"
	 Note: There is a blue frame around the selected marker icon, "M1".

For more information on marker measurement, see [Chapter 7.3.2, "Using Markers"](#), on page 123.

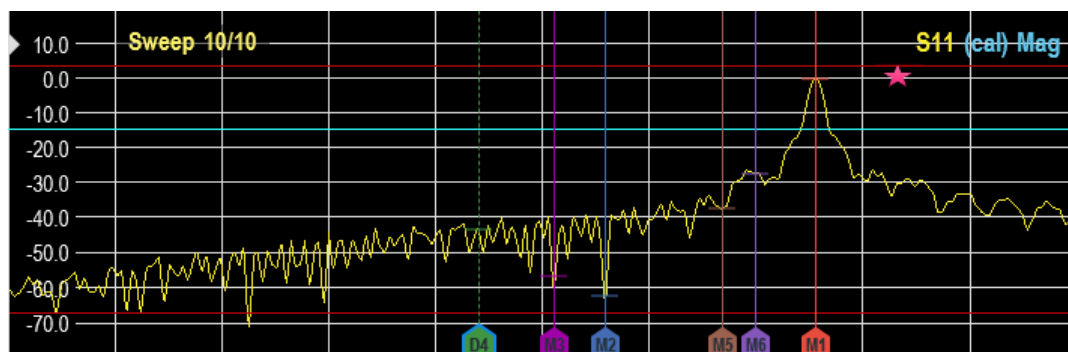
4.1.3 Measurement Trace Window

The "Measurement trace window" is the main user interface window in the R&S Cable Rider ZPH. It displays the measurement traces where markers and limit lines are also displayed.



Invalid trace indicator

Trace invalid indicator icon,  indicates that the measurement is still in progress



The **Invalid trace indicator** is displayed below the S11 result format and calibration status.

For information of result format and calibration status, see [Chapter 7.1, "Performing Cable and Antenna Measurements"](#), on page 100 and [Chapter 7.1.6.1, "Calibration States"](#), on page 108.

For information of markers, display line and limit lines, see [Chapter 7.3, "Analyzing Measurement Results"](#), on page 121.

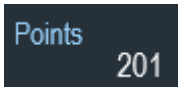
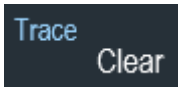
4.1.4 Parameter View

The "Parameter view" contains the important hardware setting parameters used in the measurement.

It is located at the right side and bottom section of the screen layout. See [Figure 4-1](#).

You can select any parameter in the "Parameter view" to adjust the configurations of the hardware settings. See details of each of the parameter in [Chapter 7.2.2, "Configuring the Horizontal Axis"](#), on page 114 and [Chapter 7.2.3, "Configuring the Vertical Axis"](#), on page 118.

Parameter	Description
"Center", "Start", "Stop" Center 2 GHz Start 0 m	Function-specific displays depending on the softkey indicated in the softkey label. It is used to configure one of the following: - center frequency, start or stop frequency for the measurement. - start or stop cable length for measurement. See Chapter 7.2.2, "Configuring the Horizontal Axis", on page 114.
"Span" Span 3 GHz	Configure the frequency span of the measurement. See Chapter 7.2.2.1, "Setting the Frequency Range for DTF Measurements" , on page 115.
Time & Date 6/10/2016 16:08	Display time and date of the instrument. This is a read-only field. See Chapter 4.2.3, "Configuring Date and Time" , on page 35 and "Setting the date format" on page 37.

Parameter	Description
"REF" 	Configure the reference level of the measurement. See Chapter 7.2.3, "Configuring the Vertical Axis" , on page 118.
"Points" 	Configure the number of measurement points. See Chapter 7.2.4.2, "Changing the Number of Measurement Points" , on page 120.
"Trace" 	Toggle the trace parameter to select the different trace mode (Clear, Avg). See Chapter 7.3.1, "Working with Traces" , on page 121.
Configure Overview 	Display the configuration overview window for more configuration options used in the measurement. Configuration overview is operation mode dependent. See Chapter 4.1.4.1, "Configuration Overview" , on page 30.

4.1.4.1 Configuration Overview

This is a dedicated button located at the bottom of the "Parameter View". It is operation mode dependent. See [Figure 4-1](#).

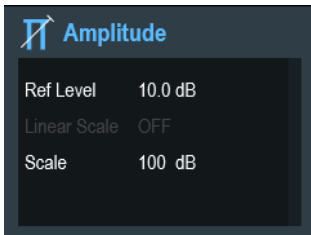
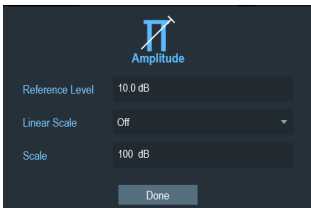
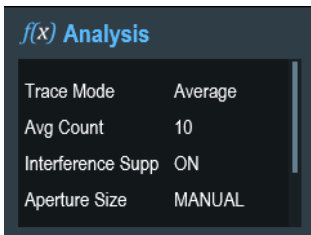
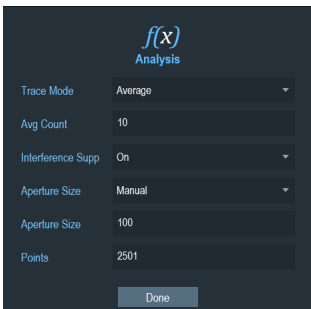
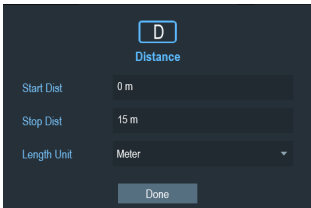
When you select this button, it opens the "Config Overview" window. Accessing it without the touchscreen input is possible via the "SETUP" key. See [Chapter 5.5, "Configuring Measurements"](#), on page 76.

The "Config Overview" illustrates here shows the flow of a distance-to-fault (DTF) measurement at different stages and the relevant parameters which have an impact on the measurement at each stage.



The "Config Overview" window is divided into six categories:

"Config Overview" Block	Corresponding Dialog Box	Description
		Select "Mode" to configure the desired measurement in cable and antenna (CAT) mode. See Chapter 7.1, "Performing Cable and Antenna Measurements", on page 100.
		Select "Stimulus" to configure the parameters related to the horizontal axis of the trace window. See Chapter 7.2.2, "Configuring the Horizontal Axis", on page 114.
		Select "Cable" to configure the cable model used in the consideration of calculation during measurement. If "User Mode" is set "Yes", the field for "Frequency", "Velocity Factor" and "Loss" will be available for user-specific cable model setting. See Chapter 7.2.1, "Selecting the Cable Mode", on page 111.

"Config Overview" Block	Corresponding Dialog Box	Description
		Select "Amplitude" to configure the parameters related to the vertical axis of the trace window. See Chapter 7.2.3, "Configuring the Vertical Axis", on page 118.
		Select "Analysis" to determine the type of trace mode (Average, Clear/Write) and the number of measurement points used in the measurement. If "Trace Mode" is configured as "Average", the field "Avg Count" is available for configuration. See Chapter 7.3, "Analyzing Measurement Results", on page 121 and Chapter 7.2.4.2, "Changing the Number of Measurement Points", on page 120.
		Select "Distance" to configure the cable length and unit used to determine the cable length. See Chapter 7.2.2.2, "Setting the Start and Stop Distance for DTF Measurements", on page 116.

4.2 Configuring the R&S Cable Rider ZPH

SETUP

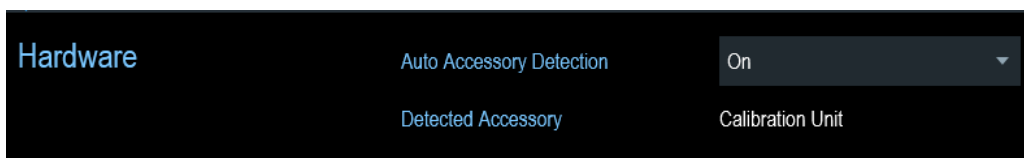
In the "Instrument Setup" dialog box, the R&S Cable Rider ZPH provides various general settings that are independent of the operating mode of the R&S Cable Rider ZPH.

1. Press SETUP key.
2. Select the "Instrument Setup" softkey.
A corresponding dialog box to configure the instrument opens.
3. Select the item you want to modify.
 - [Configuring the Hardware](#)..... 33
 - [Using the GPS Receiver](#)..... 33
 - [Configuring Date and Time](#)..... 35
 - [Selecting Regional Settings](#)..... 36
 - [Configuring the Display](#)..... 38

- [Configuring the Audio Output](#).....40
- [Configuring Power Supply](#).....41
- [Resetting the R&S Cable Rider ZPH](#)..... 42

4.2.1 Configuring the Hardware

The hardware settings contain settings that control internal and connected hardware.



Using auto accessory detection

If you are using any accessories while working with the R&S Cable Rider ZPH, the instrument is able to identify the connected hardware. To enable this setting:

1. In the "Instrument Setup" dialog box, select the "Auto Accessory Detection" item. A drop-down menu to select the accessory detection opens.
2. Set the "Auto Accessory Detection" to "On".
When this feature is on, the name of the connected accessory is displayed in the "Detected Accessory" field.

4.2.2 Using the GPS Receiver



R&S Cable Rider ZPH option

The R&S ZPH-B10 (order number 1321.0396.02) option is required to activate the internal built-in GPS receiver to locate the exact position of the measurement.

Alternatively, you can connect the GPS receiver (R&S HA-Z340, order number 1321.1392.02) to the USB connector.

When locating the exact position, the external GPS receiver takes precedence over the internal built-in GPS receiver.



Location to secure GPS receiver (R&S HA-Z340)

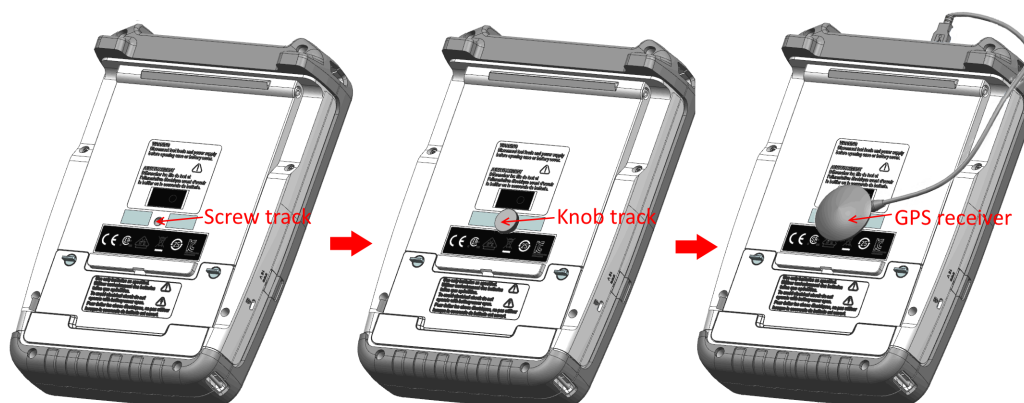


Figure 4-2: Location of GPS receiver

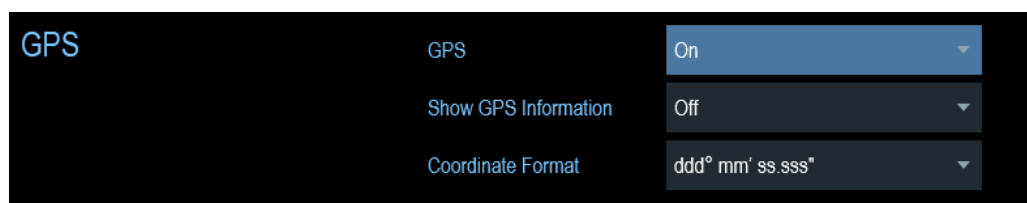
- Tighten the knob screw supplied with the GPS receiver to the screw track at the back of R&S Cable Rider ZPH.
- The GPS receiver can be conveniently attached to the knob screw as shown in [Figure 4-2](#).



GPS reference frequency

The reference frequency is automatically adjusted when the GPS receiver is enabled and a fix connection with enough satellites is established.

The "Instrument Setup" dialog box provides all settings necessary to configure the GPS receiver.



Enabling the GPS receiver

1. In the "Instrument Setup" dialog box, select the "GPS" item.
A drop-down menu opens to turn the GPS receiver on or off.
2. Turn the GPS receiver on or off as required.

When "GPS" item is turned on, the R&S Cable Rider ZPH is ready to receive GPS data.

Displaying GPS information

1. In the "Instrument Setup" dialog box, select the "Show GPS Information" item.

A drop-down menu opens to turn the display of the GPS information on and off.

2. Turn the display of GPS information on or off as required.

When the "Show GPS Information" item is set on, the R&S Cable Rider ZPH displays the GPS coordinates and number of satellites in the [Measurement Result View](#) when sufficient connection is established to the GPS satellites.

GPS	1°20'20.022" N	103°57'53.238" E	52.5 m	Satellites	9
-----	----------------	------------------	--------	------------	---

When the satellite connection is lost, the GPS coordinates and number of satellites are displayed with a white bar.

GPS	---	Satellites	---
-----	-----	------------	-----

When the GPS receiver is not connected or enabled, a message "GPS Not Connected" is displayed in the [Measurement Result View](#).

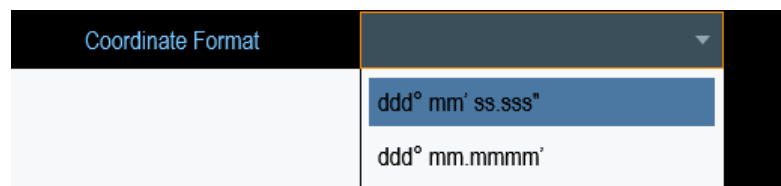
GPS	Not Connected
-----	---------------

The state of the satellite lock shown in the title bar is illustrated as follows.

- **GPS** indicates that the GPS receiver is enabled and that there is a fix connection with enough satellites for the GPS receiver to provide the coordinates.
- **GPS** indicates that the GPS receiver is enabled but that there is no fix connection to a satellite.
- **GPS** indicates that the GPS receiver is enabled but that there is no GPS receiver connection.
- The title bar shows no symbol if the GPS receiver is not enabled

Selecting the coordinate format

1. In the "Instrument Setup" dialog box, select the "Coordinate Format" item. A drop-down menu opens to select the coordinate format.



2. Select the desired format from the drop-down menu.

4.2.3 Configuring Date and Time

The R&S Cable Rider ZPH has an internal clock that can apply a date and timestamp. In the "Instrument Setup" dialog box, you can set both date and time.

Date and Time	Set Date	10/07/2015
	Set Time	18:38:48
	Time Zone	+00:00

Setting the date

1. In the "Instrument Setup" dialog box, select the "Set Date" item.
2. Enter the date you want with the numeric keys. The sequence depends on the selected date format. See ["Setting the date format"](#) on page 37.

Set Date	10/07/2015
----------	------------

3. Confirm the entry with the rotary knob.

Setting the time

1. In the "Instrument Setup" dialog box, select the "Set Time" item.
2. Enter the time you want with the numeric keys.

Set Time	18:38:48
----------	----------

3. Confirm the entry with the rotary knob.
After you have entered the time, the R&S Cable Rider ZPH verifies the validity of the time. If it is not a valid time, it sets to the next valid time.

Selecting the time zone

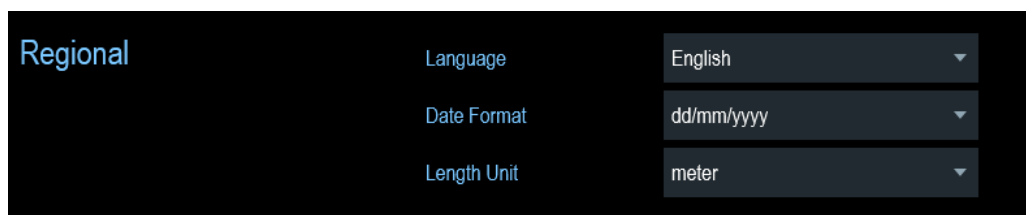
1. In the "Instrument Setup" dialog box, select the "Time Zone" item.
2. Enter a positive or negative time offset relative to the system time with the numeric keys.

Time Zone	+00:00
-----------	--------

3. Confirm the entry with the rotary knob.
After you have confirmed the time zone, the R&S Cable Rider ZPH adjusts the displayed time accordingly without changing the system time.

4.2.4 Selecting Regional Settings

The regional setting allows you to select a different language and date format.



Selecting the language

The R&S Cable Rider ZPH supports several languages for the user interface.

The following is a list of languages that the instrument supports:

English	Spanish	Japanese	Russian
French	Italian	Chinese	Hungarian
German	Portuguese	Korean	Traditional Chinese

1. In the "Instrument Setup" dialog box, select the "Language" item.
A drop-down menu opens to select the language.

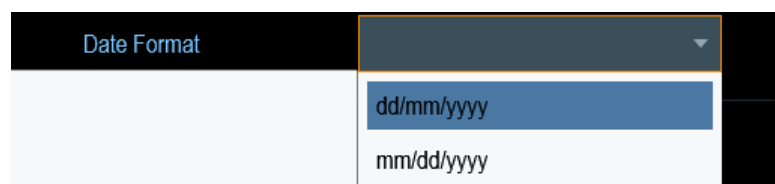


2. Select one of the languages from the drop-down menu.
3. Reboot the device to activate the choice of selected language.

Setting the date format

The R&S Cable Rider ZPH provides two different formats to display the date.

1. In the "Instrument Setup" dialog box, select the "Date Format" item.
A drop-down menu opens to select the date format.

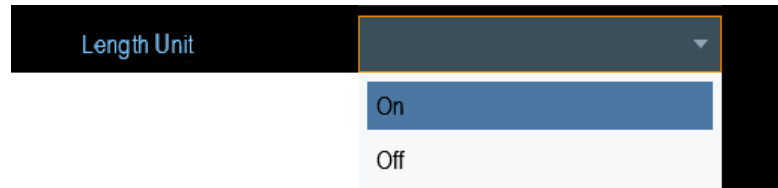


2. Select the required date format from the drop-down menu.

Setting the length unit

The R&S Cable Rider ZPH provides two different formats to configure the cable length unit.

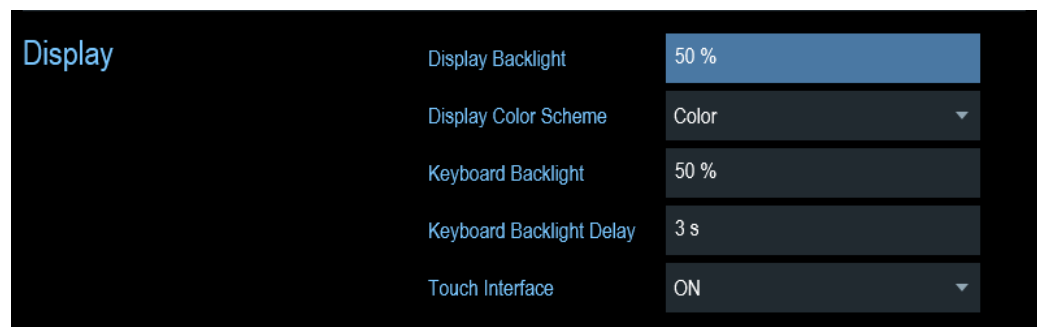
1. In the "Instrument Setup" dialog box, select the "Length Unit" item.
A drop-down menu opens to select the length unit.



2. Select the required length unit from the drop-down menu.

4.2.5 Configuring the Display

The display setting configures the display characteristics and the touch interface.



The display of the R&S Cable Rider ZPH is a TFT color LCD display.

The ideal brightness of the display depends on the intensity of the backlight. To strike a balance between battery operating time and screen display quality, set the backlight intensity to the minimum brightness needed.

To optimize the viewing angle, adjust the display color scheme settings. To achieve the maximum contrast, the screen can be switched from color display to black-and-white display.

The intensity of the keyboard backlight is adjustable with a time delay setting to turn off the backlight. The keyboard backlight remains on until the time specified by the "Keyboard Backlight Delay" or a subsequent key is pressed.

Adjusting the display backlight

1. In the "Instrument Setup" dialog box, select the "Display Backlight" item.
2. Enter the backlight intensity you want with the numeric keys.

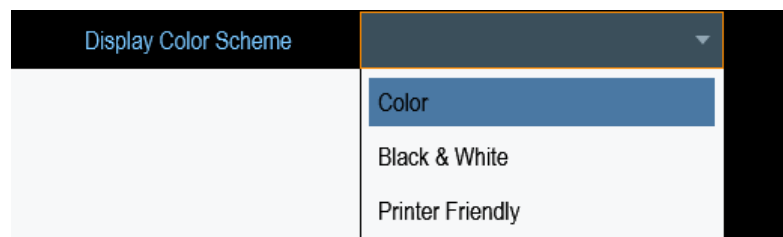


The backlight intensity is a percentage from 0% to 100% with 100% being the brightest.

3. Confirm the entry with the rotary knob.

Adjusting the display color scheme

1. In the "Instrument Setup" dialog box, select the "Display Color Scheme" item. A drop-down menu opens to select the display color scheme.



2. Select the desired color scheme from the drop-down menu.
 - a) "Color" selects a color display.
 - b) "Black & White" selects monochrome display.
 - c) "Printer Friendly" inverts the colors.

Adjusting the keyboard backlight

1. In the "Instrument Setup" dialog box, select the "Keyboard Backlight" item.
2. Enter the backlight intensity you want with the numeric keys.



The backlight intensity is a percentage from 0% to 100% with 100% being the brightest.

3. Confirm the entry with the rotary knob.

Adjusting the keyboard backlight delay

1. In the "Instrument Setup" dialog box, select the "Display Backlight" item.
2. Enter the time you want to turn off the keyboard backlight with the numeric keys.

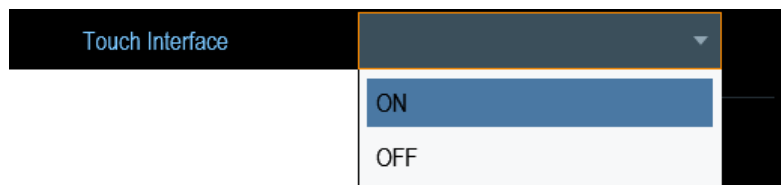


The time delay has a range of 1s to 10s.

3. Confirm the entry with the rotary knob.

Activating the touchscreen interface

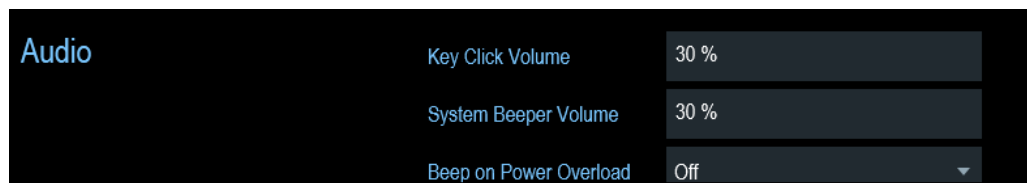
1. In the "Instrument Setup" dialog box, select the "Touch Interface" item.
2. Select "ON" to activate the touchscreen interface with R&S Cable Rider ZPH.



3. Select "OFF" to deactivate the touchscreen interface.
Note: If the touch interface is not activated, the [On-screen keyboard](#) is disabled.

4.2.6 Configuring the Audio Output

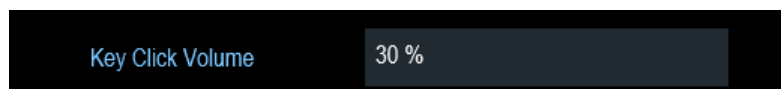
The audio settings control the audio output of the system.



Setting the key click volume

The key click volume sets the volume of the sound that the R&S Cable Rider ZPH produces when you press a key or select a softkey.

1. In the "Instrument Setup" dialog box, select the "Key Click Volume" item.
2. Enter the volume you want with the numeric keys.



The key click volume is a percentage from 0% to 100% with 100% being the loudest.

3. Confirm the entry with the rotary knob.

Setting the system beeper volume

The system beeper volume sets the volume of the system beeper of the R&S Cable Rider ZPH used, i.e. if a message box pops up.

1. In the "Instrument Setup" dialog box, select the "System Beeper Volume" item.

2. Enter the volume you want with the numeric keys.



The system beeper volume is a percentage from 0% to 100% with 100% being the loudest.

3. Confirm the entry with the rotary knob.

Activating / Deactivating audio alert for power overload

In case the R&S Cable Rider ZPH detects an overload at one of its inputs, you can configure it to make a sound.

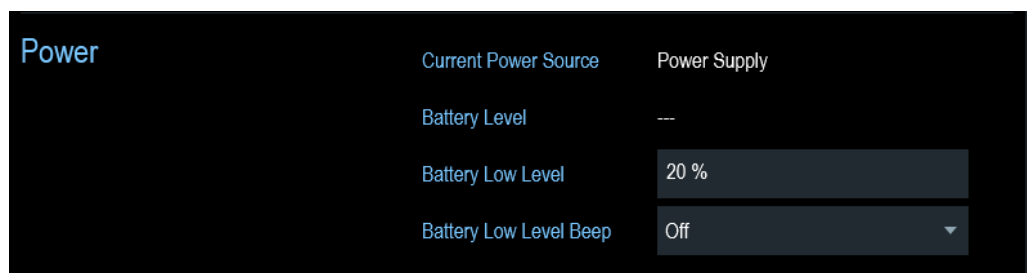
1. In the "Instrument Setup" dialog box, select the "Beep on Power Overload" item.
2. Select "Beep on Power Overload" to "On".
When this beeper turns on, the R&S Cable Rider ZPH makes a sound every time it detects an overload.



4.2.7 Configuring Power Supply

The "Current Power Source" shows the source that the R&S Cable Rider ZPH is powered by.

When you are using the battery to power up the R&S Cable Rider ZPH, the remaining "Battery Level" is displayed as a percentage with 100 % representing a full charge.

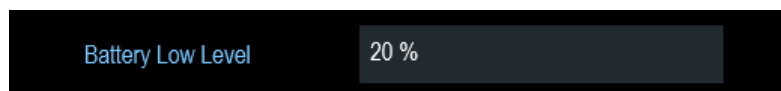


Setting the battery low level

The battery low level is a reminder that the remaining battery charge might be used up soon.

When the battery low level is reached, the battery symbol in the [Title bar](#) turns red and starts blinking. See [Chapter 3.1.1.5, "Battery Operation"](#), on page 18.

1. In the "Instrument Setup" dialog box, select the "Battery Low Level" item.
2. Enter the charge level in percent of a fully charged battery with the numeric keys.

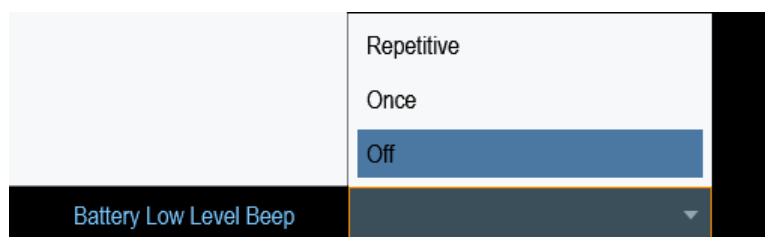


3. Confirm the entry with the rotary knob.

Activating / Deactivating audio alert for battery low-level state

The R&S Cable Rider ZPH also allows you to turn on an audio signal that indicates that the battery has reached its low-level state.

1. In the "Instrument Setup" dialog box, select the "Battery Low Level Beep" item.



2. Select either "Repetitive" or "Once" to turn on the audio signal.
If you have selected "Once", the R&S Cable Rider ZPH beeps once if the battery runs out of power. For a continuous beep, select "Repetitive".
3. Select "Off" to turn off the beeper.

4.2.8 Resetting the R&S Cable Rider ZPH

You can either preset the R&S Cable Rider ZPH or reset it to factory settings.

Presetting the R&S Cable Rider ZPH

The PRESET key resets the R&S Cable Rider ZPH to the default setup of the currently active operating mode.

This default setup allows you to define the instrument with a new configuration based on a defined measurement parameter without using parameters from a previous measurement unintentionally still being active.

- Press the PRESET  key.

Resetting the R&S Cable Rider ZPH

A "Reset to Factory Settings" resets the R&S Cable Rider ZPH to the factory defaults.

During a reset, the R&S Cable Rider ZPH restores the original configuration. It also deletes all customized datasets (limit lines, standards, channel tables, transducer tables etc.). Instead, it will reinstall all the datasets that have been available after delivery.

**Risk of data loss**

All datasets you have saved are deleted during a factory reset.

**Calibration data**

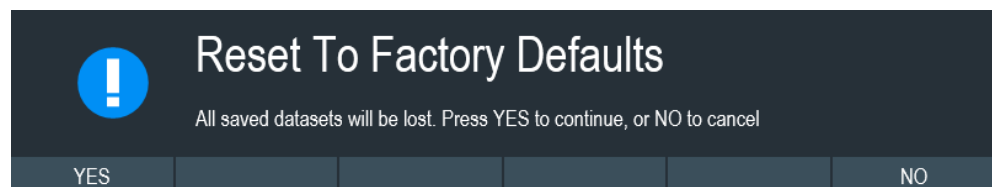
After a factory reset, the R&S Cable Rider ZPH is loaded with the default factory calibration data.

See [Chapter 7.1.6.1, "Calibration States"](#), on page 108

1. In the "Instrument Setup" dialog box, select the "Reset to Factory Settings" item.
2. Confirm the entry with the rotary knob.



The R&S Cable Rider ZPH initiates the reset procedure and shows a warning message box.



3. A corresponding dialog box opens for selection.
 - Select "Yes" to perform the reset. During the reboot, it shows a corresponding message.
 - Select "No" to cancel the reset.

4.3 Connecting the R&S Cable Rider ZPH to a PC

The R&S Cable Rider ZPH comes with the R&S InstrumentView software package. This software package features several tools that allow you to document measurement results, create and edit the different datasets necessary for the instrument.

The .NET Framework 2.0 (or higher) is required to run the software properly.

You can set up a connection between the R&S Cable Rider ZPH and R&S InstrumentView either via its [LAN port or its mini USB port](#).

You have to install the R&S InstrumentView software on the PC before you are able to establish a connection.

Download the latest R&S InstrumentView from <http://www.rohde-schwarz.com/product/zph.html>.



Firewall settings

If no connection can be established between the software and the R&S Cable Rider ZPH after successful configuration, check the firewall settings on your PC.

- [LAN Connection](#).....44
- [USB Connection](#).....48

4.3.1 LAN Connection

You can connect the R&S Cable Rider ZPH directly to the PC with a LAN cable. The [LAN port](#) is located behind a protective cap on the right side of the R&S Cable Rider ZPH.

You can set up the LAN connection in the "Instrument Settings" dialog box.

LAN	
MAC Address	00-0a-35-00-01-22
DHCP	Off
IP Address	172.17.75.1
Subnet Mask	255.255.255.0
Gateway	0.0.0.0

For a direct connection between a PC and the R&S Cable Rider ZPH, DHCP (Dynamic Host Configuration Protocol) has to be turned off (which is the default state).

1. In the "Instrument Settings" dialog box, select the "DHCP" item.
A drop-down menu opens to select the DHCP state.
2. Select "DHCP" to on or off as required.

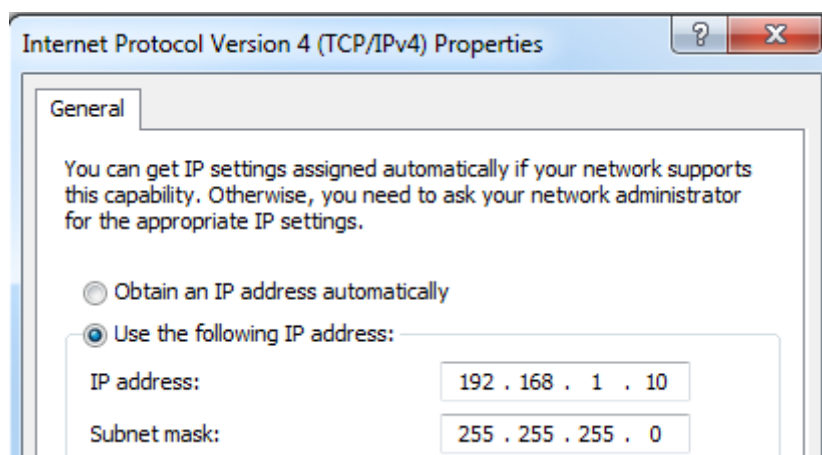
DHCP
On
Off

Setting an IP address and subnet mask

To establish a connection, the PC and the R&S Cable Rider ZPH have to be in the same subnet.

Subnet mask

1. Identify the subnet mask of your PC, i.e. in the Microsoft Windows "TCP/IP Properties".



2. In the "Instrument Settings" dialog box, select the "Subnet Mask" item.
3. Enter the subnet mask of the PC with the numeric keys.



After you have matched the subnet mask, you can define the IP address. When both devices are in the same subnet, the first three digits of the IP address are usually the same. See example below:

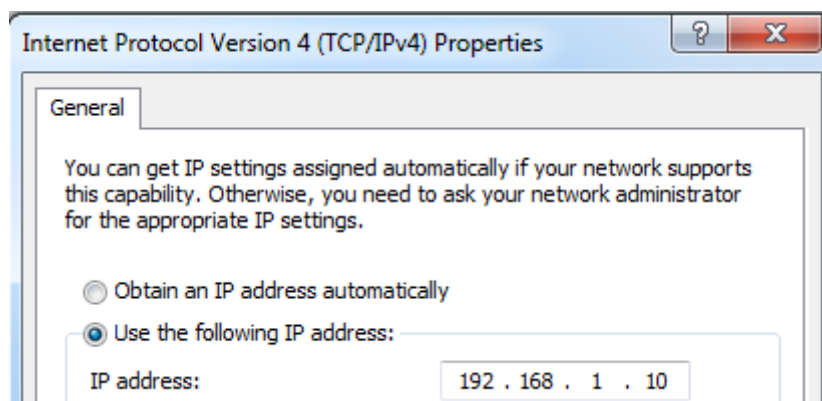
Example:

IP address for PC: 192.168.1.10

IP address for R&S Cable Rider ZPH: 192.168.1.20

IP address

1. Identify the IP address of your PC, i.e. in the Microsoft Windows "TCP/IP Properties".



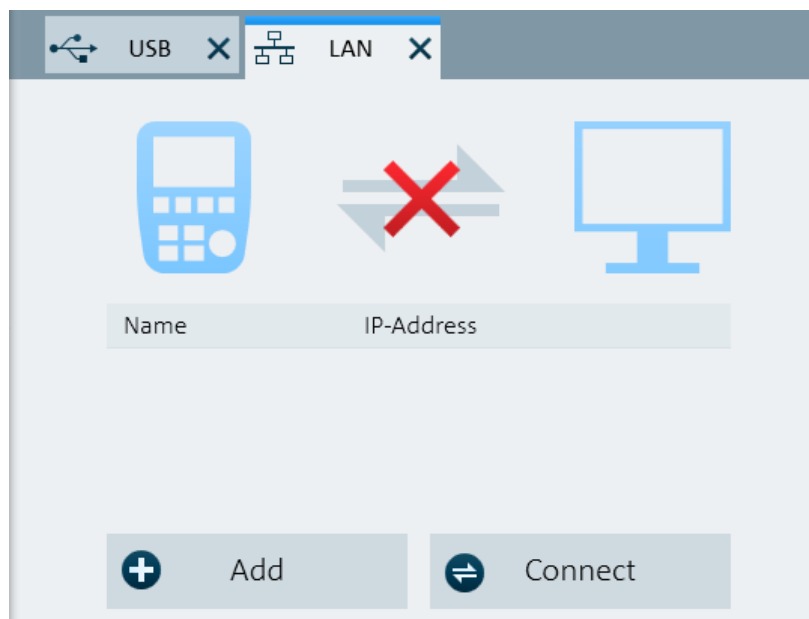
2. In the "Instrument Settings" dialog box, select the "IP Address" item.
3. Confirm the entry with the rotary knob.
4. Enter the IP address of the PC with the numeric keys.

IP Address

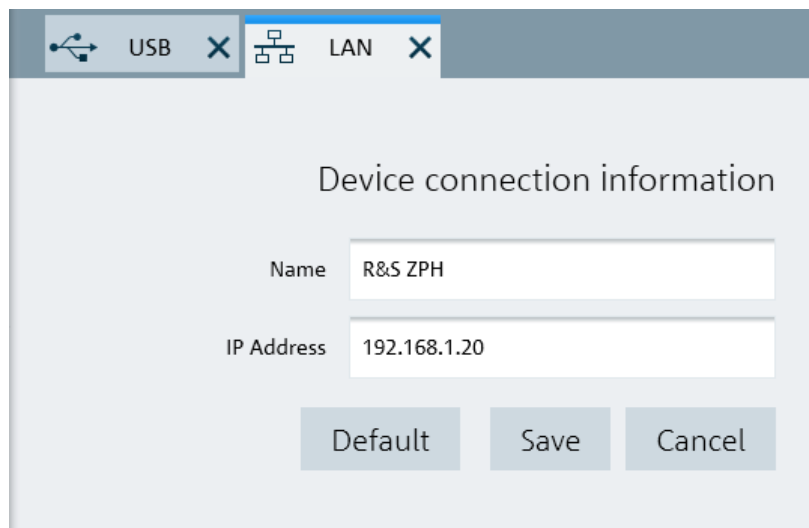
192.168.1.20

Configuring the R&S InstrumentView software package

1. Start the R&S InstrumentView software.
2. Select the "LAN" tab in the screen layout.

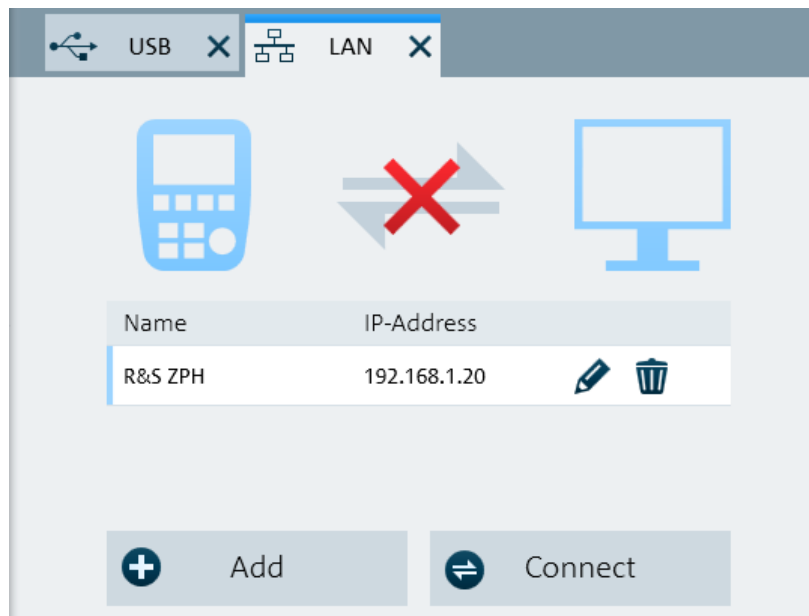


3. Select the "Add" button to create a new network connection.



4. Specify a name for the new network connection, e.g. R&S Cable Rider ZPH.
5. Enter the IP address for the R&S Cable Rider ZPH (in this case 192.168.1.20).
6. Confirm the entry with the "Save" button.

The connection is now created and configured.



7. Select the new connection labeled R&S Cable Rider ZPH.
8. Select the "Connect" button to establish the connection.

Connecting the R&S Cable Rider ZPH in an existing LAN

You can either get the R&S Cable Rider ZPH IP address automatically from the DHCP server or manually assign a fixed address.

With manual allocation, a fixed IP address and subnet mask must be assigned to the R&S Cable Rider ZPH as described in [Chapter 4.3.1, "LAN Connection"](#), on page 44. After setting up the R&S Cable Rider ZPH, configure the R&S InstrumentView software with the assigned IP address as described in ["Configuring the R&S InstrumentView software package"](#) on page 46.



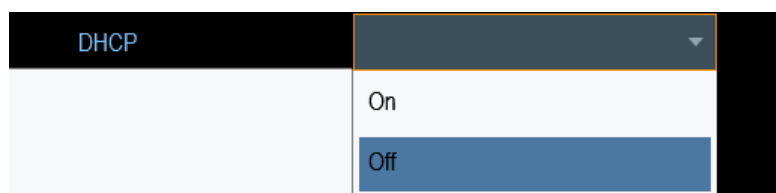
Free IP address

Contact your IT system administrator to get a free IP address.

In networks with a DHCP server, DHCP permits automatic allocation of the network configuration to the R&S Cable Rider ZPH connected via LAN cable. For this purpose, DHCP has to be active on the R&S Cable Rider ZPH.

DHCP is off by default. Turn it on like this:

1. In the "Instrument Setup" dialog box, select the "DHCP" item.
2. Select "DHCP" to "On" to activate DHCP.



The R&S Cable Rider ZPH is now allocated an IP address and the subnet mask by the DHCP server. This can take several seconds.

The IP address and subnet mask are automatically set in the corresponding input fields and are no longer available for editing.

Configure the R&S InstrumentView software with the IP address and subnet mask as defined by the DHCP server. For more information, see [Chapter 4.3.1, "LAN Connection"](#), on page 44.

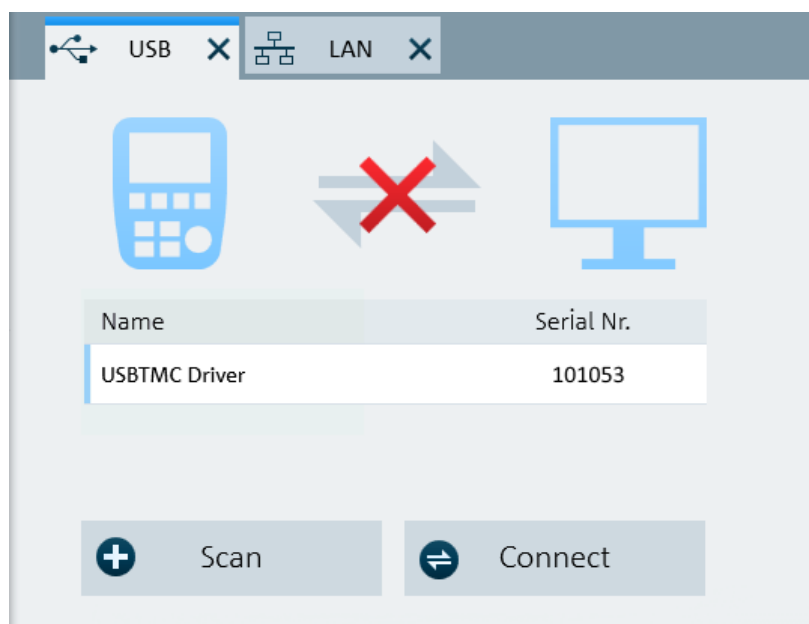
4.3.2 USB Connection

Alternatively, you can connect the R&S Cable Rider ZPH to the PC with a USB cable. The [mini USB interface](#) is located behind a protective cap on the right side of the R&S Cable Rider ZPH.

When you connect the R&S Cable Rider ZPH to a computer for the first time, Windows tries to install the new hardware automatically. The required drivers are installed along with the R&S InstrumentView software package.

When the drivers have been found on your system and the hardware has been successfully installed, Windows shows a corresponding message.

1. Connect the R&S Cable Rider ZPH via the mini USB port to your computer.
2. Start R&S InstrumentView on the PC.
3. Select the "USB" tab in the screen layout.



4. Select the "Scan" button to identify the R&S Cable Rider ZPH.
5. Confirm the selection with the "Connect" button.

4.4 Managing Options

For special measurement tasks, you can equip the R&S Cable Rider ZPH with various firmware options.

4.4.1 Enabling Options

To enable options, you have to enter a key code. The key code is based on the unique serial number of the R&S Cable Rider ZPH.

1. Press the SETUP key.
2. Select the "Installed Options" softkey.
A list of all available options and the current status of the options is displayed. See [Figure 4-3](#).

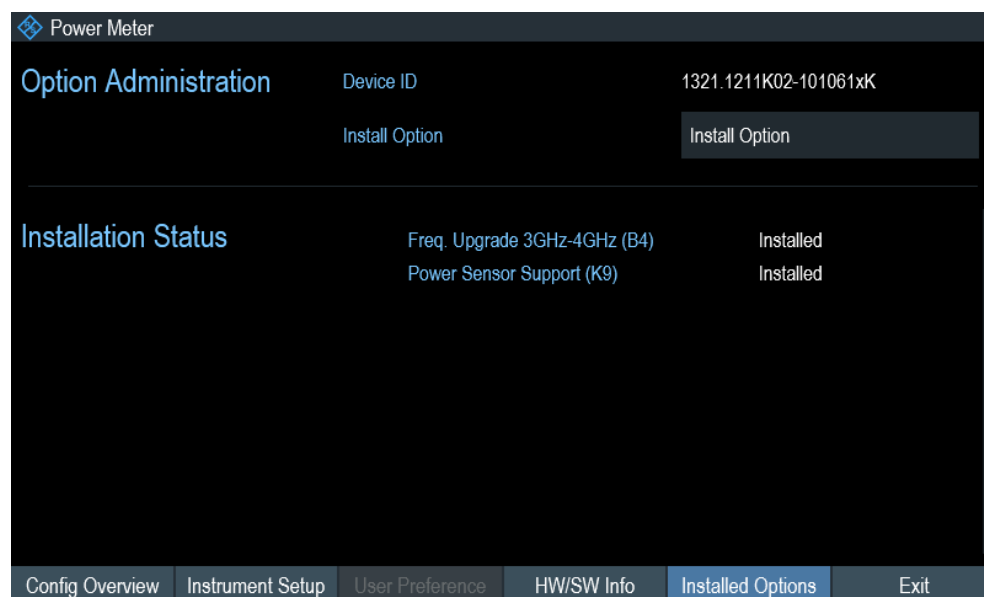


Figure 4-3: Installed option

3. Select the "Install Option" softkey from the dialog box.
The R&S Cable Rider ZPH opens an entry field to enter the option key.
4. Enter in the appropriate option key.
5. Confirm the entry with the rotary knob.
If you have entered the correct code, the instrument displays a message: "installation successful".
If you have entered an incorrect code, the instrument displays a message: "invalid key code!".
6. Enter the correct code again.

4.4.2 Checking Options

In the "Setup" menu, the R&S Cable Rider ZPH shows all options that are currently installed.

1. Press the SETUP key.
2. Select the "Installed Options" softkey.
The R&S Cable Rider ZPH shows a list of all available options and the current status of the option:
 - "Installed": This means that the option is installed and working.
 - "Demo": This means that the option is for demo purposes and it has an expiry date.

- "Removed:<option key>": This indicates that a portable license has been removed from the R&S Cable Rider ZPH and is ready to be transferred to another R&S Cable Rider ZPH.

4.4.3 Managing Options with R&S License Manager

If you are using the R&S Cable Rider ZPH in a local area network (LAN), you can manage the firmware options with a web browser (e.g. Microsoft Internet Explorer or Mozilla Firefox).

For more information on connecting the R&S Cable Rider ZPH to a LAN, see [Chapter 4.3.1, "LAN Connection"](#), on page 44.

After you have connected the R&S Cable Rider ZPH, open your web browser.

1. Enter the IP address of the R&S Cable Rider ZPH in the address bar of the web browser.



The browser will access the R&S License Manager. In this part of the R&S License Manager, you can install and activate licenses on the R&S Cable Rider ZPH. This page features three areas:

- The first area shows the details of the connected device including the device ID and the IP address.

Connected Device

FPH	Device ID:	1321.1111K02-900188-nK
FPH	IP Address:	10.113.10.184
Version: V1.00	Host Name:	localhost

- The second area provides functionality to install and activate licenses.

What do you want to do?

- [Install Registered License Keys and Activate Licenses](#) ?
- [Register Licenses, Install License Keys and Activate Licenses](#) ?
- [Reboot Device](#) ?

– Install Registered License Keys and Activate Licenses

Follow this link if you have purchased a registered license. Registered licenses only work in combination with a specific device ID.

– Register Licenses, Install License Keys and Activate Licenses

Follow this link if you have purchased an unregistered license. Unregistered licenses are not connected to a specific device ID.

– Reboot Device

Follow this link to reboot the R&S Cable Rider ZPH.

– Online help icon ?

Opens a detailed online help to the corresponding topic.

- The third area provides hints on using the license manager when you move the mouse over one of the options.

Help**Reboot Device:**

Many devices need to be rebooted, before newly installed license keys can activate the licenses on these devices.

Use "Reboot Device" to allow the R&S License Manager to remotely reboot a device, which is accessible via LXI. You will be requested to select the Device ID of the applicable device.

If you already have one or more R&S Cable Rider ZPH equipped with options, you can manage the licenses of these options on the license manager web page.

2. Select the **Manage Licenses** button.

The browser will access another part of the R&S License Manager. In this part of the license manager, you can manage licenses already installed on your R&S Cable Rider ZPH.

This page features two areas:

- The first area provides functionality to manage licenses already installed on a device.

What do you want to do?

- [Register Licenses](#) ⓘ
- [Unregister License](#) ⓘ ⓘ
- [Move Portable License](#) ⓘ

- **Register Licenses**

Follow this link if you have purchased an unregistered license. Unregistered licenses only work in combination with a specific device ID.

- **Unregister License**

Follow this link if you have installed a portable license. Portable licenses work in combination with several device IDs. However, you have to unregister it on one device before you can use it on another.

- **Move Portable License**

Follow this link if you want to move a portable license. Moving a portable license is possible without unregistering the license.

- Online help icon ⓘ

Opens a detailed online help to the corresponding topic.

- The second area provides hints on using the R&S License Manager when you move the mouse over one of the options.

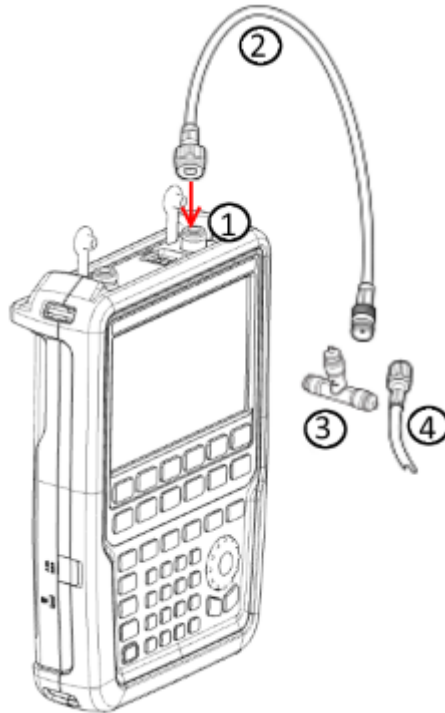
After you have followed one of the links, follow the instructions displayed in the browser. If you encounter any problems during the licensing procedure, you can access the online help at any time with the online help icon ⓘ. The online help contains an extensive description of all functionality that the license manager features.

4.5 Identifying Cable Faults

One of the basic measurement tasks for the R&S Cable Rider ZPH is to find cable faults with the distance-to-fault (DTF) measurement.

Test setup

The test setup requires an R&S Cable Rider ZPH, an RF cable (for example R&S FSH-Z320, order number 1309.6600.00) and a calibration standard (for example R&S FSH-Z28/Z29, order number 1300.7810.03 / 1300.7610.03 or R&S ZN-Z103 order number 3586.9392.00)).



- 1 = RF input (port 1)
- 2 = RF cable
- 3 = Calibration standard
- 4 = Test cable (DUT)

► Connect the RF test cable to the RF input of the R&S Cable Rider ZPH.



You should use the RF cable. Otherwise, measurement results may be invalid.

Starting the measurement

1. Press the MODE key.
2. Select the "Antenna & Cable Test" softkey.
The R&S Cable Rider ZPH switches its operating mode.
By default, the R&S Cable Rider ZPH shows the magnitude of the reflection (S11).
You can also measure the distance to fault or the cable loss.
3. Press the MEAS key.
4. Select the "DTF" softkey.

The R&S Cable Rider ZPH opens a submenu to select the measurement format.

5. Select the "Return Loss" or "SWR" menu item.
The R&S Cable Rider ZPH starts the distance-to-fault measurement and displays the result in the respective measurement format.

Setting the frequency

To get the best results, you should adjust the center frequency to that of the DUT.



Measurement bandwidth

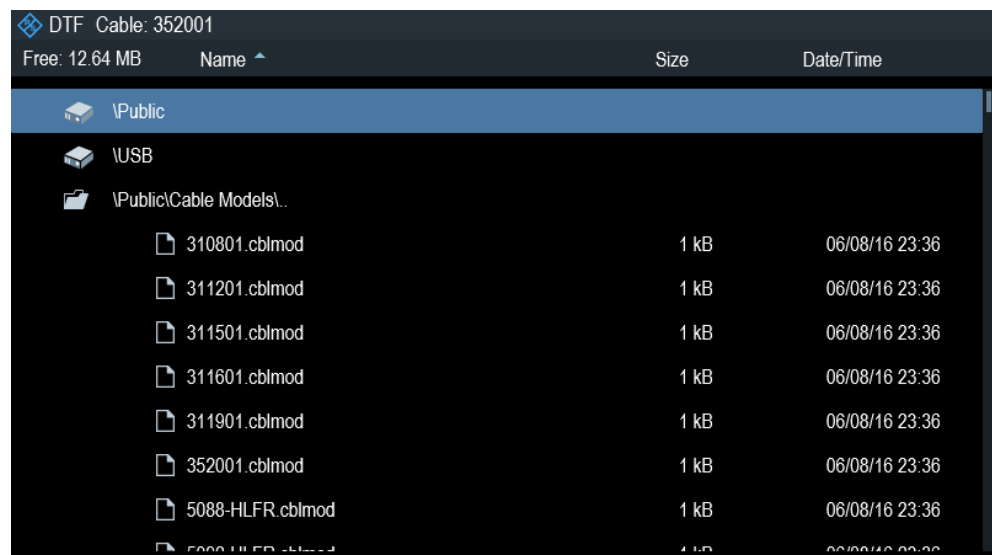
The measurement bandwidth of R&S Cable Rider ZPH is currently fixed at 10 kHz.

1. Press the FREQ/DIST key.
2. Select the "DTF Center Freq" softkey.
The R&S Cable Rider ZPH opens an input field to specify the center frequency.
3. Enter the center frequency you required.

Specifying the cable model and cable length

To perform cable tests, you have to specify the type of the cable and its approximate length.

1. Press the DTF CONFIG key.
2. Select the "Cable Config" softkey.
The R&S Cable Rider ZPH opens a file manager dialog box to select the cable model.



3. Select the cable model that you require from the list of cables.
The R&S Cable Rider ZPH loads the cable model that will be taken in for consideration during the distance-to-fault measurement.

You can also define new cable models on the R&S Cable Rider ZPH or with the R&S InstrumentView software and then transfer them to the R&S Cable Rider ZPH. For more information, see [Chapter 7.2.1.3, "Creating a Cable Model"](#), on page 112.

In addition to the cable model, you should also specify the maximum distance to the cable end.

1. Press the **FREQ/DIST** key.
2. Select the "Stop Dist" softkey.
The R&S Cable Rider ZPH opens an input field to specify the cable length.
3. Enter the maximum distance of the cable you are testing.

The range is from 3 m (10 ft) to 1500 m (4921 ft). The unit depends on the regional settings. It is either meter or feet. For more information, see ["Setting the length unit"](#) on page 38.

The R&S Cable Rider ZPH uses the cable length to determine the ideal span for the measurement and to scale the horizontal axis. For best results, the cable should be specified 20% to 50% longer than the actual cable length.

Calibrating the test setup



Using the calibration kit (R&S FSH-Z28 or R&S FSH-Z29), the R&S Cable Rider ZPH performs a "Full 1-Port" calibration over its entire span with 2501 sweep points. Thus, it is not necessary to perform a new calibration after changing the frequency range or cable length.

The R&S Cable Rider ZPH stores the calibration data in its memory. Thus, the calibration is valid after you change the operating mode or after you turn off the R&S Cable Rider ZPH.

Before connecting the cable, you should calibrate the R&S Cable Rider ZPH to get the best measurement results.

The R&S Cable Rider ZPH provides several calibration methods for cable measurements. For more information on the methods refer to the [Chapter 7.1.6.2, "Calibration Methods"](#), on page 108.

1. Press the **CAL** key.
2. Select the "Full 1-Port" softkey.
The R&S Cable Rider ZPH prompts you to connect a "Short", "Open" or a "Load" to the measurement cable.



Calibrate OPEN

Please connect an "OPEN" to "RF OUT / REFLECTION" Port!

3. Firmly connect a "Short", "Open" or a "Load" to the output end of the cable.

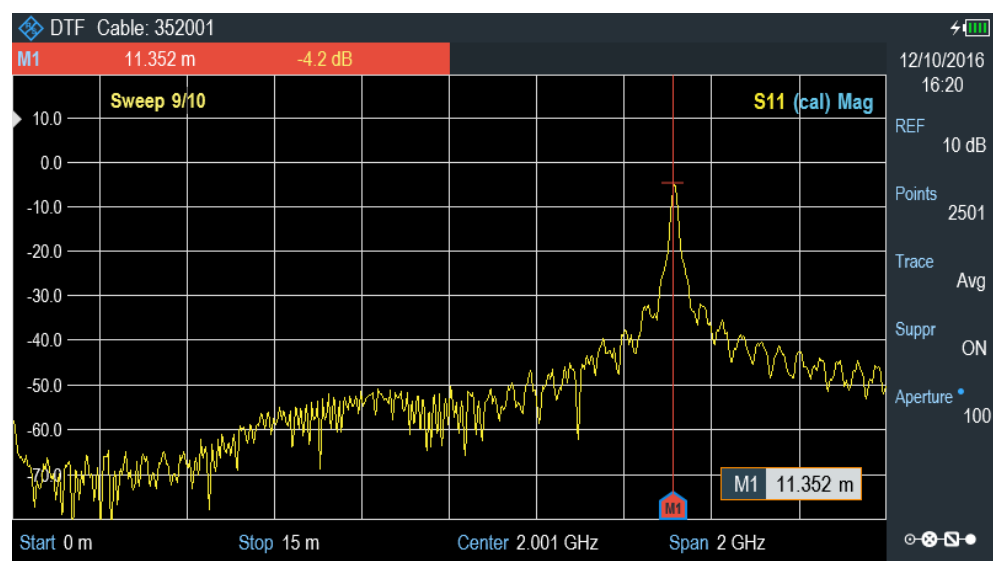
4. Proceed with the "Continue" softkey to start the calibration.
After finishing the calibration routine, the R&S Cable Rider ZPH displayed the message "Calibration done".
The R&S Cable Rider ZPH is now calibrated and a "(cal)" status is displayed next to the measurement format, i.e. **S11 (cal) Loss**. See [Measurement Trace Window](#).
5. Connect the cable under test back to the measurement cable.
The R&S Cable Rider ZPH shows the cable characteristics over the cable's entire length. With a marker, you can easily detect the distance to the cable fault.
In addition to the distance to fault measurement, the R&S Cable Rider ZPH also features a reflection measurement, for example to test impedance matching.

Using markers

The R&S Cable Rider ZPH uses markers to read out signal levels and frequencies. Markers are always positioned on the trace. Both the level and frequency at their current positions are displayed on the screen.

- Press the MARKER key.

The R&S Cable Rider ZPH activates a marker and puts it on the maximum value on the trace.



A red vertical line represents the position of the marker on the horizontal axis (e.g. the frequency).

A small red horizontal dash represents the marker position on the vertical axis (e.g. the level).

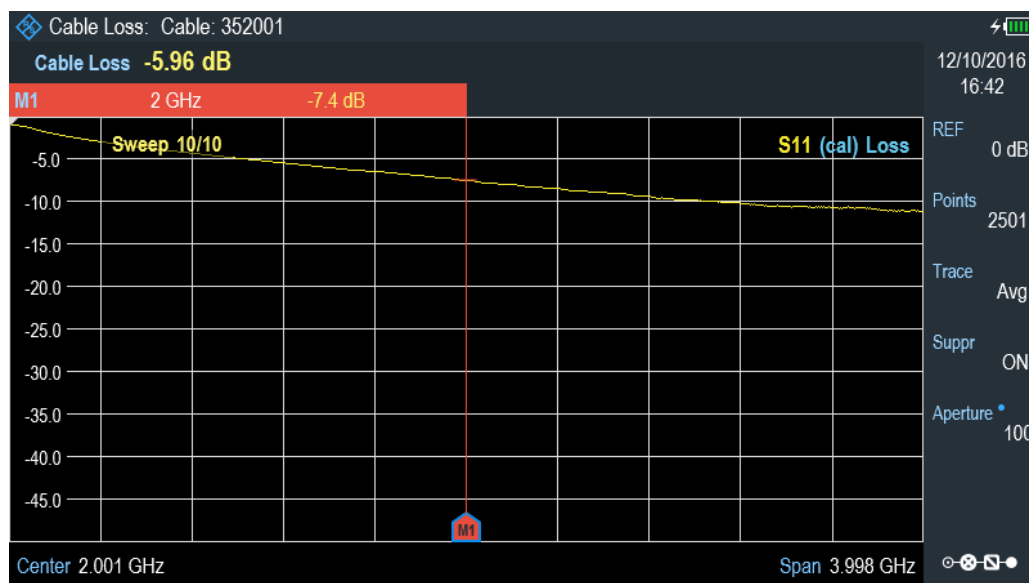
The R&S Cable Rider ZPH shows the marker position and measurement in the [Measurement Trace Result](#).

Measuring the cable loss

In addition to the distance to the cable fault, you might also be interested in the loss that the cable has over a particular frequency span.

1. Press the MEAS key.
2. Select the "Cable Loss" softkey.
The R&S Cable Rider ZPH now shows how much power is lost for a particular frequency span.

Using markers, you can determine the magnitude of the cable loss for any particular frequency.



4.6 Using Power Meter



R&S Cable Rider ZPH option

R&S ZPH-K19 (order number: 1321.0409.02) option is required to operate the R&S Cable Rider ZPH in the power meter mode.

Equipped with the power meter option, you can perform a quick power measurement using the built-in power sensor in the R&S Cable Rider ZPH.

For more information on the characteristics of the built-in power sensor, see the data-sheet of the R&S Cable Rider ZPH.

NOTICE**Risk of damaging the power sensor**

Because of high input power,

- The continuous power applied to the power sensor's input must not exceed 1 W (30 dBm).
- Use an attenuator for measurements on high-power transmitters.

However, brief power peaks $\leq 10 \mu\text{s}$ up to 2 W (33 dBm) are permissible.

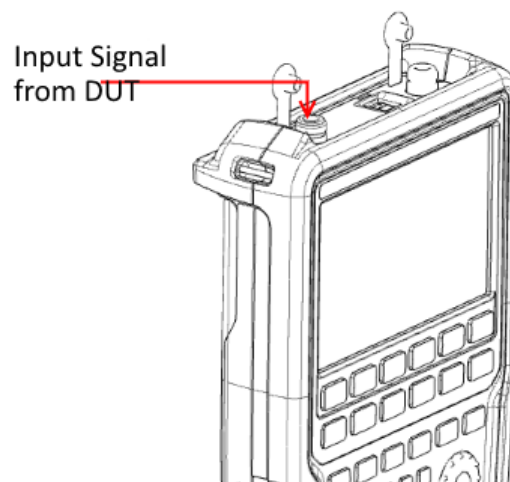
**Signal source output**

When the "SigGen On" softkey is activated, the R&S Cable Rider ZPH provides a signal source which you can use to perform a cable loss measurement in DUT. See ["Activating the signal source"](#) on page 59.

Test setup

A typical setup before power meter measurement requires the need to perform a calibration procedure on the R&S Cable Rider ZPH. See ["Calibrating the test setup"](#) on page 55.

After performing the calibration procedure, the R&S Cable Rider ZPH is ready for power meter measurement.

**Measuring the power**

1. Press the MODE key.
2. Select the "Power Meter" softkey.
The R&S Cable Rider ZPH switches its operating mode and shows the measured power level in dBm.



Entering the frequency

To get the best results, also enter the frequency of the signal under test.

1. Press the "Freq" softkey.
The R&S Cable Rider ZPH opens an entry box to enter the frequency.
2. Enter the frequency of the signal.
3. Confirm the entry with one of the unit keys.

The R&S Cable Rider ZPH transfers the new frequency to the internal power meter which then corrects the measured power readings.

Activating the signal source

The R&S Cable Rider ZPH comes with a built-in signal source which you can enable or disable in the power meter mode.

See ["Signal source output"](#) on page 58.

Once the signal source is enabled, you can output a signal source of -10 dBm at the designated frequency from the RF output connector.

- Select the "SigGen On" softkey.
The R&S Cable Rider ZPH output a signal source of -10 dBm at the RF output connector.

4.6.1 Using a Power Sensor



R&S Cable Rider ZPH option

R&S ZPH-K9 (order number: 1321.0409.02) option is required to operate the R&S Cable Rider ZPH in the power sensor mode.

For highly accurate power measurements, you can connect one of the power sensors that are supported by the R&S Cable Rider ZPH.

For a list of R&S Cable Rider ZPH supported power sensor, refer to [Chapter 8.1, "Using a Power Sensor"](#), on page 132.

You can connect the list of supported power sensors to the USB port of the R&S Cable Rider ZPH. This connector allows you to control the power sensor and supplies it with power. For more information, see ["USB type A connector"](#) on page 23.

4.6.1.1 Measuring the Power with a Power Sensor

For more information about the characteristics of the supported power sensors, refers to their datasheet.

NOTICE

Risk of damaging the power sensor

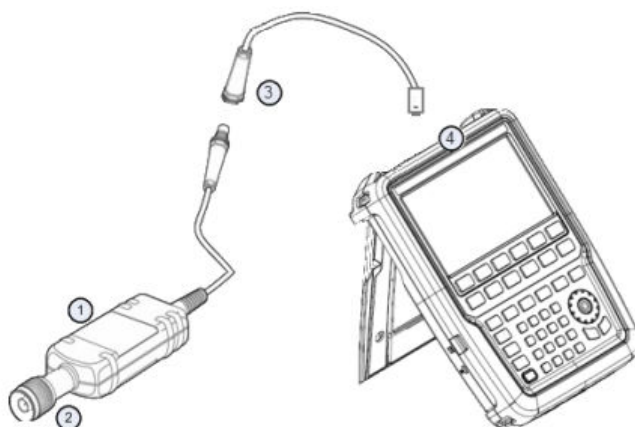
Because of high input power,

- The continuous power applied to the power sensor's input must not exceed 400 mW (26 dBm).
- Use an attenuator for measurements on high-power transmitters.

However, brief power peaks $\leq 10 \mu\text{s}$ up to 1 W (30 dBm) are permissible.

Test setup

Connect the power sensor cable to the USB port of R&S Cable Rider ZPH. If the power sensor is having the binder connector (i.e R&S FSH-Z1, R&S FSH-Z18), the FSH-Z101 adaptor cable is needed.



- 1 = Supported power sensor (e.g R&S FSH-Z1, R&S NRP-Z11)
- 2 = Power sensor connector (DUT)
- 3 = USB binder adaptor (R&S FSH-Z101)
- 4 = USB port connector

Measuring the power

1. Press the MODE key.
2. Select the "Power Meter" softkey.
The R&S Cable Rider ZPH switches its operating mode.

If the R&S Cable Rider ZPH recognizes a power sensor, it sets up a connection via the USB interface. After a few seconds, the R&S Cable Rider ZPH shows the measured power.

If no power sensor has been connected or is not connected appropriately, the R&S Cable Rider ZPH shows nothing.

If there are communication problems between the R&S Cable Rider ZPH and the power sensor, the R&S Cable Rider ZPH displays an error message that indicates a possible cause.

For more information on the error messages, see [Table 8-1](#).

Zeroing the power sensor

To compensate internal offsets of the power meter, a zeroing for the power sensor is required before starting the measurement.

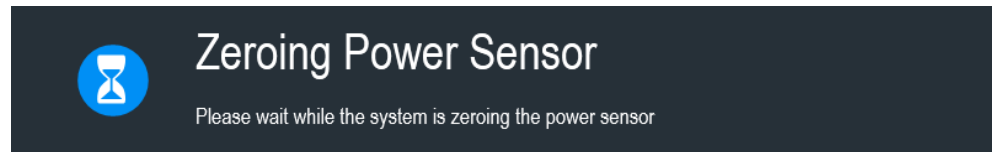
1. Select the "Zero" softkey.
Do not to apply any signals to the power sensor while zeroing is active.
A popup message box is displayed to provide instructions during the zeroing of the power sensor.



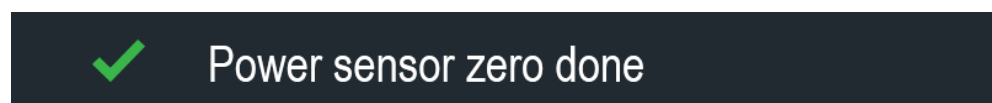
Please Remove All Signals

From the sensor input and press Continue to start zeroing

2. Disconnect the power sensor from any signal sources.
3. Select the "Continue" softkey to start zeroing.
The R&S Cable Rider ZPH starts the zeroing process.



4. Wait for the zeroing process to finish.
After zeroing is done, the R&S Cable Rider ZPH displays the message "Power sensor zero done" and again shows the power sensor softkey menu.



5. Connect the DUT to the power sensor.
The R&S Cable Rider ZPH shows the measured power level in dBm. See [Figure 8-1](#).

Set the frequency

To get the best results, enter the frequency of the signal under test.

1. Select the "Freq" softkey.
The R&S Cable Rider ZPH opens an entry box to enter the frequency.
2. Enter the frequency of the signal.
3. Confirm the entry with one of the unit keys.

The R&S Cable Rider ZPH transfers the new frequency to the power sensor which then corrects the measured power readings.

4.6.1.2 Measuring Power and Return Loss

With the directional power sensors R&S FSH-Z14 and R&S FSH-Z44, you can measure the power in both directions.

When you connect the directional power sensor between the source and the load, the R&S Cable Rider ZPH measures the power from the source to load (forward power) and from the load to source (reverse power).

The ratio between the forward and reverse power is a measure of the load matching. The R&S Cable Rider ZPH displays it as the return loss or standing wave ratio.

The power sensors for the R&S Cable Rider ZPH have an asymmetrical design. Therefore, they have to be inserted into the test setup in such a way that the "Forward" arrow on the sensor points toward the load (in the direction of the power flux).

When measuring high powers, pay strict attention to the following instructions to avoid personal injury and to prevent the power sensor from being destroyed.

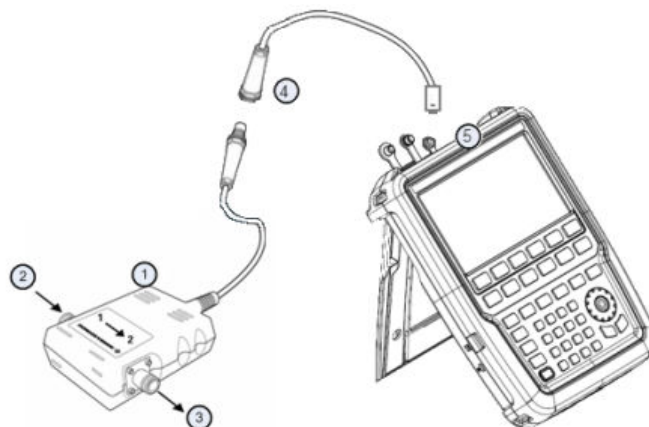
⚠ CAUTION**Danger of skin burns and damage to the instrument**

- Never exceed the permissible continuous power.
- See diagram on the rear of the sensor for the permissible continuous power.
- Turn off the RF power to connect the sensor.
- Screw the RF connectors tightly.

Test setup

Connect the power sensor cable to the USB port of R&S Cable Rider ZPH. If the power sensor is having the binder connector (i.e R&S FSH-Z14, R&S FSH-Z44), the FSH-Z144 adaptor cable is needed. Insert the directional power sensor between the source and the load.

The power sensors for the R&S Cable Rider ZPH have an asymmetrical design. Hence, you have to insert them into the test setup in such a way that the "Forward" arrow (1→2) on the sensor points toward the load (= in the direction of the power flux).



- 1 = Directional power sensor R&S FSH-Z14 or Z44
- 2 = Source
- 3 = Load
- 4 = USB binder adaptor (R&S FSH-Z144)
- 5 = USB port connector

Measuring the power

1. Press the MODE key.
2. Select the "Power Meter" softkey.

As soon as the R&S Cable Rider ZPH recognizes the power sensor, it displays the type of the directional power sensor that is connected in the [Title bar](#). After a few seconds, it also shows the forward power and return loss currently measured at the load.

Zeroing the power sensor

Before performing the power measurement, you should zeroing the power sensor.

After zeroing is done, the R&S Cable Rider ZPH displays the message "Power sensor zero done" and again shows the power sensor softkey menu.

- Connect the R&S FSH-Z14 or R&S FSH-Z44 between the source and the load. The R&S Cable Rider ZPH displays the measured forward power in dBm and the SWR of the load. See [Figure 8-2](#)

To get the best results, you should also define the frequency of the signal. For more information, see [Chapter 4.6.1.1, "Measuring the Power with a Power Sensor"](#), on page 60.

4.7 Saving and Recalling Results and Settings



Storage device

If both USB flash drive and micro-SD card are connected to the instrument, the USB flash drive takes precedent over SD card as a storage device.

If both storage devices are not connected, the internal memory of the instrument is used for storage.

The R&S Cable Rider ZPH can store measurement results and settings in the internal memory, removable micro-SD card or on a USB flash drive via the USB interface.

Results and settings are always stored together, allowing them to be interpreted in context when recalled. The R&S Cable Rider ZPH can store at least 100 data records in the internal memory which are differentiated by their names.

The R&S Cable Rider ZPH provides two [USB ports](#) and one [micro-SD card slot](#).

For more information on saving measurement results and settings, see [Chapter 5.8.1, "Saving Datasets"](#), on page 81.

For more information on recalling measurement results and settings, see [Chapter 5.8.2, "Restoring Datasets"](#), on page 84.

5 Instrument Functions

The following chapters provide information about the basic functionality and the user interface of the R&S Cable Rider ZPH.

• Touchscreen Gesture Element	65
• On-screen Keyboard	71
• Front Panel Keys	71
• Presetting the R&S Cable Rider ZPH	75
• Configuring Measurements	76
• Working Directory	77
• Taking Screenshots	77
• Managing Datasets	79
• Updating the Firmware	86
• Installing Firmware Options	86

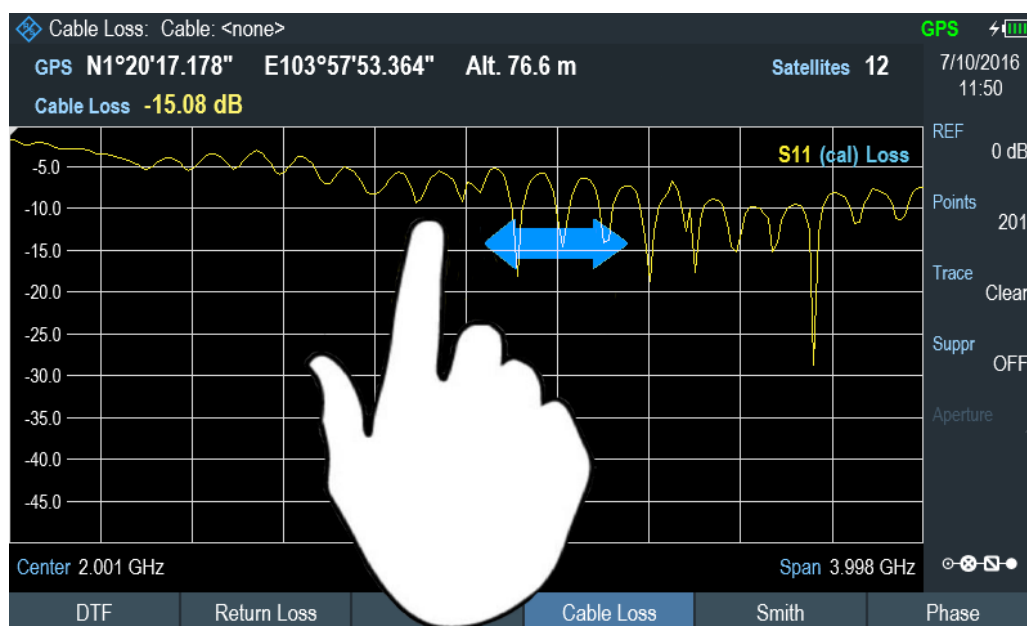
5.1 Touchscreen Gesture Element

To enhance greater flexibility and user experience in the user interaction with R&S Cable Rider ZPH, special touchscreen gestures are introduced. The following illustrated the list of special gestures that R&S Cable Rider ZPH provides.

• Change Center Frequency	65
• Change Reference Level	66
• Change Span	67
• Add Marker	67
• Move Marker	68
• Delete All Markers	69
• Hide or Unhide Measurement Result View Display	69
• Preview Screenshot	70
• Skip Wizard Measurement	70

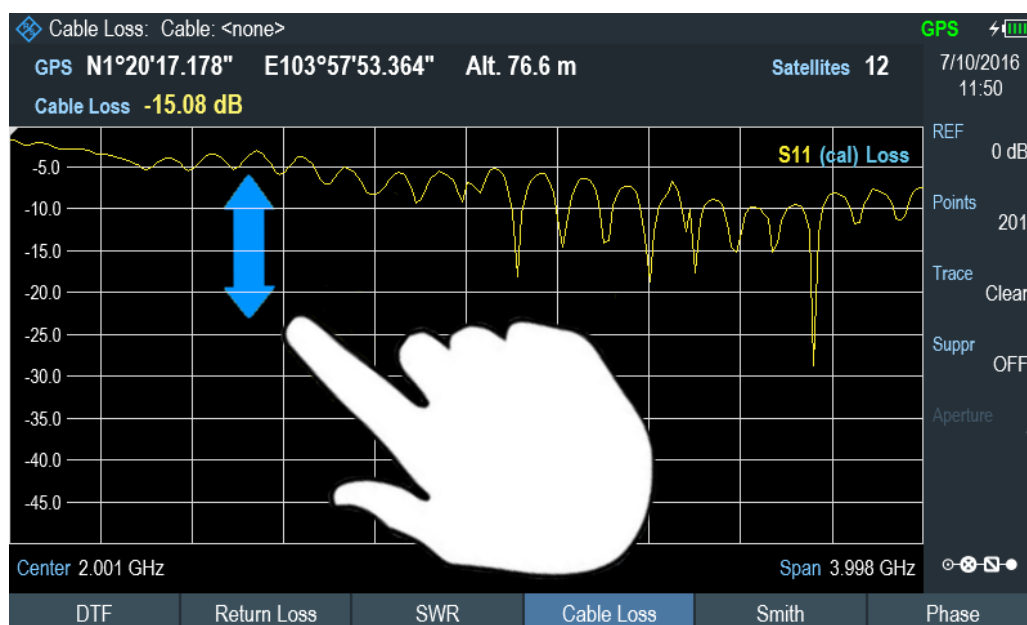
5.1.1 Change Center Frequency

Swipe left or right horizontally in the trace window to adjust the center frequency of the spectrum measurement. Alternatively, select the "Center" in the [Parameter View](#) to adjust the center frequency or press the **FREQ/DIST** key on the front panel to display the "Center Freq" softkey label for adjustment.



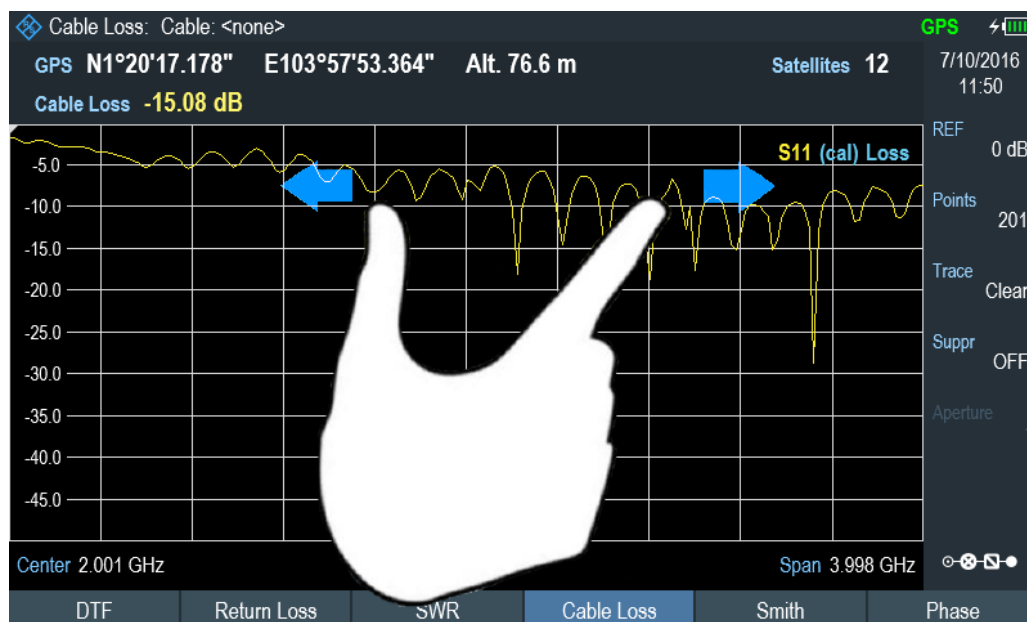
5.1.2 Change Reference Level

Swipe up or down vertically in the trace window to adjust the reference level of the spectrum measurement. Alternatively, select the "REF" button in the [Parameter View](#) to adjust the reference level or press the SCALE key on the front panel to display the "Ref Level" softkey label for adjustment.



5.1.3 Change Span

Pinch or stretch two fingers horizontally to adjust the span of the spectrum measurement. Alternatively, select the "Span" in the [Parameter View](#) to adjust the span of the spectrum measurement or press the FREQ/DIST key on the front panel and select the "Span" softkey label for adjustment.



5.1.4 Add Marker

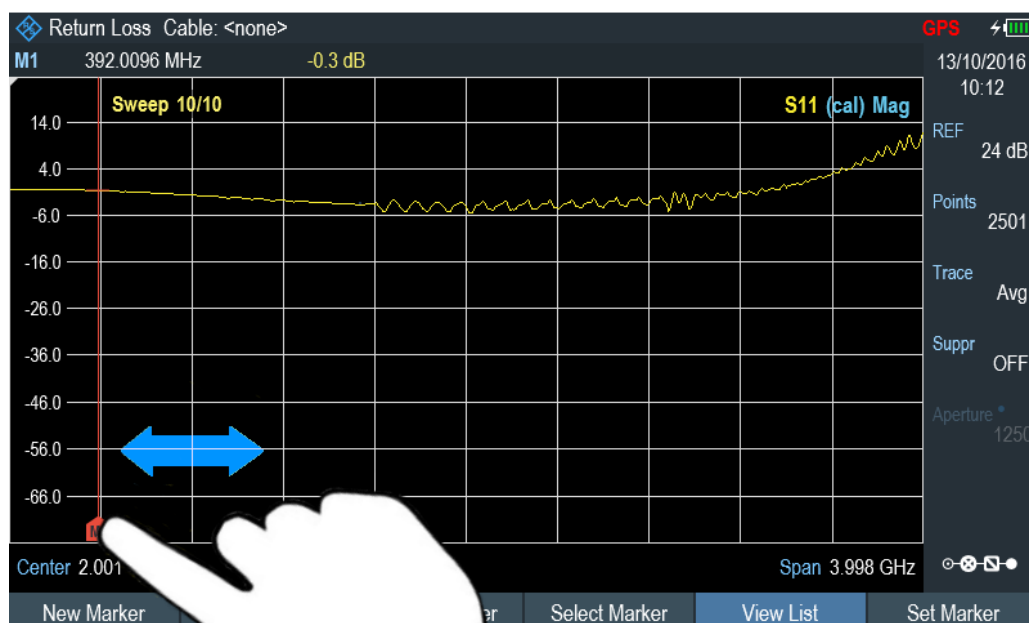
Double tap in the trace window to create a new marker on the spectrum measurement. The marker is placed on the trace where the double tap gesture is performed.

Alternatively, press the MARKER key on the front panel and select the "New Marker" from the softkey label to create a new marker on the spectrum measurement.



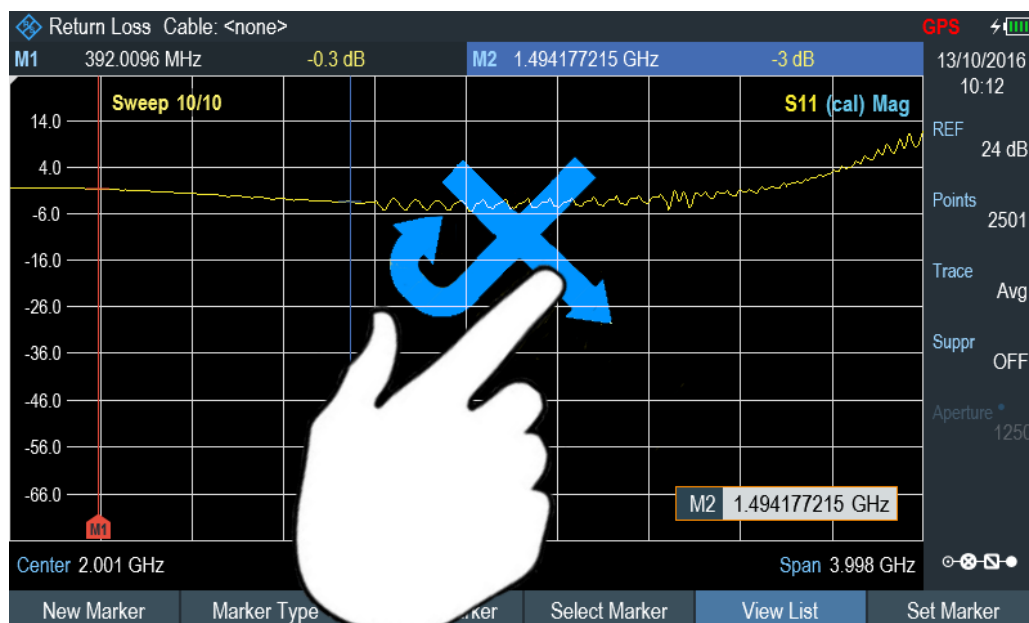
5.1.5 Move Marker

Tab and drag on the marker icon to change the marker position in the trace window. Alternatively, select the marker label in the [Measurement Result View](#) to adjust the marker position on the spectrum measurement or press the MARKER key on the front panel and select the "Select Marker" softkey label for adjustment.



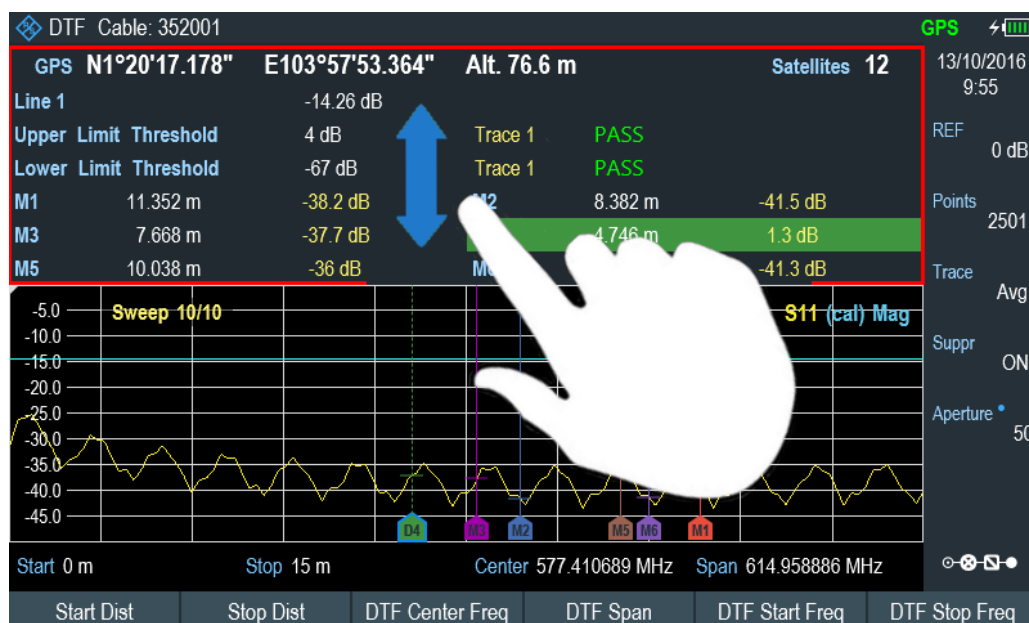
5.1.6 Delete All Markers

Draw an "X" on the trace window to delete all markers from the spectrum measurement. Alternatively, press the MARKER key on the front panel and select the "Delete Marker" from the softkey label to delete all markers from the spectrum measurement.



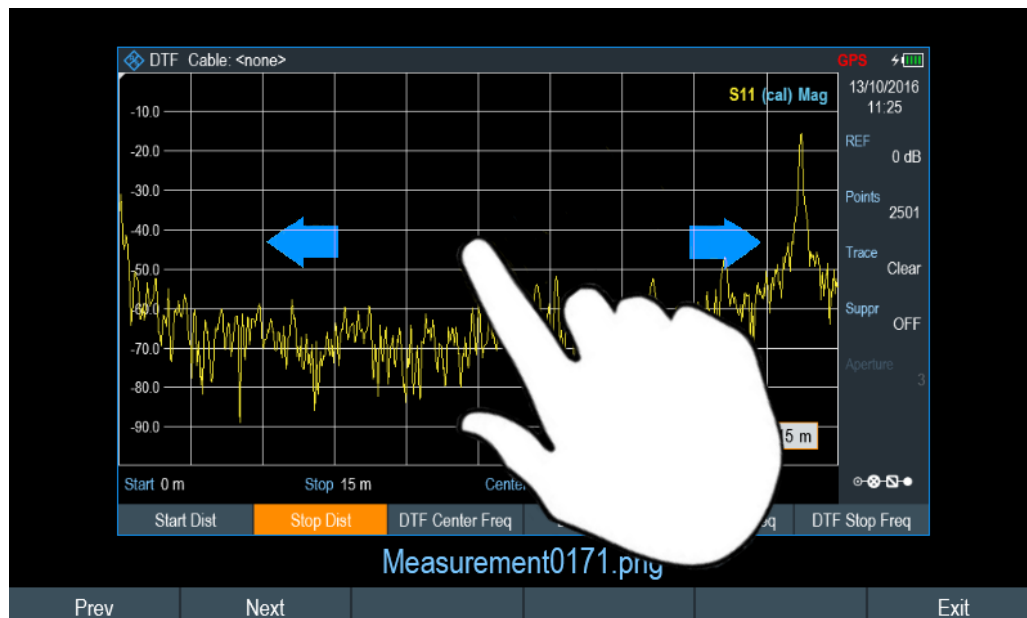
5.1.7 Hide or Unhide Measurement Result View Display

Swipe up or down vertically on the [Measurement Result View](#) window to hide or unhide the results display window.



5.1.8 Preview Screenshot

Swipe horizontally to the left or right direction in the trace window to preview the screenshot. Alternatively, select the "Prev" or "Next" softkey to preview the screenshot.



5.1.9 Skip Wizard Measurement

Swipe horizontally to the left direction to skip a wizard measurement. Alternatively, select the "Skip" softkey to skip the measurement.



5.2 On-screen Keyboard

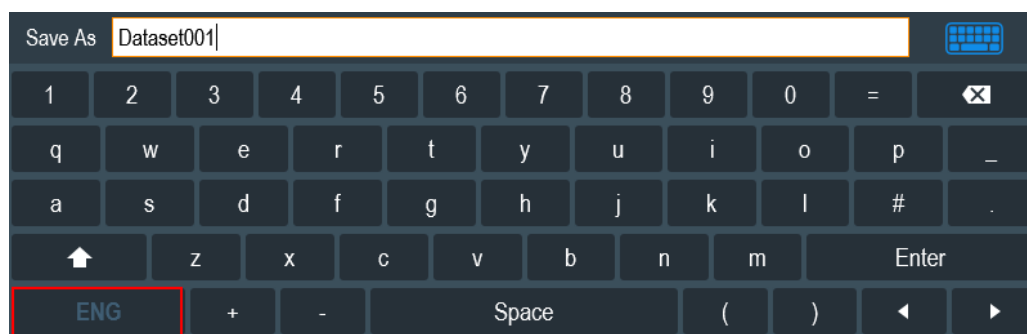
The on-screen keyboard is an additional means of interacting with the instrument. It provides convenience of usage with the touchscreen input.

Accessing the on-screen keyboard is only available for text-based entry, e.g. save or open a filename.



Touchscreen interface

If the [touchscreen interface](#) is not activated, the on-screen keyboard is disabled.



The on-screen keyboard display can be switched on and off using the on-screen keyboard  icon highlighted at the top right-hand corner.

5.3 Front Panel Keys

The following chapter illustrates the function of the front panel keys.

5.3.1 POWER Key

The POWER  key is located on the lower left of the front panel. It starts up and shuts down the instrument.

See [Chapter 3.1.2, "Switching the Instrument On and Off"](#), on page 20.

See also [Chapter 3.2.1, "Front View"](#), on page 21.

5.3.2 Screenshot Key

The screenshot  key provides a quick way to capture screenshot of the current screen at anytime.

For more information, see [Chapter 5.7, "Taking Screenshots"](#), on page 77.

5.3.3 Softkey

The six softkeys on the front panel are used to access the softkey label. See [Chapter 3.2.1, "Front View"](#), on page 21.



The softkey label is function-specific depending on the key selected on the front panel of the instrument. See [Chapter 5.3.5, "Function Keys"](#), on page 72.

5.3.4 System Keys

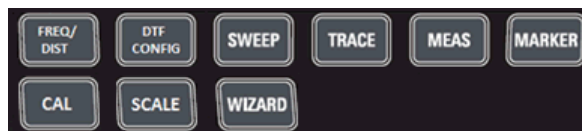
System keys configure the instrument to a predefined state, change basic settings, configure evaluation setting and provide save and recall functions.



SYSTEM keys	Descriptions
PRESET	Resets the instrument to the default state.
SETUP	Provides basic instrument configuration functions: • Date, time, display, audio and regional configuration • Battery low indicator • LAN interface • Disabling and enabling of options • Information about instrument configuration including firm-ware version and system error messages
MODE	Provides the selection between applications. • Cable & Antenna • Power Meter
LINES	Configures display lines and limit lines.
SAVE RECALL	Provides a file manager function to facilitate the saving and recalling of result and instrument settings.

5.3.5 Function Keys

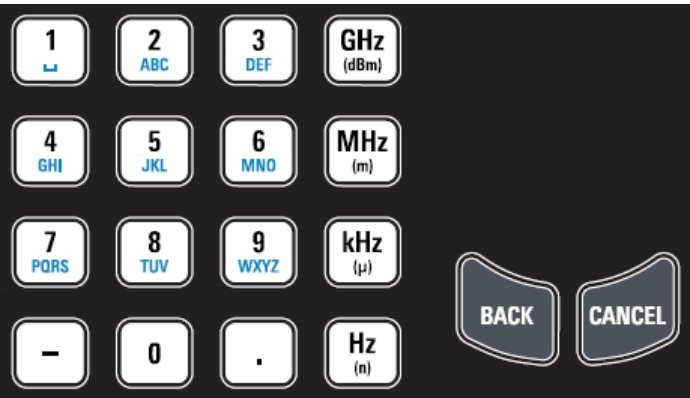
Function keys provide access to the most common measurement settings and functions in the instrument.



FUNCTION keys	Descriptions
FREQ/DIST	Mode-dependent button. Sets the center frequency, frequency span, start and stop frequencies for the frequency range under consideration. It also set the cable length under measurement.
CAL	Perform calibration on the R&S Cable Rider ZPH. For more information, see Chapter 7.1.6, "Calibrating Measurements" , on page 107
SCALE	Sets the reference level of the measurement. It also performs auto scaling of the reference level.
WIZARD	Performs a sequence of standardized and recurring measurements. See Chapter 6, "Working with the Measurement Wizard" , on page 87.
DTF Config	Configure the cable model used in the measurement. Display "DTF List" with reference to the "DTF List Threshold" setting. See Chapter 7.2, "Configuring Cable and Antenna Tests" , on page 111.
SWEEP	Set number of sweep points for measurement. Up to a maximum of 2501 sweep points is configurable Selects continuous measurement or single measurement.
TRACE	Configures the measured data acquisition and the analysis of the measurement data.
MEAS	This key provides functionality to select and configure measurement such as: • DTF • Return Loss • SWR • Cable Loss • Smith • Phase
MARKER	Sets and positions the absolute and relative measurement markers (markers and delta markers). Marker positioning using peak, next peak and minimum level.

5.3.6 Keypad

The keypad is used to enter alphanumeric parameters, including the corresponding units.



It contains the following keys:

Type of key	Description
Alphanumeric keys	Enter numbers and (special) characters in edit dialog boxes.
Decimal point	Inserts a decimal point "." at the cursor position.
Sign key	Changes the sign of a numeric parameter. In the case of an alphanumeric parameter, inserts a "-" at the cursor position.
Unit keys (GHz/-dBm MHz/ dBm, kHz/dB and Hz/dB)	These keys add the selected unit to the entered numeric value and complete the entry. In the case of level entries (e.g. in dB) or dimensionless values, all units have the value "1" as multiplying factor. Thus, they also act like an enter key function.
CANCEL key	Closes all kinds of dialog boxes, if the edit mode is not active. Quits the edit mode, if the edit mode is active. In dialog boxes that contain a "Cancel" button it activates that button. For "Edit" dialog boxes the following mechanism is used: • If data entry has been started, it retains the original value and closes the dialog box. • If data entry has not been started or has been completed, it closes the dialog box.
BACK key	If an alphanumeric entry has already been started, this key deletes the character to the left of the cursor. Note: If an entry is confirmed with enter, this key restores the value entered before. This action can be used to toggle for example between two frequencies.

5.3.7 Navigation Controls

The rotary knob provides navigation controls in the display or within dialog boxes.



The rotary knob has several functions:

- Increments (clockwise direction) or decrements (counter-clockwise direction) the instrument parameters at a defined step width in the case of a numeric entry
- Shifts markers, limit lines and display line on the screen
- Acts like a cursor key in dialog boxes or softkey submenus.
- Moves the scroll bar vertically if the scroll bar is in focused
- Acts as an enter key when pressed

5.4 Presetting the R&S Cable Rider ZPH



Before you prepare a measurement, it is recommended to preset the R&S Cable Rider ZPH. During a preset, the R&S Cable Rider ZPH resets all settings to their default state. Restoring the default configuration has the advantage that old settings do not affect measurements.

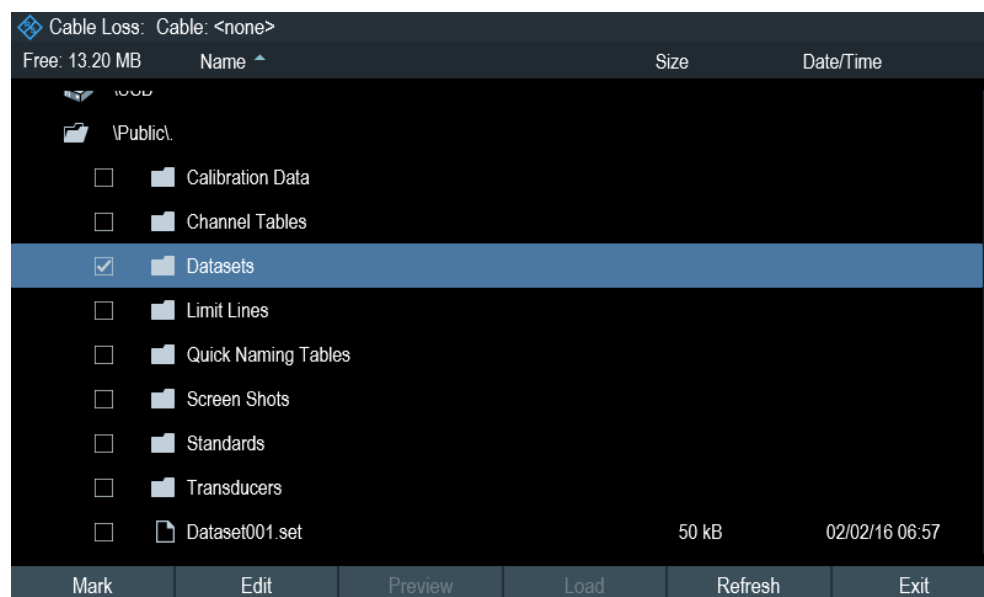
The default setup is specific to the operating mode.

- ▶ Press the PRESET key.
The R&S Cable Rider ZPH restores its default setup.

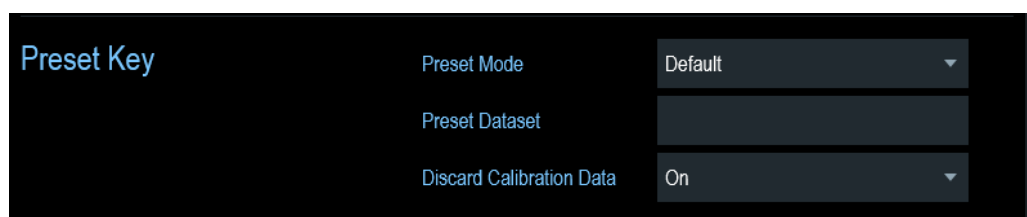
You can load or discard a previous calibration data during a preset.

You can also define your own default settings via a dataset. This dataset is then loaded after pressing the PRESET key instead of the factory default.

1. Press the SETUP key.
2. Select the "User Preference" softkey.
3. In the "User Preferences" dialog box, select the "Preset Dataset" item.
The R&S Cable Rider ZPH displays the file manager dialog box to select the dataset that contains the settings you would like to have as the preset settings.



4. Select the dataset with the settings you want and press "Load" softkey.
5. In the "User Preferences" dialog box, select the "Preset Mode" item. A drop-down menu opens to select the preset mode.
6. Select the "User Defined" to load the dataset defined in the "Preset Dataset". The R&S Cable Rider ZPH now loads the settings of the dataset after you press PRESET.
7. Select "Discard Calibration Data" to define usage of calibration data after preset. A drop-down menu opens to select the usage of calibration data.
8. Select "On" to apply calibration data or "Off" to discard calibration data after preset. Depending on the selection, the R&S Cable Rider ZPH loads or discards the calibration data after preset.



5.5 Configuring Measurements

The "Config Overview" dialog box provides an overview of the current configuration of the R&S Cable Rider ZPH. In addition, you can also change the configuration in this dialog box.

1. Press the SETUP key.

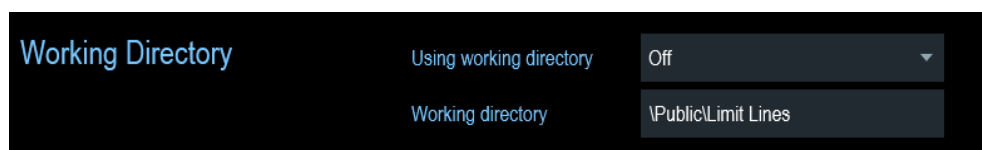
2. Select the "Config Overview" softkey.
3. Select one of the dialog boxes and change the settings as you like.

Note that the contents of the "Config Overview" dialog box are customized for each operating mode of the R&S Cable Rider ZPH. Therefore, the order and number of displayed settings is different in each mode.

5.6 Working Directory

Using the "Working Directory", you can customize the folder directory to save the screenshots and datasets captured during measurement.

1. Press the SETUP key.
2. Select the "User Preference" softkey.
3. In the "User Preferences" dialog box, select the "Using working directory" item.
4. Select "On" to activate the customize folder directory or "Off" to use the default storage device in the R&S Cable Rider ZPH. See ["Data storage devices"](#) on page 82.
5. Define the folder name in the "Working directory" item.



5.7 Taking Screenshots



You can take and store a screenshot of the current screen anytime with the screenshot key.

- ▶ Press the screenshot key.
The R&S Cable Rider ZPH takes the screenshot.

If available, the R&S Cable Rider ZPH stores the screenshot on an external storage device (USB flash drive or micro-SD card). If both are connected, the R&S Cable Rider ZPH uses the USB flash drive.

If no external device is available, the R&S Cable Rider ZPH stores the screenshot in its internal memory until the internal memory is full. In that case, you can transfer the screenshots with the R&S InstrumentView software to your computer.



Saving screenshot and dataset at the same time

Depending on the "Capture" settings configured in the "User Preference" menu, using the screenshot key also saves a dataset in addition to the screenshot.

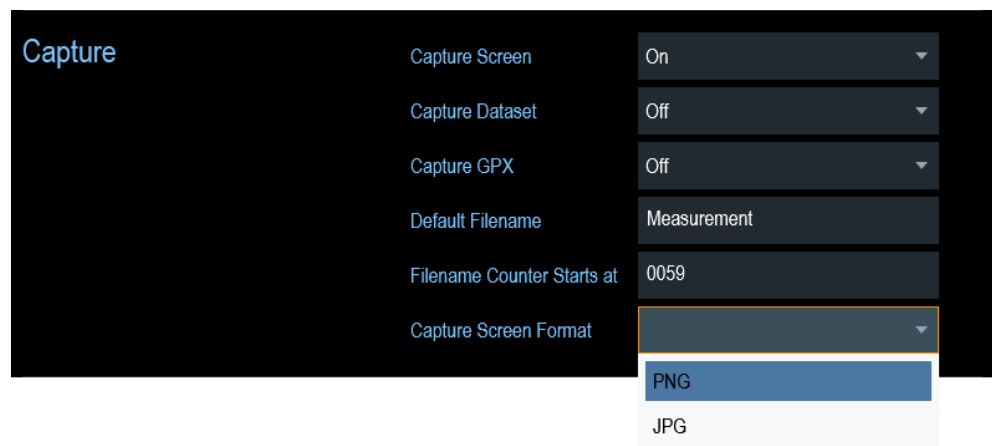
For more information, see [Chapter 5.8, "Managing Datasets"](#), on page 79.

Screenshot filename and file format

All screenshots get a default filename "Screenshot####". The files also get numbers (####) in an ascending order, beginning with 0000. You can select a default filename and a starting number in the "User Preference" menu.

The file format of screenshots is either *.png or *.jpg, depending on your configuration in the "User Preference" menu.

1. Press the SETUP key.
2. Select the "User Preference" softkey.
3. Select the "Default Filename" and "Filename Counter Starts At" items and assign a filename and number as you wish.
4. Select the "Capture Screen Format" items to select the screenshot file format.



Previewing screenshots

The R&S Cable Rider ZPH provides functionality to preview screenshot.



Special touchscreen gesture

You can swipe horizontally to the left or right direction to preview the screenshot.

See [Chapter 5.1.8, "Preview Screenshot"](#), on page 70.

1. Press the SAVE/RECALL key.
2. Select the "File Manager" softkey.
The R&S Cable Rider ZPH opens the file manager to select a screenshot for the preview.

3. Select the screenshot for preview.
4. Select the "Preview" softkey to preview the screenshot.
5. Select the "Prev" or "Next" softkey to preview the screenshots available in the selected folder.
The filename of the previewed screenshot is displayed below the screenshot.
See [Figure 5-1](#) and [Chapter 5.8.2.1, "Previewing a Dataset"](#), on page 85.
6. Select the "Exit" softkey to return to the file manager.

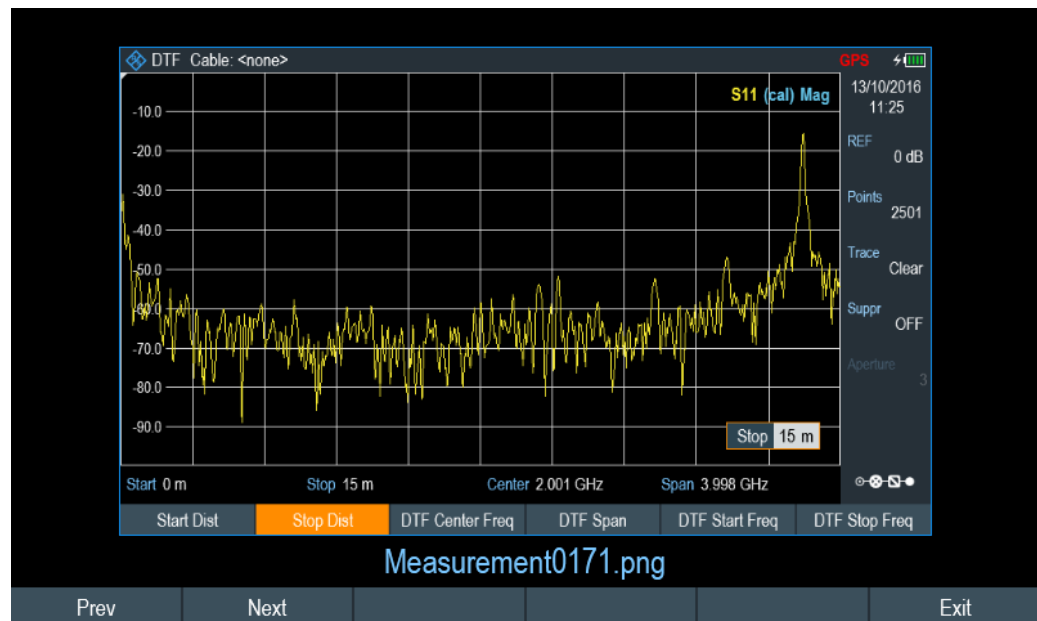


Figure 5-1: Preview screenshot

5.8 Managing Datasets



The R&S Cable Rider ZPH provides functionality to manage (e.g. save, restore) datasets available in its internal memory or an external storage device.

Datasets

The R&S Cable Rider ZPH supports various types of datasets. The instructions below primarily describe the management of datasets that you create on the R&S Cable Rider ZPH during measurements, for example measurement results and configurations. Note that these datasets have the file extension `.set`.

Datasets with the file extension `.set` are an image of measurement results and configurations. Thus, you can subsequently reproduce the context of the measurement.

Using the R&S InstrumentView software, you can use the datasets for documentation purposes or post-processed it for a more detailed analysis later on. Note that datasets also contain calibration data if calibration has been performed.

Templates

The R&S Cable Rider ZPH also supports various other types of datasets or templates. Such templates mainly contain additional requirements for a particular measurement, like limit lines or channel tables.

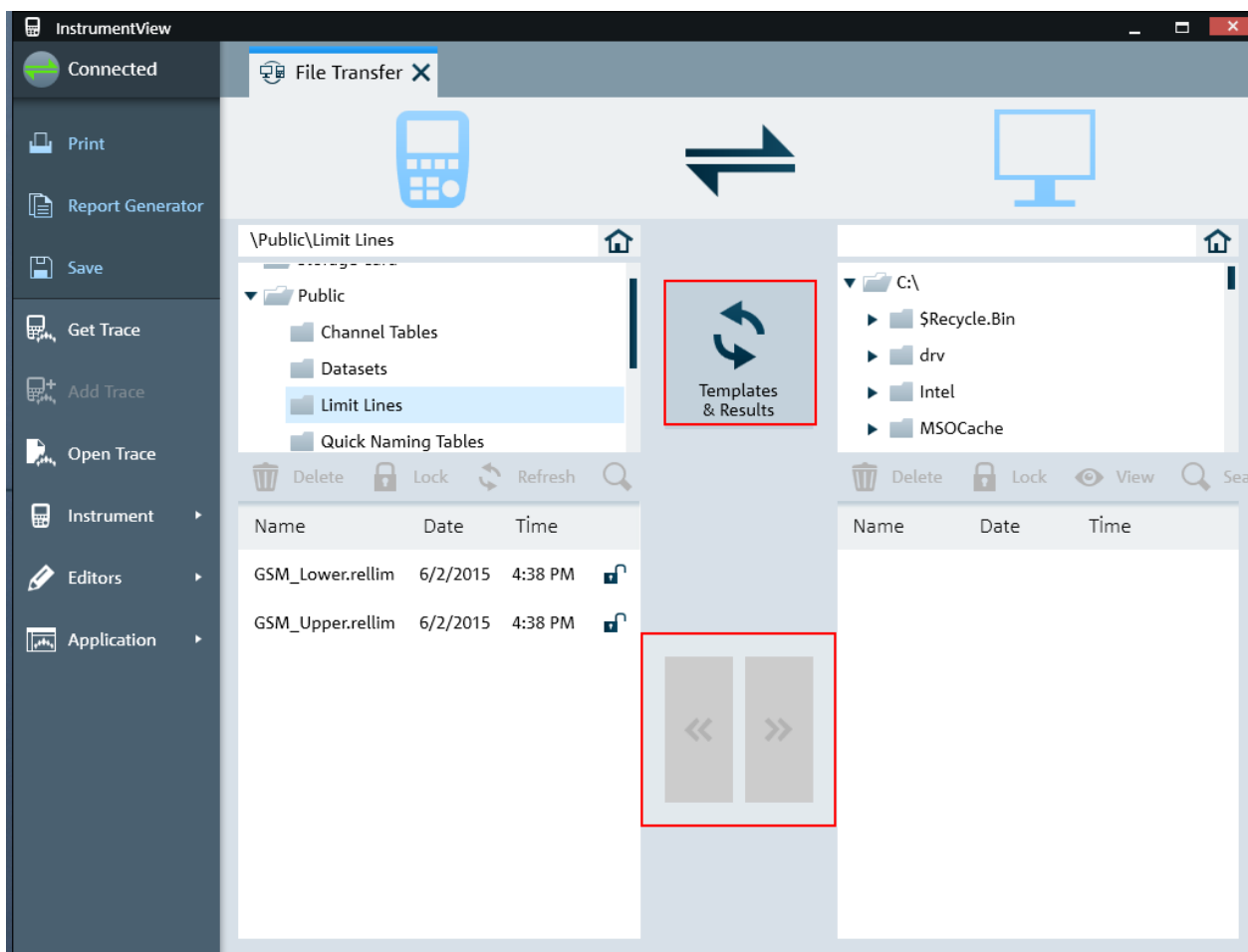
Creating and editing of these templates are only possible with the functionality provided by the R&S InstrumentView software package. Note that the file extension depends on the application of the template (for example, a template containing a channel table has the extension `.chntab`).

For more information on working with templates and datasets, refer to the documentation of the R&S InstrumentView software package.

Data synchronization

The R&S InstrumentView features data synchronization that matches the data available between the R&S Cable Rider ZPH and the PC.

1. Select "File Transfer" from the "Instrument" menu.
The software opens the "File Transfer" dialog box.
2. Select the "Template & Result"  synchronization button to process data synchronization between the computer and instrument.
This data synchronization updates all files that have been created or edited with the R&S InstrumentView software package to the instrument and vice versa. (Note that template can only be created and edited in the PC, see ["Templates"](#) on page 80).
3. Alternatively, data can be transferred in a single direction using the  direction button between the PC and instrument and vice versa.

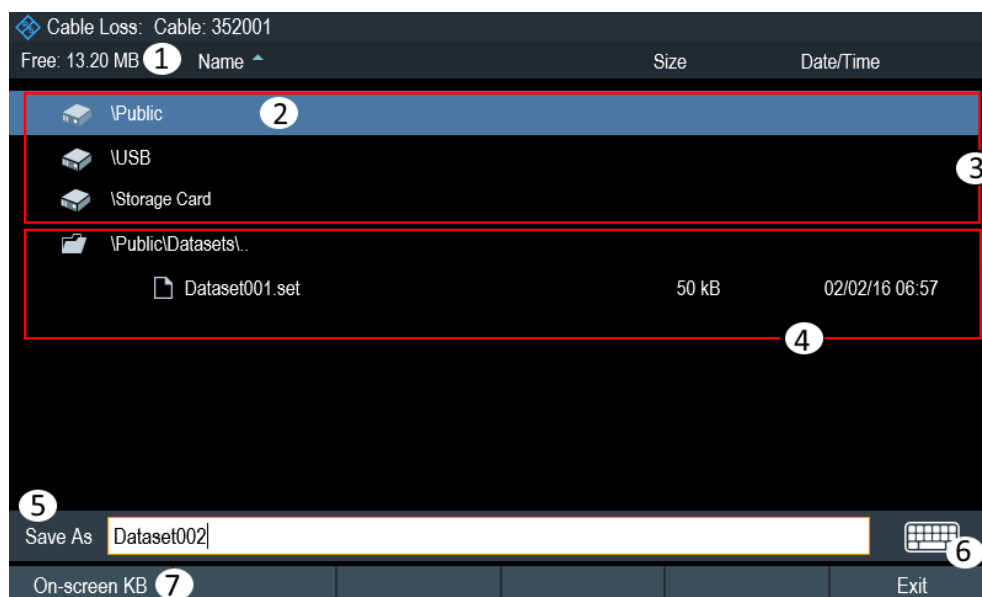


- [Saving Datasets](#).....81
- [Restoring Datasets](#).....84
- [Deleting Datasets](#).....86

5.8.1 Saving Datasets

The R&S Cable Rider ZPH allows you to save the data that is analyzed at any time.

1. Press the SAVE/RECALL key.
2. Select the "Save" softkey.
The R&S Cable Rider ZPH opens the "Save Dataset" dialog box.



- 1 = Remaining memory on selected data storage device
- 2 = Currently selected data storage
- 3 = Available data storage
- 4 = Currently folder structure of the selected data storage
- 5 = Dataset name input field
- 6 = On-screen Keyboard icon
- 7 = File manager softkey menu

Data storage devices



Storage device

If both USB flash drive and micro-SD card are connected to the instrument, the USB flash drive takes precedent over SD card as a storage device.

If both storage devices are not connected, the internal memory of the instrument is used for storage.

The folder structure shows all the available data storage devices. Possible storage devices are the internal memory of the R&S Cable Rider ZPH, micro-SD card or USB flash drive.

The default storage device depends on which devices are connected to the R&S Cable Rider ZPH. See ["Storage device"](#) on page 82.

The internal memory provides approximately 20 MB of data, therefore the number of datasets you save on the R&S Cable Rider ZPH is limited. Each dataset needs about 100 kB of memory, but this value can vary.

If you are using an external storage device, the number of datasets you can save is limited only by the size of the storage device.

R&S Cable Rider ZPH shows the remaining memory on the storage device in the dialog box.

1. Select the storage device you want to save the data.

2. Select the folder you want to save the data.
3. Enter a filename in the corresponding input field.
The default filename for datasets is `Dataset###.set` with a new number in ascending order for each new dataset. The file extension for datasets is `.set`.
If you enter another name, the R&S Cable Rider ZPH uses that name and assigns a new number to the filename if you save the data set the next time. This function allows you to assign consecutive dataset filename without entering a new name every time you want to save a dataset.
You can define the dataset filename at the "User Preference" dialog box. Select the "Default Dataset Name" and enter the filename in the entry box.
4. Press the rotary knob to confirm the entry.
The R&S Cable Rider ZPH saves the dataset.

5.8.1.1 Alternative Ways to Save Datasets

Using the screenshot key , the R&S Cable Rider ZPH provides an alternative and more convenient way to save dataset.

1. Press the SETUP key.
2. Select the "User Preference" softkey.
3. Configure the "Default Filename", "Filename Counter Starts at" and "Capture Screen Format" menu items.
The screenshot key  saves a screenshot of the display and the selected data of the current measurement based on the filename syntax defined in the "Default Filename", "Filename Counter Starts at" and "Capture Screen Format" menu items.

5.8.1.2 Renaming Filename

If necessary, you can rename files or file directories directly on the R&S Cable Rider ZPH.

1. Press the SAVE/RECALL key.
2. Select the "File Manager" softkey.
The R&S Cable Rider ZPH opens the file manager.
3. Select the files or file directories in the file manager.
Alternatively, press the "Mark" softkey to select the desired files or files directories.
4. Select the "Edit" softkey.
The R&S Cable Rider ZPH displays a submenu for selection.
5. Select the "Rename" menu item to rename the files or file directories.
The R&S Cable Rider ZPH opens an input field to change the name of the selected files or file directories.



5.8.2 Restoring Datasets

You can preview and load previous saved measurement results with the recall function of the R&S Cable Rider ZPH. This function also provides easy access to previous measurement settings so that you do not have to set up the R&S Cable Rider ZPH again.



1. Press the SAVE/RECALL key.
2. Select the "Recall" softkey.
The R&S Cable Rider ZPH opens the "Recall Dataset" dialog box.

3. Select the storage device and file directory you want to load the dataset.
The R&S Cable Rider ZPH restores the configuration that the dataset contains.

By default, the most recently saved dataset is highlighted. If you need another dataset, navigate to the file directory or storage device that contains the dataset you need.

5.8.2.1 Previewing a Dataset

The R&S Cable Rider ZPH provides the function to preview datasets. The preview function allows you to take a quick look at the screenshot and its corresponding measurement settings. During preview, the R&S Cable Rider ZPH does not yet activate the measurement settings of that dataset.

1. Press the SAVE/RECALL key.
2. Select the "File Manager" softkey.
3. Browse through the available datasets and select the desired dataset.
4. Select the "Preview" softkey.
The R&S Cable Rider ZPH shows a preview of the measurement results and the measurement settings contained in the selected dataset.
5. Select the "Prev" or "Next" softkey to preview the datasets available in the selected folder.
The filename of the previewed dataset is displayed at the bottom of the screen layout. See [Figure 5-2](#).

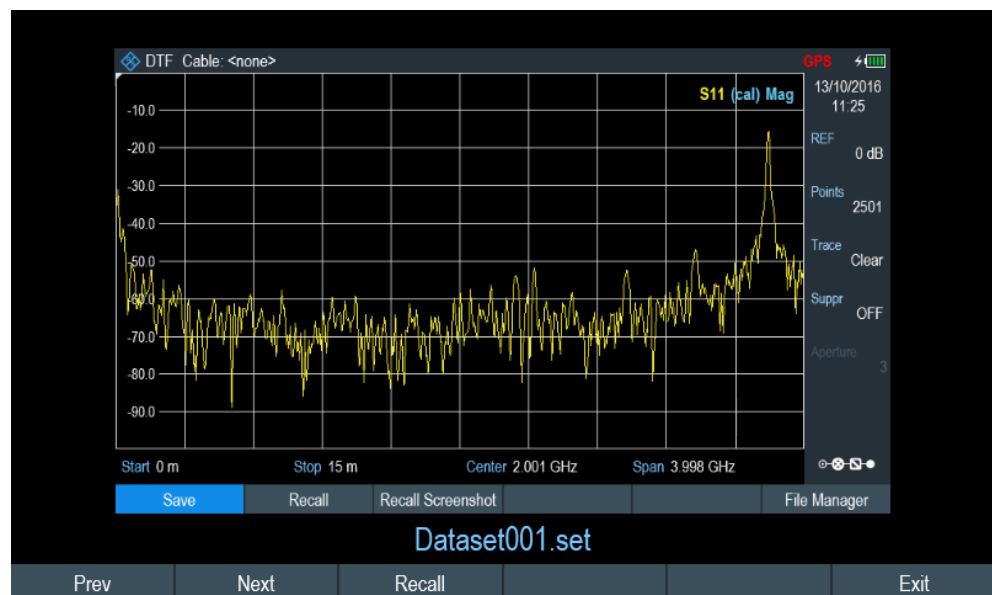


Figure 5-2: Preview dataset

6. Select the "Recall" softkey to load the dataset
Alternatively, select the "Exit" softkey to return to the file manager.

5.8.2.2 Loading a Dataset

If you find a dataset whose settings you need for your current measurement task, you can load it.

- ▶ Select the "Load" softkey.
The R&S Cable Rider ZPH loads the dataset and adjusts its measurement settings according to the dataset.
See also [Chapter 5.8.2.1, "Previewing a Dataset"](#), on page 85.

5.8.3 Deleting Datasets

If you have to delete a dataset, you can do so with the file manager.

1. Press the SAVE/RECALL key.
2. Select the "File Manager" softkey.
The R&S Cable Rider ZPH opens the file manager.
3. Select the desired files or file directories in the file manager.
Alternatively, press the "Mark" softkey to select the desired files or files directories.
4. Select the "Edit" softkey.
The R&S Cable Rider ZPH displays a submenu for selection.
5. Select the "Delete" menu item to delete the files or file directories.
Before deleting, the R&S Cable Rider ZPH shows a warning message that you need to confirm.
6. Select "Yes" to delete the selected files or file directories.
The R&S Cable Rider ZPH deletes the selected files or file directories from its memory.

5.9 Updating the Firmware

You can download new firmware versions from the R&S Cable Rider ZPH website.

<http://www.rohde-schwarz.com/product/zph.html>

The website also provides release notes for each new firmware version. The release notes include instructions on how to perform a firmware update.

5.10 Installing Firmware Options

You can equip the R&S Cable Rider ZPH with several firmware options to enable additional operating modes or special measurements.

For more information, see [Chapter 4.4, "Managing Options"](#), on page 49.

6 Working with the Measurement Wizard



When testing antennas and making measurement which involves complex signals, it is often necessary to perform a sequence of standardized and recurring measurements, often in an environment that is not easily accessible. To make sure that measurements are performed as required and to avoid a constant adjustment of parameters, the R&S Cable Rider ZPH features a measurement wizard.

The measurement wizard allows you to combine several individual measurement configurations to a sequence of measurements (or measurement set). As all relevant parameters have been set before the actual measurement and cannot be changed once the measurement procedure has begun, the wizard is a good way to avoid mistakes and save time when setting up measurements.

Note that it is necessary to install and use the R&S InstrumentView software package if you want to configure the measurement steps and parameters in the measurement wizard.

This chapter describes the functionality of the measurement wizard. You can use the wizard for measurements in all the operating modes.

For details on the individual measurements you can perform with the wizard, refer to the corresponding chapters.

- [Chapter 7, "Cable and Antenna Test Mode"](#), on page 98
- [Chapter 8, "Power Meter"](#), on page 132
- [Chapter 9, "Using the Internal Power Meter"](#), on page 142
- [Chapter 10, "Performing Pulse Power Measurements"](#), on page 144

You can use the wizard for measurements in all operating modes.

Note that it is necessary to install and use the R&S InstrumentView software package if you want to access the measurement wizard.

6.1 Performing and Configuring Measurements

Before you can use the measurement wizard, you have to define a measurement set using the "Wizard Set Editor" in the R&S InstrumentView software package.

The R&S InstrumentView software package is delivered with the R&S Cable Rider ZPH. The latest version is also available for download on the R&S Cable Rider ZPH website at <http://www.rohde-schwarz.com/product/zph.html>.

After creating the measurement wizard set using the R&S InstrumentView, transfer the file to the R&S Cable Rider ZPH.

For more information of the "Wizard Set Editor", see the R&S InstrumentView manual.

Load the measurement wizard

Now that the measurement set is available on the R&S Cable Rider ZPH, you can perform the measurement wizard.

1. Press the WIZARD key.
The R&S Cable Rider ZPH opens the wizard dialog box. See [Figure 6-1](#).

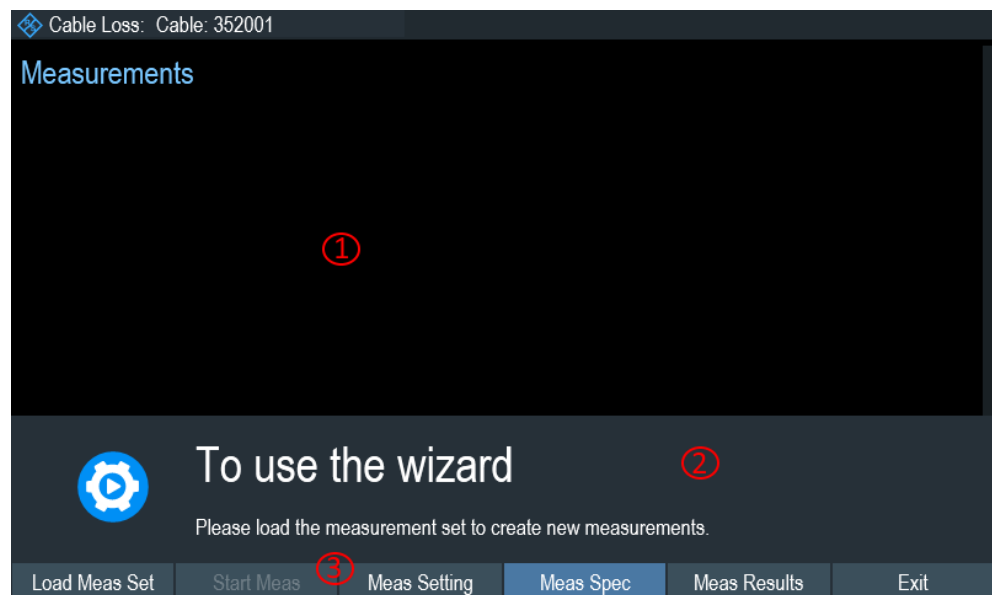


Figure 6-1: Wizard dialog box

- 1 = Measurement wizard dialog box
- 2 = Measurement wizard message box
- 3 = [Softkeys](#) menu of measurement wizard application

2. Select the "Load Meas Set" softkey.
The R&S Cable Rider ZPH opens the file manager to select the measurement wizard set.
3. Select the desired measurement wizard set from the file manager.
4. Select the "Load" softkey to confirm the selection.
The R&S Cable Rider ZPH loads the measurement wizard set.

Measurement Setting

The parameters highlighted in the measurement setting dialog are configurable during the start of the measurement. See [Figure 6-2](#).

1. Select the "Meas Setting" softkey.
The R&S Cable Rider ZPH opens the "Meas Setting" dialog box.
2. Select the desired menu item in the "Meas Setting" dialog box.
Note that some of the parameters are read-only information. See [Table 6-1](#).

Return Loss Cable: <none>

General

Measurement Definition

User

No. of Steps to Perform

Description

Site

Site Name

Comments

GPS Position not connected

Cable Definition

Use Wizard Cable Settings

Cable Model

Clear Cable Model

Cable Length

Calibration Settings

Default Calibration

Use Stored Calibrations

Figure 6-2: Measurement setting dialog

Table 6-1: Measurement setting parameters

Measurement parameters		Descriptions
General	User	Name of the person that performs the measurement.
	Measurement Definition	Name of the measurement wizard set. This field is a read-only field that shows the measurement name as defined in the R&S InstrumentView software package.
	Number of Steps to Perform	Number of individual measurements in the measurement sequence as defined with the R&S InstrumentView software package. The field allows you to reduce the number of individual measurements and perform only those measurements that are necessary. If you reduce the number of measurements, the R&S Cable Rider ZPH omits the last measurement in the sequence. You can edit this field only if you turned on the "Allow Variable Number of Sequence Steps" in the "Wizard Set Editor" of the R&S InstrumentView software.
	Descriptions	Short description of the measurement task. This field is a read-only field that shows the description as defined with the R&S InstrumentView software.
Site	Site Name	Location of the measurement.

Measurement parameters		Descriptions
	Comments	Comments about the measurement, e.g. the external conditions during the measurement.
	GPS Position	Displays the GPS information. See Chapter 4.2.2, "Using the GPS Receiver" , on page 33.
Cable Definition	Use Wizard Cable Settings	Select the usage of cable characteristics as defined in the measurement set. Select "On" to use the predefined cable characteristics or "Off" to re-define the cable model and cable length in R&S Cable Rider ZPH. In the case, if "On" is selected, the parameters below will be locked.
	Cable Model	Cable model that you perform the measurement on. You can define a cable model with the R&S Cable Rider ZPH software, but can also change the cable model on short notice, if necessary. See Chapter 7.2.1.3, "Creating a Cable Model" , on page 112.
	Clear Cable Model	Deactivates the currently active cable model. See Chapter 7.2.1.2, "Clear Cable Model" , on page 112.
	Cable Length	Length of the cable that you perform the measurement on.
Cable Settings	Default Calibration	Calibration that was defined when creating the wizard set in the R&S InstrumentView software.
	Use Stored Calibrations	If set to "On", the wizard uses the calibration stored in the R&S Cable Rider ZPH. If set to "Off", the wizard uses the calibration defined in the R&S InstrumentView software.

Measurement specification

The measurement specification dialog box displays the measurement step sequences and the individual performed measurement status. See [Figure 6-3](#).

- Select the "Meas Spec" softkey.
The R&S Cable Rider ZPH opens the "Meas Spec" dialog box.



Figure 6-3: Measurement specification dialog box

1 = Measurement step in a wizard set
 2 = Individual measurement step status

Performing a Sequence of Measurements



Calibration data

The R&S Cable Rider ZPH adds the calibration data of each calibration you perform to a calibration data folder available on its internal memory. Each dataset in the calibration data folder is unique for a particular calibration method and a particular measurement configuration.

Note that the calibration is only valid for the instrument it has been performed on.

Before you start a measurement sequence with the measurement wizard, the R&S Cable Rider ZPH compares the contents of the calibration data folder to the measurement configurations and required calibration methods in the measurement sequence.

- If the R&S Cable Rider ZPH has already been calibrated for a particular configuration, it restores that data. Another calibration is not necessary.
- If the R&S Cable Rider ZPH has not been calibrated for a particular configuration yet, calibration becomes necessary. The new calibration data is added to the calibration data folder.

Therefore, calibration is necessary only for calibration methods that have not been used for a particular measurement configuration before.

However, it is recommended to perform calibration on a regular basis to keep measurements as accurate as possible.

You can delete obsolete calibration data from the folder:

\Public\Calibration Data

Now that you have updated all [Measurement setting parameters](#) concerning the measurement task, you can start the measurement procedure.



Figure 6-4: Perform wizard measurement dialog box

1 = Image of a measurement step defined in the R&S InstrumentView software package.

2 = Wizard message box

3 = See [Table 6-2](#)

1. Select the "Start Meas" softkey.

If you have not yet calibrated the R&S Cable Rider ZPH for the measurement, it asks you to perform the calibration routine. The stages of the calibration depend on the defined calibration routine. See [Chapter 7.1.6, "Calibrating Measurements"](#), on page 107 and ["Calibration data"](#) on page 91.

After having successfully calibrated the R&S Cable Rider ZPH, it starts to go through the measurements that are part of the measurement wizard set. The sequence of the measurements is defined in the R&S InstrumentView.

Before the start of each measurement, the R&S Cable Rider ZPH displays a message "Preparing New Measurement" in the wizard message box.

The message box contains information and instructions on how to prepare and perform the measurement that you have defined in the R&S InstrumentView software.

2. At each measurement step, you have several options:

- Select the "Continue" softkey.

The R&S Cable Rider ZPH finishes the current measurement and opens the measurement wizard dialog box. See [Figure 6-5](#)

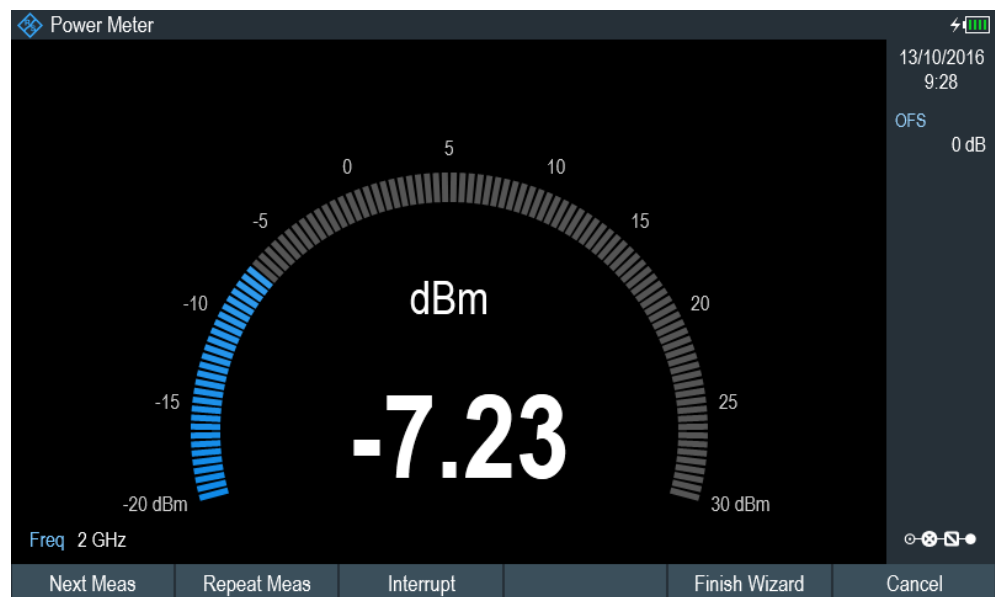


Figure 6-5: Measurement wizard dialog

- Select the "Next Meas" softkey to proceed to the next measurement step in the measurement sequence.
- Select the "Repeat Meas" softkey if the result does not match your expectation and you want to validate the result again.
- Select the "Interrupt" softkey if the result does not match your expectation and you want to find the origin of the problem by using a different settings or measurement than those defined in the wizard.
- Select the "Finish Wizard" softkey to end the measurement sequence.
- Select the "Cancel" softkey if at any time the result does not match your expectation and you want to abort the measurement.

The R&S Cable Rider ZPH prompts you to save measurement result and exit the wizard measurement.

- Select the "Interrupt" softkey.

The R&S Cable Rider ZPH opens the wizard interrupt dialog box.

There are three selections in the wizard interrupt dialog box, you can either:

- Select the "Leave Menu" softkey to proceed and perform the necessary reconfiguring of the measurement. The R&S Cable Rider ZPH goes to the current measurement environment which you can analyze the measurement settings and make the necessary reconfiguration on the measurements.

After you have completed the reconfiguration on the measurement, press WIZARD key to return back to the wizard interrupt dialog box

- Select the "Resume Sequence" softkey to resume back to the measurement.
- Select the "Cancel" softkey to abort the wizard measurement.

- Select the "Skip" softkey.

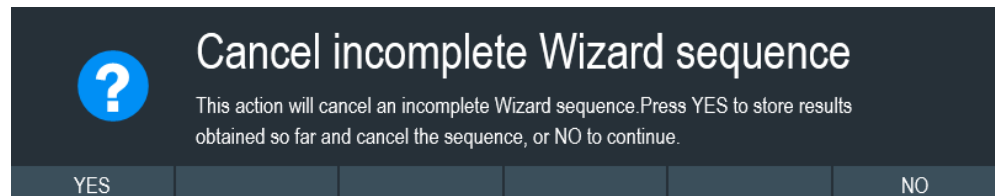
The R&S Cable Rider ZPH skips a single measurement step and continue the subsequent measurement step.

Note: Alternatively, you can swipe horizontally to the left direction to skip a wizard measurement. See [Chapter 5.1.9, "Skip Wizard Measurement"](#), on page 70.

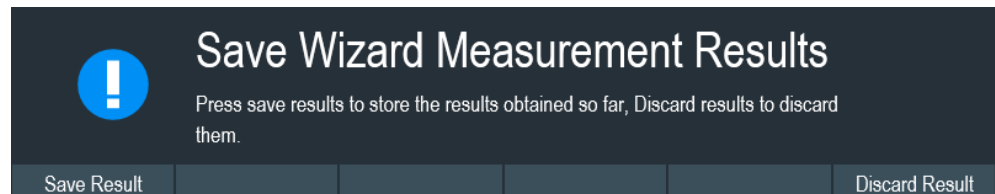
- Select the "Cancel" softkey.

The R&S Cable Rider ZPH displays a message "Cancel Incomplete Wizard Sequence" in the wizard message box.

Select "YES" to abort the wizard measurement or "NO" to continue.



This is followed with a message prompt to save measurement result. The R&S Cable Rider ZPH displays a message "Save Wizard Measurement Results" in the wizard message box.



Select "Save Result" to save the measurement results or "Discard Result" to discard the measurement results.

3. After each measurement is completed, the R&S Cable Rider ZPH displays a message "Measurement Done" in the wizard message box.
Select the "Continue" softkey to proceed to the next measurement step (if any).



Note: Changing cable characteristics. If necessary, you can define different cable characteristics (cable model and length) after each individual measurement. This is useful, for example, if you want to do the same measurements on different cables at one go.

This feature is available when you activated the "Prompt User to Change Cable Settings" in the "Wizard Set Editor" of the R&S InstrumentView software.

When this function is activated, the R&S Cable Rider ZPH asks you to select new cable characteristics during the preparation of a measurement.

- Select the "Yes" softkey if changes are required and select new cable characteristics before proceeding with the measurement.
- Press the "No" softkey if changes are not required and proceed with the measurement.

4. After all the measurements are completed, the R&S Cable Rider ZPH displays a message "All Measurements Done" in the wizard message box.

Select the "Continue" softkey. The R&S Cable Rider ZPH prompts you to save or discard the measurement results.

Select the "Save Result" softkey to save the results on the selected storage device or "Discard Result" softkey to discard all the measurement results.



All Measurements Done

Table 6-2: Softkey in the measurement wizard

Softkey	Description
Next Meas	The R&S Cable Rider ZPH proceeds to perform the measurement.
Continue	The R&S Cable Rider ZPH finishes the current measurement and begins with the next measurement by showing the necessary preparation instruction.
Repeat Meas	Repeat the current measurement
Interrupt	If you interrupt the measurement sequence, you can change the different settings or measurements as if wizard is not in used. The R&S Cable Rider ZPH keeps the results of measurement you have already performed. When you finished reconfigured the measurement, you can resume back to the measurement sequence.
Skip	Skip a single measurement step and continue the subsequent measurement step Skipping individual measurements is possible when you turn on "Allow to skip measurements and finish wizard sequence" in the "Wizard Set Editor" of the R&S InstrumentView software package.
Cancel	Abort wizard measurement. The R&S Cable Rider ZPH displays a message "Cancel Immediate Wizard Sequence" in the message box. If wizard measurement is aborted, the R&S Cable Rider ZPH displays a message "Save Wizard Measurement Results" in the message box. If wizard measurement result is saved, the R&S Cable Rider ZPH returns to the last saved measurement result trace window. If the result is discarded, the R&S Cable Rider ZPH returns to the measurement dialog box.
Exit	Exit wizard measurement.
Finish Wizard	Ends the measurement sequence and returns to the "Measurement Wizard" dialog box. The results of the measurements you have already finished are kept in the memory of the R&S Cable Rider ZPH. Ending the sequence is possible when you turn on "Allow to skip measurements and finish wizard sequence" in the "Wizard Set Editor" of the R&S InstrumentView software package.

Softkey	Description
Save Result	Save result of the measurements performed in the wizard set. See " Measurements Result " on page 96
Discard Result	Discard measurement results.

Measurements Result



Limited internal memory

If you have to store the results on the internal memory, make sure that there is enough space left to store them or else the results might get lost. If the space is not enough, you can delete old data with the file manager.

For more information, see [Deleting Datasets](#).



Measurement wizard results

All the measurement wizard results are stored in the wizard result folder during the process of the measurement wizards. These stored results will not be saved until you do a [Save Result](#) at the end of the wizard measurement.

The results for a measurement set consist of a number of files, each file corresponding to one of the performed measurements. For easy evaluation, the R&S Cable Rider ZPH includes the name of the measurement as defined in the wizard dialog or R&S InstrumentView.

All result files that belong to a measurement set are stored in the same directory. The directory is named after the measurement name and site. The syntax is 'site-name_measurement_#'.

The R&S Cable Rider ZPH adds numbers in ascending order to the files as well as directories if you perform a measurement or measurement set more than once.

6.2 Evaluating Results

The R&S InstrumentView software package provides functionality to evaluate results and compile measurement reports. However, before you can start to evaluate the results you have to download the results to your computer. See "[Data synchronization](#)" on page 80.

The report generator function in R&S InstrumentView allows you to create measurement reports for the full measurement set or a selection of dataset only. You can also perform simple tasks like activating or deactivating markers that have been set during the measurement.

1. Select the "Report Generator" menu item in the R&S InstrumentView
The R&S InstrumentView opens the "Report Generator" dialog box that provides all functionality to manage measurement sets.

2. Select the measurement sets that you want to include in the report.
3. Select the reporting parameters checkmarks that you want to show in the report, e.g. checkmark to show marker data.
4. Select the "Generate" button to create the report.

For more information on the report generator function, see the R&S InstrumentView user manual.

7 Cable and Antenna Test Mode

The cable and antenna test (CAT) mode provides functionality to measure cables and antennas of transmission equipment in wireless telecommunication systems.

In a perfect system, the signal would arrive at the antenna without any losses and be transmitted with the required power and frequency. In reality, however, you can encounter many possible mechanical defects in the system that cause a deterioration of the transmission quality. See [Figure 7-1](#) for the typical defects in a transmission system.

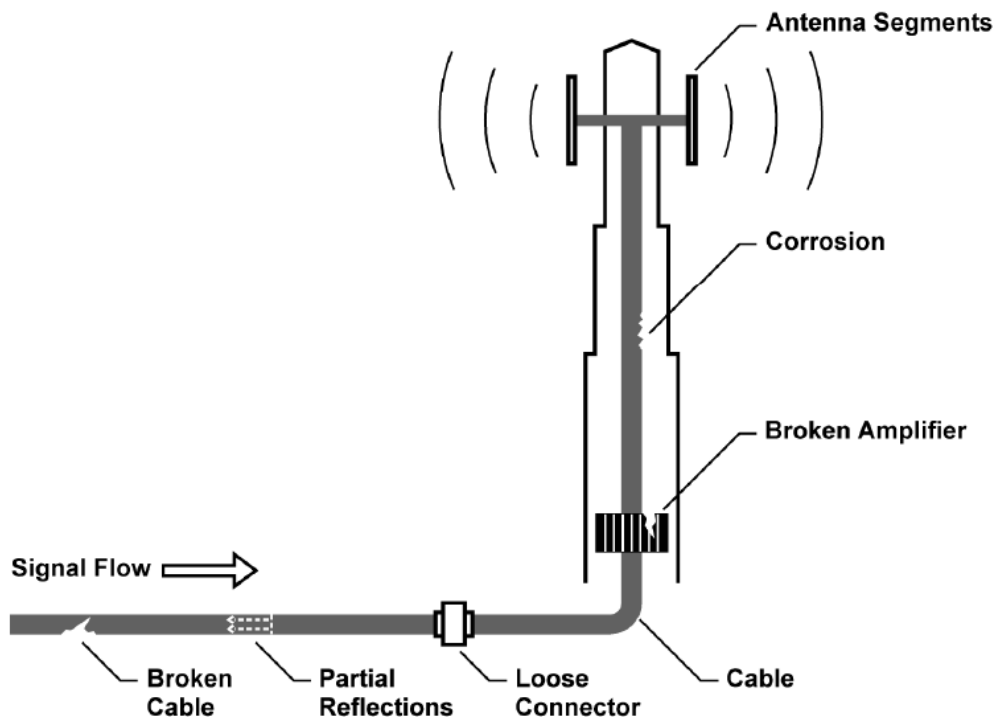


Figure 7-1: Typical defects in a transmission system

The R&S Cable Rider ZPH provides the necessary functionality to test the system equipment for its characteristics and identify faults when it is being installed or maintained.

- [Retrun Loss Measurements](#)
- [SWR](#)
- [Distance to Fault Measurements](#)
- [1-Port Cable Loss Measurements](#)
- [Smith Chart](#)
- [Phase Measurement](#)

Test setup

A typical test setup to test cables and antennas includes the R&S Cable Rider ZPH, an RF cable (R&S FSH-Z320, order number 1309.6600.00), a calibration standard (R&S

FSH-Z28/Z29, order number 1300.7810.03 / 1300.7610.03 or R&S ZN-Z103 order number 3586.9392.00) and the cable under test. See [Chapter 7.1.6.2, "Calibration Methods"](#), on page 108.

Cable and antenna tests also require a signal source which is already part of the R&S Cable Rider ZPH hardware. The signal source transmits a reference signal through the internal VSWR bridge to the test port.

1. Connect the RF cable to the RF input.
2. Connect the test cable to the RF cable.

By default, the R&S Cable Rider ZPH is in the CAT mode after you have turned it on. To switch to the CAT mode from another operating mode, proceed as follows.

1. Press the MODE key.
2. Select the "Antenna & Cable" softkey.

The R&S Cable Rider ZPH starts the antenna and cable test (CAT) mode.

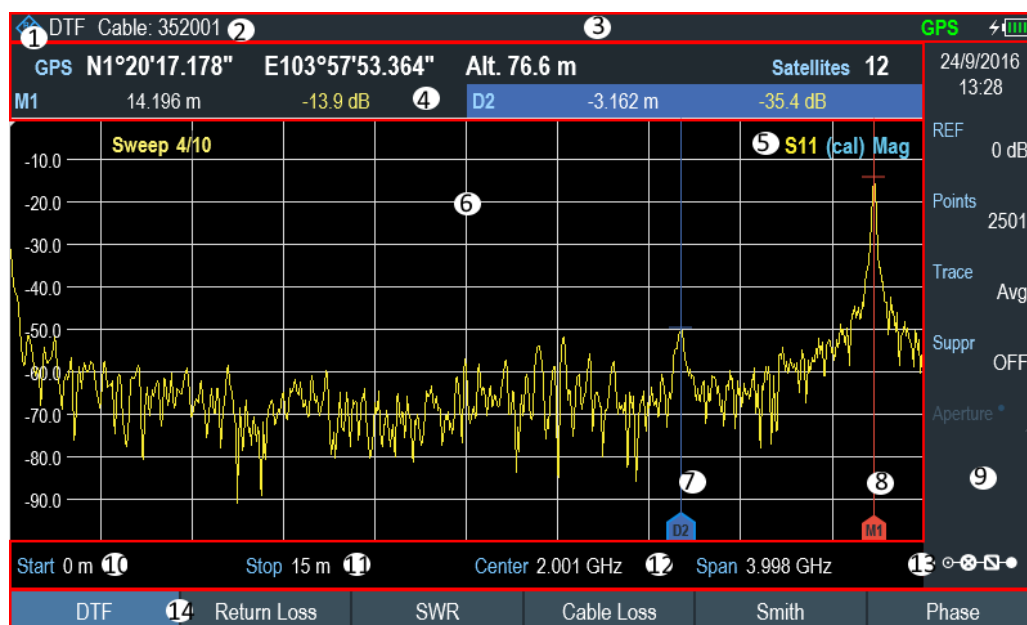


Figure 7-2: Screen layout of cable and antenna test mode

- 1 = Measurement type
- 2 = Cable model
- 3 = Title bar
- 4 = Measurement result view
- 5 = Status line: (S-matrix, calibration status, measurement format)
- 6 = Measurement trace window
- 7 = Delta marker
- 8 = Marker
- 9 = Parameter view
- 10 = Cable start length
- 11 = Cable stop length

- 12 = Cable frequency information
- 13 = [Config Overview](#)
- 14 = CAT softkey menu

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7.1 Performing Cable and Antenna Measurements

In order to get an idea about the problems in a transmission system that is as accurate as possible, the R&S Cable Rider ZPH features several measurements. Each measurement shows a different aspect of the cable characteristics.

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• 1-Port Cable Loss Measurement	103
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7.1.1 Reflection Measurements

The reflection (S11) measurement is a good way to get an idea if the transmission system works properly. If unusual amounts of signal power are being reflected, you can guess that there is something wrong in the system.

A reference signal is transmitted along the transmission system, and this signal is reflected back by a discontinuity along the transmission line, usually by an impedance mismatch. This reflected signal is measured and compared with the reference signal to determine the loss of power.

The reflection measurement can be performed in the following measurement formats:

- Magnitude (return loss in dB)
Return loss is power loss in dB, measured over the specified frequency range of the transmission system. The return loss is the default measurement mode in R&S Cable Rider ZPH.
- SWR
The standing wave ratio, SWR provides the ratio of the maximum and minimum AC voltages along the transmission line caused by the reflections.

1. Press the MEAS key
2. Select the "SWR" or "Return Loss" softkey.
The R&S Cable Rider ZPH starts the reflection measurement over its entire frequency range with the selected measurement format.

[Figure 7-3](#) shows an example of a reflection measurement in magnitude and SWR format without any major faults in the cable or the antenna.

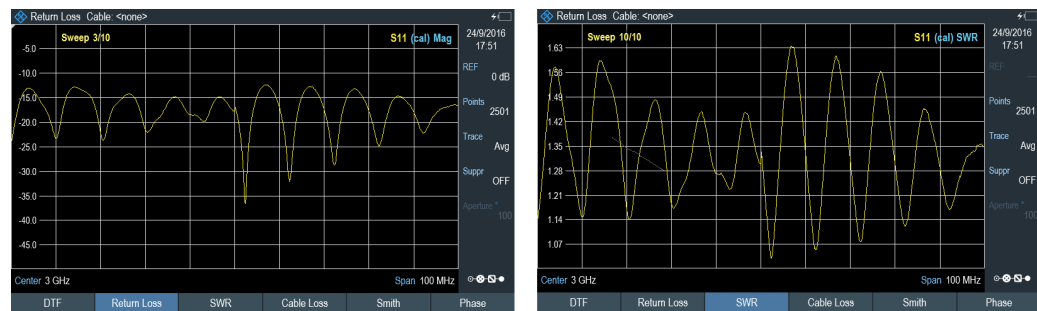


Figure 7-3: Reflection measurement

You can perform reflection measurements on the complete system or on individual components of the system. If you measure while two or more system components are connected, the results of the reflection measurement are an aggregate over these components. Therefore you can only see the aggregated magnitude of the reflected power in a specified frequency range.

To draw conclusions about which component is affected and to determine the location of the fault, you need to perform further analysis using other measurements.

7.1.2 Distance to Fault Measurements

The distance to fault (DTF) measurement determines the exact location of possible faults in a transmission system. If you connect the end of the cable to the R&S Cable Rider ZPH, the DTF measurement shows you the exact distance to the fault (in meter or feet), regardless by what the fault is caused. In addition, the measurement shows the degree of the fault in dB. From this information, you can determine the component that has the fault and its seriousness.

In order to determine the distance to a cable fault, the R&S Cable Rider ZPH measures the reflections of the cable under test in the frequency domain. The R&S Cable Rider ZPH first determines the magnitude of the reflections for a particular frequency by comparing the phase of the reflected signal and a reference signal created by the signal source. It then performs an inverse fast fourier transformation (IFFT) on the signal that has been received. In combination with the characteristics of the cable model, the R&S Cable Rider ZPH is able to determine the distance the reflections have been traveling.

Because of its sensitivity by first measuring in the frequency domain and subsequent IFFT, the measurement is able to locate faults in a cable accurately. To keep this accuracy, the R&S Cable Rider ZPH also accounts for any attenuation that occurs over distance in a cable.

The DTF measurement can be performed in the following measurement formats:

- Magnitude (return loss in dB)
- SWR

1. Press the MEAS key.
2. Select the "DTF" softkey.

The R&S Cable Rider ZPH displays the submenu to select the measurement format.

3. Select "Return Loss" or "SWR".

The R&S Cable Rider ZPH calculates the distance to cable faults.

If you are measuring the cable only, make sure to terminate the other end into a load.

Figure 7-4 shows an example of a DTF measurement in magnitude and SWR measurement format. The peaks that the trace shows at the marker positions are possible faults. Depending on the distance, you can also get an idea of the component that is defective.

Marker 1, M1 for example, shows a defect in the cable. Marker 2, M2 shows a fault at the end of the cable, probably a bad or loose connection.



Figure 7-4: Distance to fault measurement

Split screen

Using split screen, you can display the DTF measurement in both time and frequency domain. The main DTF measurement is displayed in the upper screen window (time domain) and the reflection measurement is displayed in the lower screen window (frequency domain). The Y-axis on both screen window depends on the selected measurement format (Magnitude or SWR) in DTF measurement.

The marker and limit line controls are independent for each screen window. The markers or limit lines shown in the [Measurement result result](#) are measurement performed by the selected screen window. See [Figure 7-5](#).

1. Press the MEAS key.
2. Select the "DTF" softkey.
The R&S Cable Rider ZPH displays the submenu to select the measurement format.
3. Enable the checkbox for "Split Screen" menu item.
The R&S Cable Rider ZPH displays the DTF measurement in the top screen window and the reflection measurement in the bottom screen window.
4. Tap on the desire trace window to select the screen window.
The selected screen window is highlighted with a blue frame around the screen window. Alternatively, you can select the trace to identify the screen window

5. Press TRACE key.
6. Select the "Select Trace" softkey to toggle between the screen window.
The selected screen window is highlighted with a blue frame around the screen window

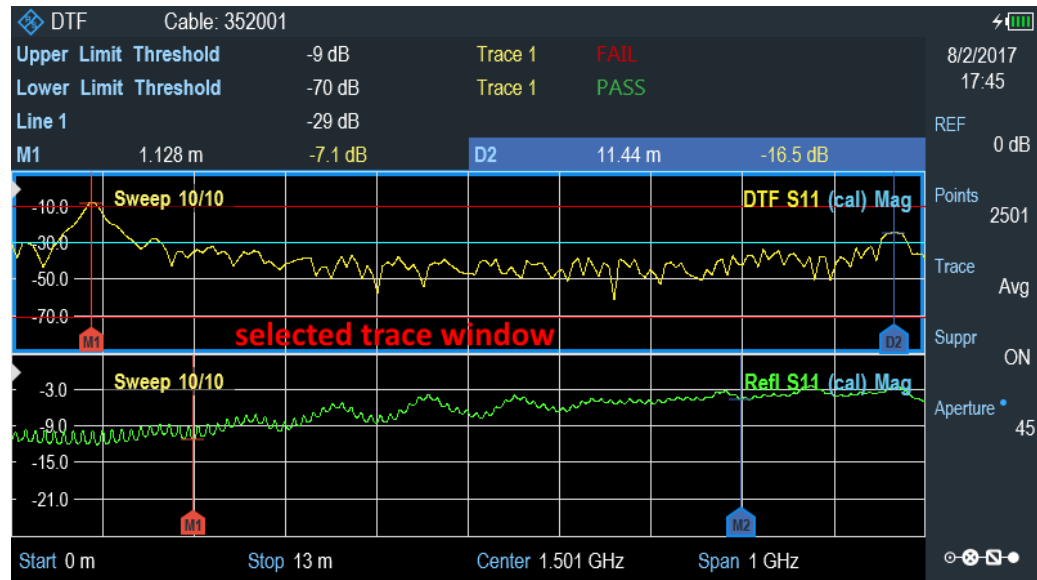


Figure 7-5: Split screen for DTF measurement

7.1.3 1-Port Cable Loss Measurement



(Short + Open) / 2 measurement format

When the (Short + Open) / 2 format is selected, additional calibration steps are required to terminate the end of the cable under test with a short and open before the cable loss measurement is performed.



(Short + Open) / 2

Please connect a "SHORT" to the end of the cable under test.

The cable loss measurement evaluates the power attenuation of a cable over a specified frequency range in dB. The amount of power that gets absorbed depends on the frequency and length of the cable.

The measurement can be performed in the following measurement format:

- Normal
- (Short + Open) / 2

1. Press the MEAS key.
2. Select the "Cable Loss" softkey.
The R&S Cable Rider ZPH displays a submenu to select measurement format.
3. Select "Normal" or "(Short + Open) / 2" menu item.
The R&S Cable Rider ZPH evaluates the cable loss over its entire frequency range.

Figure 7-6 shows the typical results of a cable loss measurement with a steadily declining loss in amplitude.

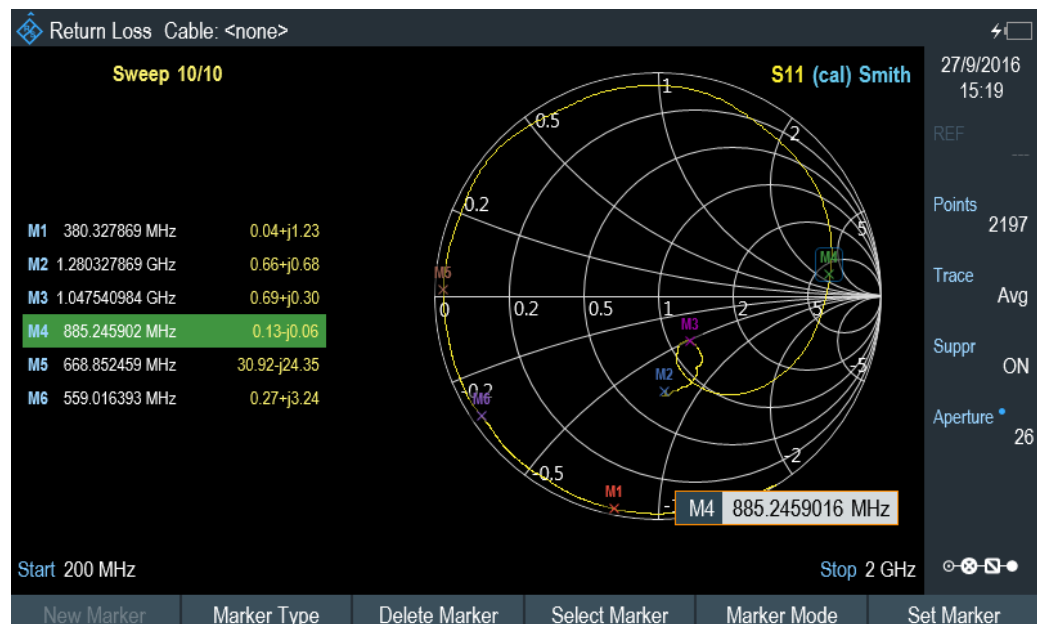


Figure 7-6: 1-port cable loss measurement

7.1.4 Smith Chart

The smith chart is a circular diagram that primarily shows the impedance or reflection characteristics of a DUT.

1. Press the MEAS key.
2. Select the "Smith" softkey.
The R&S Cable Rider ZPH shows the reflection of the DUT in smith chart.



Using markers

In addition to the standard marker functionality, the smith chart also features several marker output formats.

Marker output format	Descriptions
"dB Magnitude + Phase"	Shows the magnitude (in dB) and the phase at the current marker position.
"Lin Magnitude + Phase (Rho)"	Shows the converted magnitude (in %) and the phase (in rho) at the current marker position.
"Real + Imag (Rho)"	Shows the real and imaginary components at the current marker position.
"R + jX"	Shows the real and imaginary components of the impedance at the marker position. The imaginary component is converted to inductance or capacitance. Marker frequency and sign are taken into account.
"G + jB"	Shows the real and imaginary components of the admittance at the marker position. The imaginary component is converted to inductance or capacitance. Marker frequency and sign are taken into account.
"(R + jX) / Z0"	Shows the real and imaginary components of the standardized impedance.
"(G + jB) / Y0"	Shows the real and imaginary components of the standardized admittance.

- Press the MARKER key.
The R&S Cable Rider ZPH activates a marker and opens the marker softkey menu. Like usual traces, you can move the marker around with the rotary knob or enter a specific marker position.

By default, the marker position is specified by the marker frequency and complex resistance in Ω . The complex resistance in that case is calculated according to :
(real component) + j (imaginary component).

1. Select the "Marker Mode" softkey.
The R&S Cable Rider ZPH displays the marker mode submenu.
2. Select the marker format that you require.
The R&S Cable Rider ZPH adjusts the marker information accordingly.
See ["Using markers"](#) on page 105.

Selecting the reference impedance

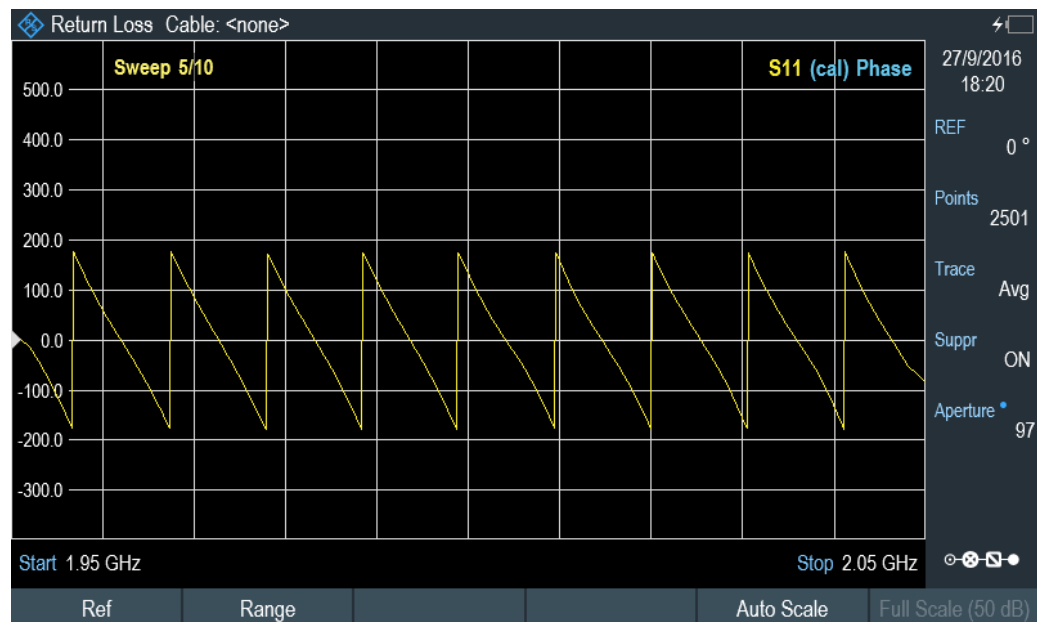
The default reference impedance (the matching point in the center of the smith chart) is 50 Ω . It is, however, also possible to perform reflection measurements on networks with another impedance.

1. Press the MARKER key.
2. Select the "Marker Mode" softkey.
The R&S Cable Rider ZPH displays the marker mode submenu.
3. Select the "Ref Impedance" menu item.
The R&S Cable Rider ZPH opens an input field to select the reference impedance.
4. Enter the reference impedance you require.
The value is from 1 m Ω to 10 k Ω .

7.1.5 Phase Measurement

The phase measurement shows the phase characteristics of the DUT in degrees.

1. Press the MEAS key.
2. Select the "Phase" softkey.
The R&S Cable Rider ZPH performs the phase measurement of the DUT.



The R&S Cable Rider ZPH supports the following measurement format:

- Group Delay
Shows the group delay measurement that describes the time period or delay of the signal as it goes through the DUT.
- Reflection Coefficient
Show the reflection coefficient, which is the ratio of the amplitude of a reflected wave and that of the incident wave. Measurement unit of “rho” or “mrho” is selectable.
- Others
 - Electrical Length
Numerical display of the electrical length of the DUT
 - Delay Time
Numerical display of the delay time of the cable
 - VSWR
Numerical display of the maximum and average (voltage) standing wave ratio of the DUT
 - Phase Wrap or Unwrap
Expands the range of the phase

7.1.6 Calibrating Measurements

In its default state, the R&S Cable Rider ZPH uses factory calibration. Factory calibration is a full 1-port calibration over the current frequency range (i.e. span) of the R&S Cable Rider ZPH. When factory calibration is active, the status line reads (dcal). In many cases, this calibration already provides accurate results.

To get the best and most accurate results, you have to calibrate the measurement. The R&S Cable Rider ZPH provides several calibration methods. You will need one of the

available calibration standards R&S FSH-Z28 / Z29 (order number: 1300.7810.03 / 1300.7610.03) or [calibration kit](#), R&S ZN-Z103 (order number: 3586.9392.00).

To successfully calibrate the test setup, you have to connect the calibration standard at the reference plane, usually the output of the RF measurement cable.

Calibration is performed over the R&S Cable Rider ZPH entire frequency range (full span). This full span calibration eliminates the need for recalibration when you change a parameter or select a different cable or DUT.

Calibration also remains valid after turning off the R&S Cable Rider ZPH or changing into another operating mode as calibration data is saved in the internal memory of the R&S Cable Rider ZPH. If you save the measurement in a dataset, calibration data is part of that dataset. When you restore the dataset and perform the same measurement again, you do not have to recalibrate the R&S Cable Rider ZPH. See [Chapter 5.4, "Presetting the R&S Cable Rider ZPH"](#), on page 75.

7.1.6.1 Calibration States

The R&S Cable Rider ZPH features several calibration states that it displays in the status line. The possible states depend on the calibration type (see below).

- (dcal)
The calibration data uses the default calibration. The default calibration is a "Full 1-port" calibration performed in the factory during production. It is stored in the memory and can be restored after a preset or self-alignment.
- (cal)
The calibration data uses the user calibration. To get in this state, a "Full 1-port " is performed. See also the [automated calibration](#).

7.1.6.2 Calibration Methods

The following calibration types are available in antenna and cable test mode.

- Full 1-Port
RF input port is calibrated for measurements on that port. The calibration routine requires the calibration standards open, short and load to be connected one after another.
- Easy 1-Port
RF input port is calibrated for measurements on that port. The calibration procedure requires no calibration standards as the R&S Cable Rider ZPH calibrates an open connection only.

Calibration kit, R&S ZN-Z103

Equipped with the calibration kit, R&S ZN-Z103, you can perform an automatic "Full 1-Port" calibration across the entire frequency range. Unlike the manual calibration, this calibration unit performs the calibration standard open, short and load to RF input of the R&S Cable Rider ZPH without making any connection change during the calibration procedure.

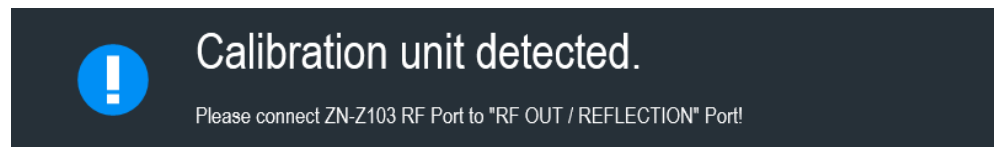
Detection of the calibration kit is by means of the USB interface connection to the R&S Cable Rider ZPH. See [Figure 7-8](#).

When the calibration kit is detected, the R&S Cable Rider ZPH displayed the information in the [Figure 7-7](#).



Figure 7-7: Calibration kit information on title bar

1. Press CAL key to activate the calibration procedure.
The R&S Cable Rider ZPH displayed the message "Calibration unit detected".



2. Connect the calibration kit, R&S ZN-Z103 to "RF OUT/ REFLECTION" port of the R&S Cable Rider ZPH
3. Select "Continue" to start the calibration.
The R&S Cable Rider ZPH performs the full 1-port calibration for a "Short", "Open" or a "Load" connection automatically.

After completed the calibration routine, the R&S Cable Rider ZPH displayed the message "Calibration done!". The [status line](#) now shows "(Cal)" to indicate a successful calibration.



Figure 7-8: Calibration kit, R&S ZN-Z103

- 1 = RF input
- 2 = Calibration kit, R&S ZN-Z103
- 3 = USB interface of calibration kit, R&S ZN-Z103

7.1.6.3 Performing a Full 1-Port Calibration



Cancel calibration

You can abort the calibration any time by pressing the "Cancel" softkey.

The procedure below shows a full 1-port calibration routine. All other calibration methods basically work the same way, except for the type and number of calibration standards you are going to need.

1. Disconnect the DUT from the RF cable.
After disconnecting the DUT, the R&S Cable Rider ZPH is ready for calibration.
2. Press the CAL key.
3. Select the "Full 1-Port" softkey.
The R&S Cable Rider ZPH prompts you to connect an "Open" to the "RF OUT / REFLECTION" port.



Calibrate OPEN

Please connect an "OPEN" to "RF OUT / REFLECTION" Port!

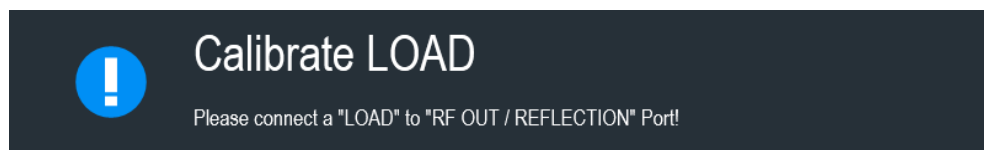
4. Firmly connect the "Open" of the calibration standard to the "RF OUT / REFLECTION" port.
5. Select the "Continue" softkey to start the calibration.
The R&S Cable Rider ZPH calibrates the "Open".
6. Next, the R&S Cable Rider ZPH prompts you to connect a "Short" to the "RF OUT / REFLECTION" port.
7. Disconnect the "Open" of the calibration standard. Firmly connect the "Short" of the calibration standard to the "RF OUT / REFLECTION" port.



Calibrate SHORT

Please connect a "SHORT" to "RF OUT / REFLECTION" Port!

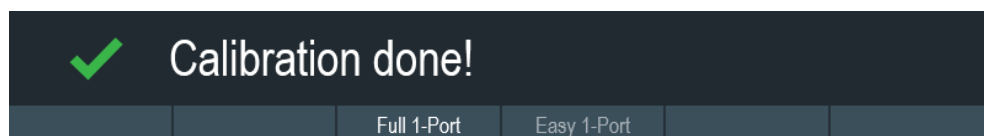
8. Select the "Continue" softkey to start the calibration.
The R&S Cable Rider ZPH calibrates the "Short".
9. Next, the R&S Cable Rider ZPH prompts you to connect a "Load" to the "RF OUT / REFLECTION" port.
10. Disconnect the "Short" of the calibration standard. Firmly connect the "Load" of the calibration standard to the "RF OUT / REFLECTION" port.



11. Select the "Continue" softkey to start the calibration.

The R&S Cable Rider ZPH calibrates the "Load".

After finishing the calibration routine, the R&S Cable Rider ZPH displayed the message "Calibration done". The [status line](#) now shows a "(Cal)" to indicate a successful calibration.



7.2 Configuring Cable and Antenna Tests

For valid measurement results, you need to specify the characteristics of the cable under test like cable model or the frequency usage range.

7.2.1 Selecting the Cable Mode

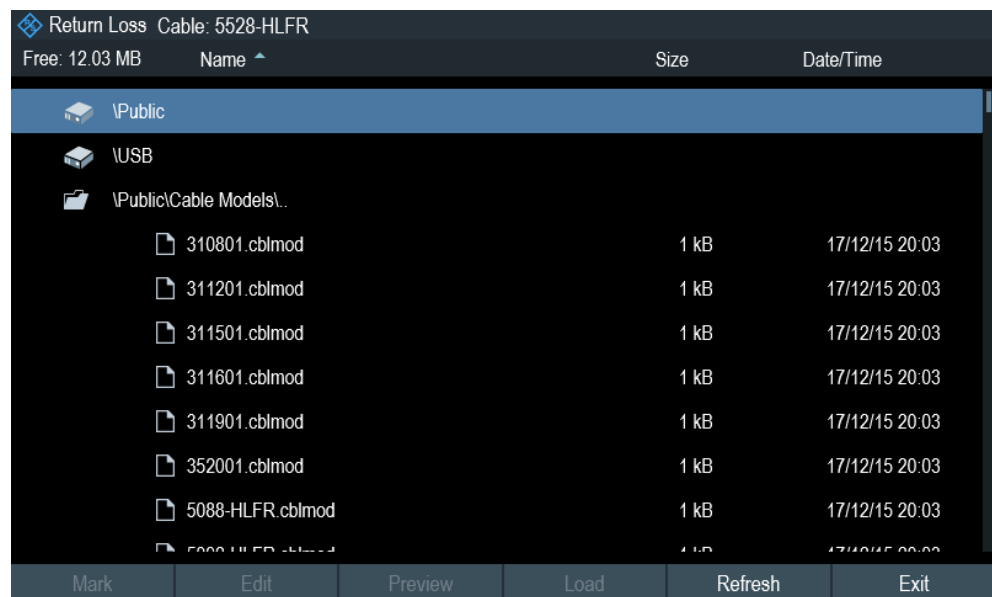
To determine the speed of propagation, and therefore the precise distance to any faults, you have to specify the cable model that you want to test.

The R&S Cable Rider ZPH already comes with an assortment of predefined cable models that you can use without doing anything. If you want to test a cable that is not listed, you can also define cable models manually, either directly on the R&S Cable Rider ZPH or with the "Cable Model Editor" of the R&S InstrumentView software package that is delivered with the R&S Cable Rider ZPH.

For more information of the "Cable Model Editor", see R&S InstrumentView user manual.

7.2.1.1 Selecting a Predefined Cable Model

1. Press DTF CONFIG key.
2. Select the "Cable Config" softkey.
The R&S Cable Rider ZPH opens a submenu to select the cable model.
3. Select the "Cable Model" menu item.
The R&S Cable Rider ZPH opens the file manager to select a cable model.



4. Select the cable mode that you are testing.
The R&S Cable Rider ZPH loads the selected cable mode. Note that the selected cable mode is also displayed in the [title bar](#).

7.2.1.2 Clear Cable Model

1. Press DTF CONFIG key.
2. Select the "Cable Config" softkey.
The R&S Cable Rider ZPH opens a submenu to select the cable model.
3. Select the "Clear Model" softkey.
The R&S Cable Rider ZPH unload the cable model from the measurement.

7.2.1.3 Creating a Cable Model



Temporary cable model

When you change any cable parameters or load another cable model, the temporary cable model data is lost and you have to define it again if you have to perform further measurements.

The R&S Cable Rider ZPH provides two ways to define customized cable models.

The first way is to define a cable model with the "Cable Model Editor" that is part of the R&S InstrumentView software package. The R&S InstrumentView is delivered with the R&S Cable Rider ZPH. With this software, you can define a cable model on a computer and then transfer it to the instrument.

For more information, see [Chapter 5.8, "Managing Datasets"](#), on page 79.

If you do not have access to a computer, but still need a cable model that is not stored on the R&S Cable Rider ZPH, you can also define the characteristics of a cable temporarily on the R&S Cable Rider ZPH itself. It is not possible to save these cable characteristics in a dataset, they are lost when you change them or load another cable model.

1. Press DTF CONFIG key.
2. Select the "Cable Config" softkey.
The R&S Cable Rider ZPH opens a submenu to select the cable model.
3. Select the "User Settings" menu item.
The R&S Cable Rider ZPH opens a submenu to specify the user settings for the cable model.
4. Select the "Frequency" menu item.
The R&S Cable Rider ZPH opens an input field to specify the frequency.
5. Enter the frequency of the cable you are measuring
6. Repeat from step 3 to configure the setting for the cable velocity and cable loss.
You can now perform measurements using the temporary cable definition.
See ["Temporary cable model"](#) on page 112.

After you have defined the cable characteristics, you still have to activate the use of the customized cable.

1. Select the "Cable Config" softkey.
The R&S Cable Rider ZPH opens a submenu to select the cable model.
2. Enable the checkbox to turn on the "User Model" menu item.
The R&S Cable Rider ZPH uses the customized cable model.

7.2.1.4 Working with a DTF List



"DTF Meas Overview", "DTF List" and "DTF Threshold" are only available in the distance to fault (DTF) measurement.

The DTF list shows the results of the distance to fault measurement in numerical form.

1. Press the "DTF CONFIG" key.
2. Select the "DTF List" softkey.
The R&S Cable Rider ZPH opens a table that lists the peaks it has found during the measurement.



Peak ①	Distance ②	Return Loss ③
1	13.87 m	-42.78 dB
2	13.92 m	-42.11 dB
3	13.99 m	-41.73 dB
4	14.2 m	-14.11 dB
5	14.4 m	-41.83 dB
6	14.45 m	-42.13 dB
7	14.51 m	-42.10 dB

Threshold -43.00 dB

Cable Config DTF Meas Overview DTF List DTF List Threshold Exit

1 = Shows the peak the results refer to

2 = Shows the distance from the measurement plane to the peak.

3 = Shows the magnitude of the peak.

To limit the information in the list, you can define a new threshold level for the DTF list, so that only the peaks above a certain level are included in the list.

1. Press the "DTF CONFIG" key.
2. Select the "DTF List Threshold" softkey.
The R&S Cable Rider ZPH opens a submenu to specify the threshold in dB.
3. Enter the threshold you require.
The R&S Cable Rider ZPH now only shows the peaks that are above the level you have entered.

DTF Meas Overview

The DTF Meas Overview provides a menu overview to configure and set up a DTF measurement.

For more information, see [Chapter 4.1.4.1, "Configuration Overview"](#), on page 30.

7.2.2 Configuring the Horizontal Axis

The FREQ/DIST key contains all necessary functions to define the frequency and distance parameters when performing cable measurements. The contents of the menu depend on the currently selected measurement.



Dedicated DTF frequency

The "Dedicated DTF Frequency" menu item defines whether the frequency (DTF Start Freq, DTF Stop Freq, DTF Center Freq, DTF Span) settings in DTF measurement are coupled to frequency (Start, Stop, Center, Span) settings in other measurements in CAT mode. When set "Off", the frequency (start, stop, span) settings are coupled across all measurements in CAT mode.

See ["Setting a dedicated DTF frequency"](#) on page 116.

7.2.2.1 Setting the Frequency Range for DTF Measurements

In the default setting, the R&S Cable Rider ZPH automatically selects a center frequency of 1 GHz and a distance of 50 m. The R&S Cable Rider ZPH optimizes the settings for the best resolution, if you change the stop distance.

If you have to keep the current frequency settings, it is best to define a manual span.

Setting the frequency span

When setting the frequency range, it is best to first set the span and then the center frequency.

There are three different span modes in the DTF measurement:

- Manual
Setting for span is defined manually. However, the maximum span that can be set depends on the maximum cable distance defined.
- Auto
The best span is automatically calculated for the best length resolution.
- Coupled
The frequency parameters are coupled with the [Return Loss](#) measurement, with the maximum cable distance adjusted for the best resolution. This mode is useful when you switch between the [Return Loss](#) and [DTF](#) measurements.

1. Press the FREQ/DIST key.
2. Select the "DTF Span" softkey.
The R&S Cable Rider ZPH opens a submenu to specify the frequency span. By default, the R&S Cable Rider ZPH automatically calculates the best span ("Auto Span") for the best length resolution. If the required span is too large for the current center frequency, the R&S Cable Rider ZPH sets the center frequency to the smallest possible frequency.
3. Select the "Manual Span" menu item.
The R&S Cable Rider ZPH opens an input field to specify the frequency span.
4. Enter the span you require.
The R&S Cable Rider ZPH sets the new span. Note that the maximum span you can set depends on the maximum cable distance you have defined and is never greater than the span calculated by the "Auto Span" function. The minimum span that you can set is 10 MHz.

Setting the displayed frequency range

After you have selected the span, you can set a particular frequency range whose results the R&S Cable Rider ZPH displays.

In the default configuration, the R&S Cable Rider ZPH adjusts the "DTF start" and "DTF stop" frequency according to the span and the center frequency. The distance from center frequency to the start and stop frequency is the same. Alternatively, you can directly set a "DTF start" and "DTF stop" frequency.

1. Press the **FREQ/DIST** key.
2. Select the "DTF Center Freq" softkey.
The R&S Cable Rider ZPH opens an input field to specify the center frequency.
3. Enter the center frequency you require.
The R&S Cable Rider ZPH adjusts the frequency range according to span and center frequency.
4. Select the "DTF Start Freq" or the "DTF Stop Freq" softkey.
The R&S Cable Rider ZPH opens an input field to specify the start frequency or stop frequency.
5. Enter the start frequency or stop frequency you require.
The R&S Cable Rider ZPH adjusts the frequency range according to your settings. Note that the distance from start to stop frequency has to be equal to the span. The R&S Cable Rider ZPH adjusts the values if you enter a frequency range that is not the same as the span.

Setting a dedicated DTF frequency

You can configure a dedicated DTF frequency to be used in the DTF measurement. With this configuration, the DTF frequency setting will remain unchanged when there is a frequency change in other measurements in the CAT mode.

1. Press the **SETUP** key.
2. Select the "User Preference" softkey.
3. Select the "Dedicated DTF Frequency" item.
A drop-down menu opens to select the dedicated DTF frequency setting.
4. Select "On" to configure a dedicated DTF frequency.
See ["Dedicated DTF frequency"](#) on page 115.

7.2.2.2 Setting the Start and Stop Distance for DTF Measurements

The start and stop distance define the scaling of the horizontal axis.

In the default setting, the horizontal axis starts at 0 m and covers the maximum or stop distance you have set. By adjusting the start and stop distance, you can zoom in to a particular section of the cable for further analysis.

1. Press the **FREQ/DIST** key.
2. Select the **"Start Dist"** or **"Stop Dist"** softkey.
The R&S Cable Rider ZPH opens an input field to specify the start distance or stop distance.
3. Enter the distance you want the display to start from and to end at.
In auto span mode, the R&S Cable Rider ZPH adjusts the frequency settings in order to get the best display resolution.
If you have set the span manually, the R&S Cable Rider ZPH zooms in to the section of the cable you have defined. The results maintain their accuracy in that case.

7.2.2.3 Setting the Frequency Range for CAT Measurements (except DTF)

If you measure the reflection, transmission or cable loss, the displayed frequency range is defined by the span, the center frequency or start and stop frequencies.

Defining the span

The span you should select depends on the frequency band you are analyzing and the frequency range you need information about.

The minimum span for both measurements is 10 Hz, the maximum span depends on the R&S Cable Rider ZPH and is either 2.998 GHz or 3.998 GHz (R&S ZPH-B4 option).

1. Press the **FREQ/DIST** key.
2. Select the **"Span"** softkey.
The R&S Cable Rider ZPH opens an input field to specify the frequency span.
3. Enter the span you require.
The R&S Cable Rider ZPH sets the span you have entered.

Setting the displayed frequency range

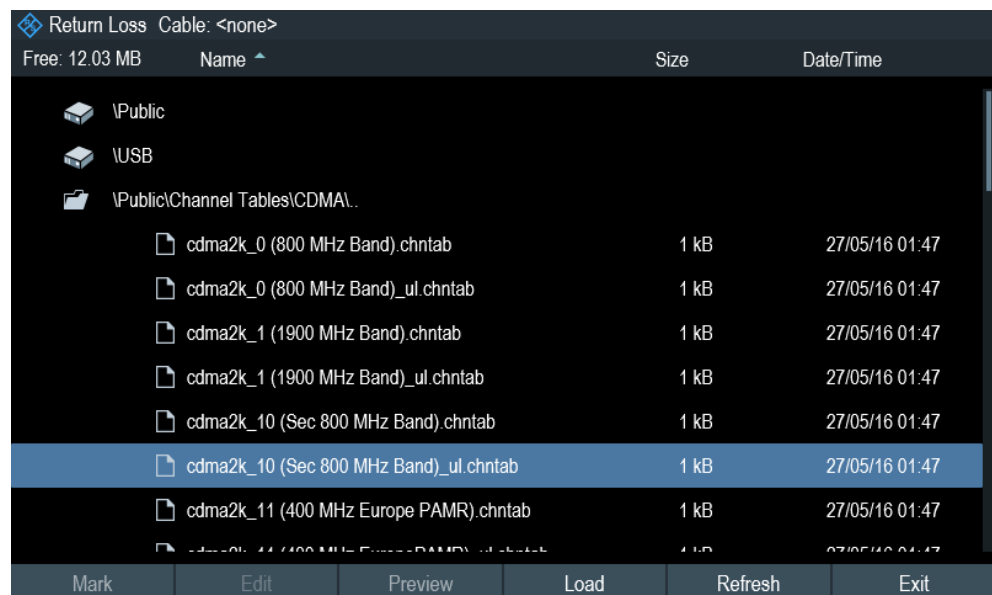
In the default configuration, the R&S Cable Rider ZPH adjusts the start and stop frequency according to the span and the center frequency, with the center frequency being in the middle of the horizontal axis. Alternatively, you can directly set the start and stop frequency.

1. Press the **FREQ/DIST** key.
2. Select the **"Center"** softkey.
The R&S Cable Rider ZPH opens an input field to specify the center frequency.
3. Enter the center frequency you require.
Alternatively, set the frequency range independent of span and center frequency.
4. Select the **"Start"** softkey and enter a start frequency
5. Select the **"Stop"** softkey and enter a stop frequency.

7.2.2.4 Selecting a Signal Standard for CAT Measurements (except DTF)

When you perform the reflection, cable loss, smith chart or phase measurement, the R&S Cable Rider ZPH provides several configurations for measurements on a particular signal standard. When you select one of these standards, the R&S Cable Rider ZPH loads the corresponding parameters like center frequency or span.

1. Press the **FREQ/DIST** key.
2. Select the "Signal Standard" softkey.
The R&S Cable Rider ZPH opens a submenu to select the signal standard.
3. Select either the "Select Uplink" or "Select Downlink" menu items.
The R&S Cable Rider ZPH opens the file manager to select the signal standard.
4. Select the standard you require.
The R&S Cable Rider ZPH load the settings of the standard you selected.



7.2.3 Configuring the Vertical Axis

The **SCALE** key contains menu on settings related to the level display.

7.2.3.1 Setting the reference value

The reference value defines the amplitude of the reference line. The R&S Cable Rider ZPH indicates the position of the reference value with a white triangle  at the vertical axis.

When you change the reference value, the R&S Cable Rider ZPH adjusts the labels of the vertical axis. Changing the reference value results a change in the vertical position of the trace. It does not change the position of the reference line.

1. Press the SCALE key.
2. Select the "REF" softkey.
The R&S Cable Rider ZPH opens an input field to specify the reference level.
3. Enter the reference level you require or move the reference level with the rotary knob.
The R&S Cable Rider ZPH sets up the display accordingly.

7.2.3.2 Defining the display range

The display range defines the scale of the vertical axis and therefore the amplitude between the two horizontal grid lines. The unit depends on the measurement format.

When you change the display range, you can increase or decrease the amplitude the R&S Cable Rider ZPH displays and, e.g. include signal parts that are outside the displayed screen area. The position of the reference value and the trace do not change.

1. Press the SCALE key.
2. Select the "Range" softkey.
The R&S Cable Rider ZPH opens a submenu to select the range setting.
3. Select one of the menu items to select the display range that you require.

7.2.3.3 Adjusting the vertical axis automatically

The R&S Cable Rider ZPH provides an automatic scaling algorithm to optimize the results display. The R&S Cable Rider ZPH does this by determining the minimum and maximum trace values and adjust the vertical axis according to these values.

1. Press the SCALE key.
2. Select the "Auto Scale" softkey.
The R&S Cable Rider ZPH performs the automatic adjustment of the vertical axis. You can also do a reset on the vertical axis by performing a "Full Scale (50 dB)" setting.
3. Select the "Full Scale (50 dB)" softkey.
The R&S Cable Rider ZPH performs the reset scaling of the vertical axis to display a scale from 0 dB to -50 dB.

7.2.3.4 Setting the reference position

The reference position defines the position of the reference line in the diagram. The reference position is a linear value between "0" and "10". Each value represents one horizontal grid line of the diagram. The "0" value corresponds to the top grid line and the "10" corresponds to the bottom grid line.

When you change the reference position, the R&S Cable Rider ZPH also shifts the position of the trace by the magnitude of the reference position change. It has no effect on the reference value itself.

1. Press the SCALE key.
2. Select the "Range" softkey.
The R&S Cable Rider ZPH opens a submenu to select the range setting.
3. Select the "Ref Position" menu item.
The R&S Cable Rider ZPH opens an input field to specify the reference position.
4. Enter the reference position you require.
The R&S Cable Rider ZPH moves the trace accordingly.

7.2.4 Setting the Measurement Sweep

The SWEEP key provides menu to control the response on how the measurement results are presented.

7.2.4.1 Selecting the Sweep Mode

The sweep mode is the way the R&S Cable Rider ZPH performs the measurement.

In its default state, the R&S Cable Rider ZPH measures continuously. In this mode, the R&S Cable Rider ZPH automatically repeats the sweep in the defined range of the horizontal axis and updates the trace accordingly after it has finished with one sweep.

Single sweep mode performs the sweep in the defined span once, then the R&S Cable Rider ZPH goes into an idle state. If the trace averaging is set, the R&S Cable Rider ZPH performs the sweep a certain number of times (depending on the number of averages you have set) over the defined span and then stops measuring.

For more information on trace setting, see [Chapter 7.3.1, "Working with Traces"](#), on page 121.

7.2.4.2 Changing the Number of Measurement Points

The number of (measurement) points defines the number of measurements performed during a sweep. Thus, it indirectly sets the frequencies of those measurements. The distance from one measurement point to the next depends on the currently set frequency range (span divided by number of points). However, the measurement points are spread evenly over the selected frequency range.

The number of points also defines the resolution and, therefore, the accuracy of the measurement and affects the measurement time. In the default state, the R&S Cable Rider ZPH evaluates 201 measurement points. This number allows for fast measurement times and sufficient accuracy. For measurements with a higher or lower frequency resolution, you can change the number of measurement points. Note that measurement times increase if you set a higher number of measurement points.

1. Press the SWEEP key.
2. Select the "Points" softkey.
The R&S Cable Rider ZPH opens an input field to specify the number of measurement points. Up to 2501 measurement points is possible for measurement.
3. Enter the number of measurement points you require.
The R&S Cable Rider ZPH sets the number of measurement points used for the measurement.

7.2.4.3 Measurements Hold

The R&S Cable Rider ZPH provides a hold function that stops the display update and leaves room for further analysis of the measurement results.

1. Press the SWEEP key.
2. Select the "Hold" softkey.
The R&S Cable Rider ZPH interrupt the display update.
To resume the display update, select the "Hold" softkey again.

7.3 Analyzing Measurement Results

7.3.1 Working with Traces

The R&S Cable Rider ZPH provides several trace modes. The trace mode defines the way the R&S Cable Rider ZPH writes the trace.

For more information on the sweep mode, see [Chapter 7.2.4.1, "Selecting the Sweep Mode"](#), on page 120.

There are two ways how the R&S Cable Rider ZPH write the trace:

- **Clear/Write**
This is the default trace mode. In this mode, the trace is overwritten after each sweep.
- **Average**
In this mode, the trace is the result of the moving average over several sweeps. You can define the number of sweeps to be (moving) averaged.

1. Press the TRACE key.
2. Select the "Trace Mode" softkey.
The R&S Cable Rider ZPH opens a submenu to select the trace mode.
3. Select the "Clear/Write" or "Average" menu item.

7.3.1.1 Working with Memory Traces

The R&S Cable Rider ZPH can transfer a trace to the trace memory and also display the current trace and the trace in the trace memory for comparison. The saved trace is always displayed in a lighter yellow to distinguish it from the current trace. See [Figure 7-9](#).

1. Press the TRACE key.
2. Select the "Trace ►Memory" softkey.
The R&S Cable Rider ZPH transfers the trace to the trace memory.
3. Select the "Show Memory" softkey.
The R&S Cable Rider ZPH displays the saved trace in lighter yellow.

You can remove the memory trace by pressing the "Show Memory" softkey again.

The memory traces are bit-mapped into the picture memory. Therefore, when the memory trace is recalled, it will not be adapted to any modifications of the reference level or span that may have been made in the meantime.

When you load a dataset, the R&S Cable Rider ZPH stores the corresponding trace in the trace memory. You can view that trace with the "Show Memory" softkey.

7.3.1.2 Using Trace Mathematics

Trace mathematics subtract the memory trace from the live trace and vice versa and then display the results. After you transfer a trace to the trace memory, you can perform the trace mathematics function.

1. Press the TRACE key.
2. Select the "Trace Math" softkey.
The R&S Cable Rider ZPH opens a submenu to select the trace math operation.
3. Select the "Trace-Memory" or "Memory-Trace" menu item.
The R&S Cable Rider ZPH calculates and shows the resulting trace.
4. To turn off trace mathematics, select the "Off" menu item.

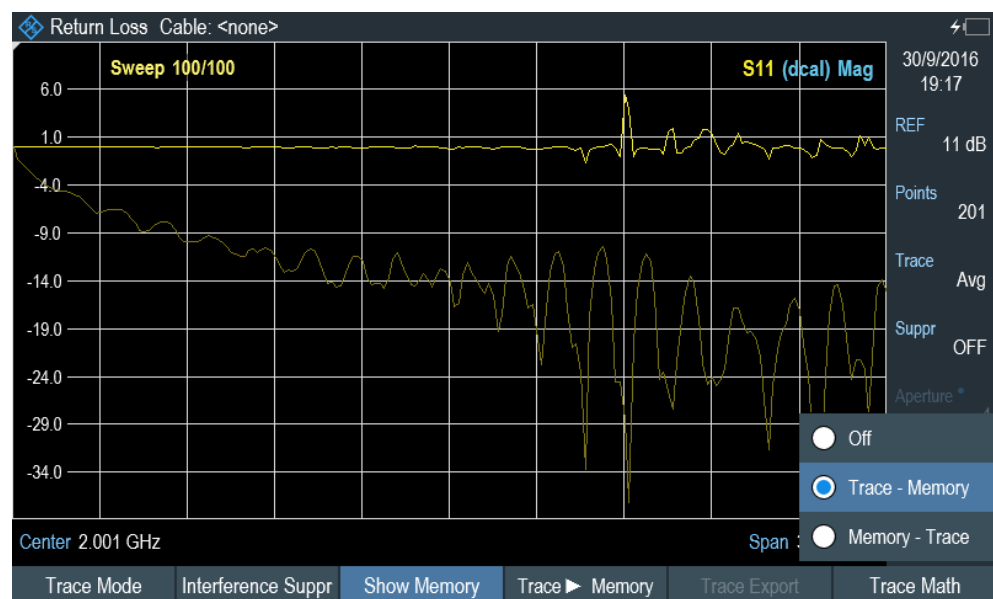


Figure 7-9: Trace memory

7.3.1.3 Using Trace Export

Stores the trace data to a file. The trace data will be exported to either a *.csv or *.slp file formats.

1. Press the TRACE key.
2. Select the "Trace Export" softkey.
The R&S Cable Rider ZPH opens the file manager to save the trace data.
3. Specify the filename for the trace data in the "Save As" entry field.
4. Press on the rotary knob to save the file.
The R&S Cable Rider ZPH saves the trace data.

7.3.2 Using Markers

The [Measurement Result View](#) shows the horizontal position of all markers and the corresponding vertical value.

You can select any marker in the [Measurement Result View](#) for further marker function using the marker softkey menu.

7.3.2.1 Using Markers and Deltamarkers

The R&S Cable Rider ZPH has six markers, five of which can be used as either markers or delta markers.

The markers cannot leave the trace and indicate the horizontal and vertical coordinates of the point they are positioned on. The horizontal position of a marker is shown by a vertical line which extends from the top to the bottom of the measurement diagram. The marker list above the diagram area shows the exact coordinates of all markers in use.

The position of a delta marker is indicated by a dashed line to distinguish it from a normal marker. The delta marker level is always a relative to the main marker level and so the delta marker level unit is always dB. The delta marker frequency is always relative to the main marker – in other words, the delta marker frequency is the frequency difference between the frequency at the point marked by the main marker and the frequency at the point marked by the delta marker.

To measure complex signals, you can activate up to six markers. Marker 1 is always a normal marker and the reference of all delta markers. Markers 2 to 6 are either markers or delta markers depending on your setup.

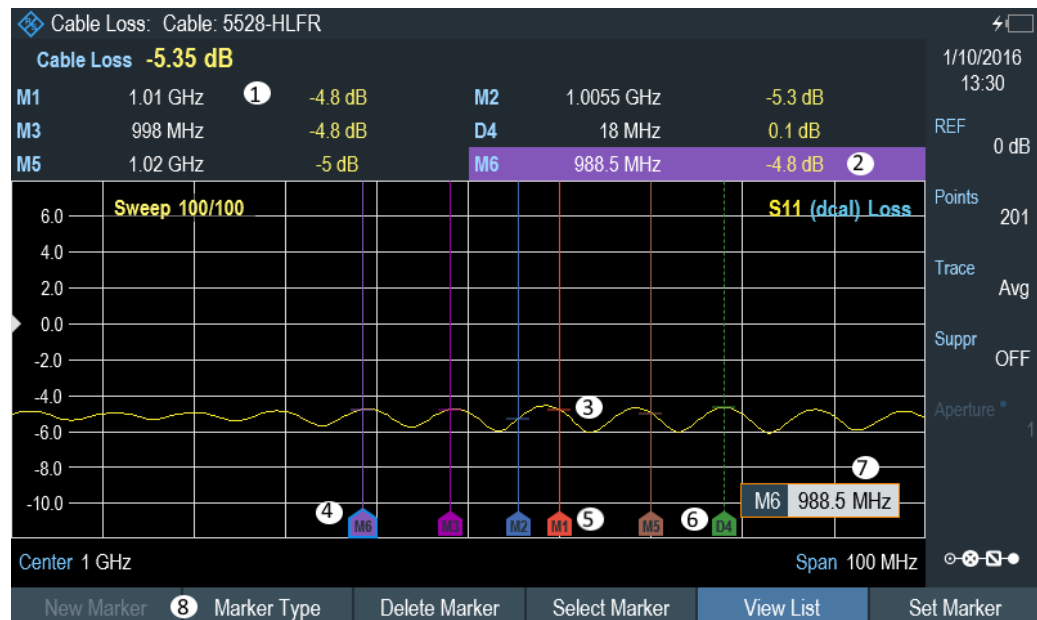


Figure 7-10: Screen layout with active markers

- 1 = Measurement Result View
- 2 = Marker (solid line)
- 3 = Delta marker (dotted line)
- 4 = Active marker label (see highlighted line on the marker list as well as the marker label)
- 5 = Marker label: M(x)
- 6 = Delta marker label: D(x)
- 7 = Marker input field
- 8 = Marker menu

Positioning Markers



Special touchscreen gesture

Double tap on the touchscreen to position new marker on the trace window. The first marker that is positioned on the trace window is always the main marker, the following markers added on the trace window are the delta markers.

Tab and drag on the marker icon to change the marker position.

See [Chapter 5.1.4, "Add Marker"](#), on page 67 and [Chapter 5.1.5, "Move Marker"](#), on page 68.

1. Press the MARKER key.

If, as yet, no marker has been activated, the R&S Cable Rider ZPH automatically activates the main marker and positions it on the maximum level that has been measured. In addition, the marker frequency input field opens.

You can perform the following actions:

- Tab and drag on the marker icon to change the marker position.
- Position the marker with the rotary knob
When positioning the marker with the rotary knob, the step size is one pixel.
- Enter a marker position with the number keys and confirm the entry with one of the unit keys.

2. Confirm the marker position by pressing the rotary knob.

The marker input field closes.

Positioning a Delta Marker

When a normal marker is already in use, you can add delta markers.



Special touchscreen gesture

Double tap on the touchscreen to position the delta marker on the trace window.

See [Chapter 5.1.4, "Add Marker"](#), on page 67.

1. Press the MARKER key.

2. Select the "New Marker" softkey.

The R&S Cable Rider ZPH activates a delta marker and positions it on the next maximum level that has been measured. In addition, the delta marker input field opens.

The R&S Cable Rider ZPH adds the delta marker to the marker list and shows the marker position relative to the normal marker (M1).

You can perform the following actions:

- Enter a delta marker position with the number keys and confirm the entry with one of the unit keys.
- Change the delta marker position with the rotary knob.

3. Confirm the delta marker position by pressing the rotary knob.

The delta marker input field closes.

4. To add more markers, press the "New Marker" softkey several times until you have the number of markers you want in the display.

Selecting the Marker Type

When you add new markers, they are delta markers by default. Their coordinates are relative to the first marker (M1). You can turn delta markers into normal markers if you need absolute information about the marker position.

1. Press the MARKER key.
2. Select the delta marker you want to convert in the [Measurement Result View](#).
Alternatively, select the "Select Marker" softkey to select the delta marker you want to convert.
3. Select the "Marker Type" softkey.
The delta marker turns into a normal marker. Its label changes accordingly (e.g. D2 to M2) and its coordinates are now absolute values.

Automatic Positioning of Markers

The R&S Cable Rider ZPH offers functions that make setting the markers easier or allow to make instrument settings on the basis of the current marker position:

1. Press the MARKER key.
2. Select the affected marker in the [Measurement Result View](#).
Alternatively, select the "Select Marker" softkey to select the affected marker.
3. Select the "Set Marker" softkey.
The R&S Cable Rider ZPH opens a submenu to select the marker automatic positioning settings.
4. Select the marker automatic position that you require.
The R&S Cable Rider ZPH positions the marker accordingly.

The R&S Cable Rider ZPH provides the following selections for automatic positioning of markers:

- "Set To Peak"
The peak function places the active marker or the delta marker on the highest level value of the trace.
- "Set To Next Peak"
The Next Peak function places the active marker or delta marker on the next highest level value of the trace, relative to its current position.
- "Set To Minimum"
The minimum function places the active marker or delta marker on the lowest value of the trace.
- "All Marker To Peak"
This function place all the active markers to the peak values of the trace.

Removing Markers

Remove markers any time you want from the trace window.

Removing selected markers



Deactivating markers

If you delete main marker ("M1"), all delta markers that are relative to that marker are also deleted.

1. Select the marker you want to delete in the [Measurement Result View](#).
Alternatively, select the "Select Marker" softkey to select the marker you want to delete.
2. Select the "Delete Marker" softkey.
The R&S Cable Rider ZPH opens a submenu to select the marker deletion.
3. Select the "Delete Selected" menu item.
The R&S Cable Rider ZPH deletes the marker.

Removing delta markers only

1. Press the MARKER key.
2. Select the "Delete Marker" softkey.
The R&S Cable Rider ZPH opens a submenu to select the marker deletion.
3. Select the "Delete All Delta" menu item.
The R&S Cable Rider ZPH deletes all delta markers.

Removing all markers at the same time.



Special touchscreen gesture

Draw an "X" on the trace window to delete all markers and delta markers on the trace window.

See [Chapter 5.1.6, "Delete All Markers"](#), on page 69.

1. Press the MARKER key.
2. Select the "Delete Marker" softkey.
The R&S Cable Rider ZPH opens a submenu to select the marker deletion.
3. Select the "Delete All" menu item.
The R&S Cable Rider ZPH deletes all markers and delta markers.

View List

You can hide or un-hide the display of the [Measurement Result View](#).

**Special touchscreen gesture**

Swipe up or down vertically on the [Measurement Result View](#) to hide or unhide the marker list.

See [Chapter 5.1.7, "Hide or Unhide Measurement Result View Display"](#), on page 69.

1. Press the MARKER key.
2. Select the "View List" softkey.
The R&S Cable Rider ZPH hide or un-hide the [Measurement Result View](#), depending on its original state.

7.3.3 Using Display Line

Like markers, display line helps you to determine the level of the signal.

A display line is a blue straight line that runs horizontally and corresponds to a certain level value. You can move the display line to each pixel in the display. This means that the accuracy and exact vertical position of the display line depends on the resolution of the vertical axis.

With a display range of 100 dB, for example, each pixel corresponds to 0.3 dB. In that case, the accuracy of the display line is 0.3 dB. If you enter a value with a higher resolution, the R&S Cable Rider ZPH rounds that value. See [Figure 4-1](#).

You can also move the display line with the rotary knob. The step size for movement with the rotary knob is one pixel.

1. Press the LINES key.
2. Select the "Display Line" softkey.
The R&S Cable Rider ZPH displays the display line as a blue horizontal line. It shows the vertical position of the line in a table above the diagram area.
When you activate the display line, the R&S Cable Rider ZPH also opens an input field to define the vertical position of the line.
3. Enter the level value you need.
The R&S Cable Rider ZPH positions the display line accordingly.
Alternatively, you can also move the display line with the rotary knob.

7.3.4 Using Limit Lines

Limit lines help you to identify if a signal complies with certain level characteristics.

A limit line is made up out of two or more points that are connected to a line. Each of the points that define the shape of the limit line consists of two coordinates. One coordinate defines the horizontal position (e.g. frequency), the other one the vertical position. With the R&S Cable Rider ZPH, you can build limit lines that consist of up to 1000 points.

Values that define the horizontal characteristics of the limit line can be either absolute values (e.g. frequency in MHz) or relative values whose reference is the center of the measurement trace (e.g. the center frequency). Relative values are of advantage if you, for example, measure modulated output signals and you change the center frequency but need the limit line to remain the same. Absolute limit lines have the file extension ".abslim" while relative limit lines have the file extension ".rellim"

Values that define the vertical characteristics are always level values in dB. If the scaling of the vertical axis is currently a linear one (units V or W), the R&S Cable Rider ZPH automatically switches to a logarithmic scaling after you turn on the limit line.

After turning on a limit line, the R&S Cable Rider ZPH checks if the signal violates the shape of the limit line. If one or more signal levels exceed the limit value, the R&S Cable Rider ZPH features several indicators that the limit check has failed.

- A general message in the diagram header that indicates if the signal violates the limit line, including the trace that violates the limit: **Trace 1 FAIL**
- An audio signal that sounds every time a limit is violated
- The trace color turns red in areas of the measurement that violate a limit

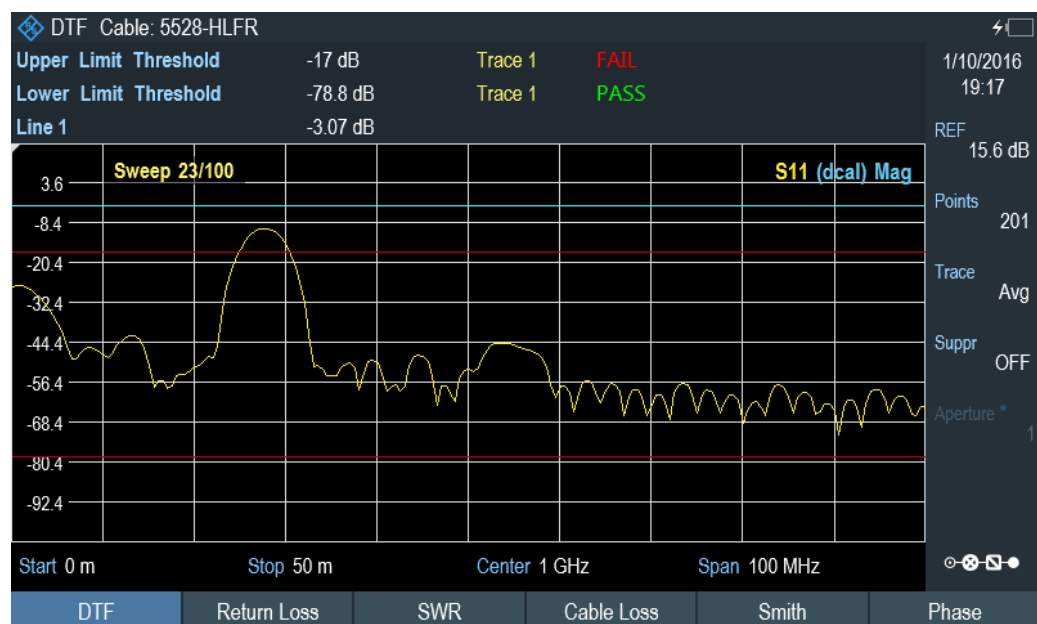


Figure 7-11: Upper and lower Limit Lines

You can create and edit limit lines with the R&S InstrumentView software and then transfer them into the internal memory of the R&S Cable Rider ZPH. The number of limit lines you can store in the memory depends on other datasets available on the R&S Cable Rider ZPH or if you are using an external storage device (e.g. memory stick).

For more information on limit lines, see [Chapter 5.8, "Managing Datasets"](#), on page 79.

7.3.4.1 Selecting a Limit Line

Before selecting a limit line, you need to decide if you want to use it as an upper or lower limit line. In case of upper limit lines, the R&S Cable Rider ZPH checks if the signal is above the limit line. In case of lower limit lines, the R&S Cable Rider ZPH checks if the signal is below the limit line.

You also have to make sure that the limit line is compatible to the scale of the horizontal axis.

1. Press the LINES key.
2. Depending on the application, press the "Upper Limit" or "Lower Limit" softkey.
3. Select the "Load From File" menu item.
The R&S Cable Rider ZPH opens the file manager to select the limit line.
4. Select one of the available limit lines.
5. Press the "Load" softkey.
The R&S Cable Rider ZPH activates the limit line. In the diagram, the limit line is displayed as a red line. See [Figure 7-11](#).
If you have already selected a limit line, you can turn the limit line on and off with the "Show Limit Lines" softkey.

Alternatively, you can define a threshold that works like a limit line. A threshold is a simple horizontal limit line.

1. Press the "Upper Limit" or "Lower Limit" softkey.
2. Select the "Set Threshold" menu item.
The R&S Cable Rider ZPH opens an input field to define the threshold.
3. Enter the threshold you require.
The R&S Cable Rider ZPH displays the line and performs a limit check for that threshold.



Threshold line and display line

Like the display line, a threshold line is a straight horizontal line. The difference is that the R&S Cable Rider ZPH performs a limit check for threshold lines, but not for display lines.

A failed limit check may be an issue if you want to create a measurement report, because measurements with failed limits are not included in this report.

Using a display line, you can use a line and are able to create a measurement report at the same time, regardless if any limits have been violated or not.

The process of turning off a limit line completely is similar to that of selecting a line.

1. Press the "Show Limit Lines"
The R&S Cable Rider ZPH hides the limit line.

2. To remove the limit lines, select the "Upper Limit" or "Lower Limit" softkey.
3. Select the "Remove" softkey.
The R&S Cable Rider ZPH removes the limit line.

7.3.4.2 Performing Limit Checks



Limit violation

Note that a limit check fails only if the signal exceeds the limit line. If the signal level is the same as the limit value, the limit check passes.

If limit lines are active, the R&S Cable Rider ZPH automatically checks the trace for limit violations after each frequency sweep. As long as the signal does not violate the limit line, the R&S Cable Rider ZPH shows a "Pass" message in the measurement diagram. When one single value (i.e. one pixel) is outside of the limits, the R&S Cable Rider ZPH displays a "Fail" message in the diagram area and, in addition, sounds a beep.

A limit check relates only to the frequency range defined by the limit line, not the span.

Audio signal

You can turn the acoustic signal that sounds in case of a limit violation on and off.

- Select the "Audio Beep" menu item.
Once selected, the audio beep is active, the R&S Cable Rider ZPH beeps each time a limit is violated.

8 Power Meter



R&S Cable Rider ZPH option

R&S ZPH-K9 (order number: 1321.0415.02) option is required to operate the R&S Cable Rider ZPH in the power meter mode.

For highly accurate power measurements, you can connect a power sensor to the R&S Cable Rider ZPH and perform measurements.

- [Using a Power Sensor](#)..... 132
- [Using a Directional Power Sensor](#)..... 137

8.1 Using a Power Sensor

The power sensor function turns the R&S Cable Rider ZPH into a wideband power meter. It then always measures the power of the whole signal in the frequency range of the power sensor. In most cases, the signal shape has no effect on the measurement.

The R&S Cable Rider ZPH supports the following power sensors.

- R&S FSH-Z1¹
- R&S FSH-Z18¹
- R&S NRP-Z11
- R&S NRP-Z21
- R&S NRP-Z22
- R&S NRP-Z23
- R&S NRP-Z24
- R&S NRP-Z31
- R&S NRP-Z51
- R&S NRP-Z52
- R&S NRP-Z55
- R&S NRP-Z56
- R&S NRP-Z57
- R&S NRP-Z81²
- R&S NRP-Z91
- R&S NRP-Z92
- R&S NRP-Z211
- R&S NRP-Z221

¹ The FSH sensor does not have a USB connector, but binder adapter instead. The cable identified by FSH-Z144 (USB to binder adapter) is required to connect these sensors on the USB port. This FSH-Z144 is an RS232 to USB converter cable.

² Only these power sensors support the trace mode (power versus time display)

For more information on the characteristics of the supported power sensors, see the following:

- The datasheet of the R&S Cable Rider ZPH.
- The website for R&S power sensors.

http://www.rohde-schwarz.com/en/products/test_and_measurement/power_volt_meter/NRPZ.html

1. Press the MODE key.
2. Select the "Power Meter" softkey
The R&S Cable Rider ZPH activates the mode for power measurements.



Figure 8-1: Screen layout of the power meter mode

- 1 = Connected power sensor model
- 2 = Measurement time
- 3 = Power offset
- 4 = Readout of the measured power
- 5 = Analog readout of the measured power
- 6 = Measurement frequency
- 7 = Configuration overview icon
- 8 = Power sensor softkey menu

8.1.1 Connecting a Power Sensor

The R&S Cable Rider ZPH controls and powers the power sensors via the USB interface on the top of the instrument. See "[USB type A connector](#)" on page 23.

If you are using the R&S FSH-Z1 and R&S-FSH-Z18 power sensors, connect the power sensor cable to the FSH-Z144 (USB to binder adapter) before connecting it to the USB interface of the R&S Cable Rider ZPH.

For the test setup of the power sensor, see ["Test setup"](#) on page 60.

After connecting the power sensor to the R&S Cable Rider ZPH, you can connect the DUT to the N-connector of the power sensor.

NOTICE

Risk of damage to the power sensor

Before you start to work with the power sensor, make sure that the continuous power applied to the input of the power sensor does not exceed a certain level.

Refer to the documentation of the power sensor for more information on the maximum input power.

If the R&S Cable Rider ZPH recognizes a power sensor, it sets up a connection via the interface and after a few seconds shows the measured power. It displays the type of the power sensor in the display header.

If no power sensor has been connected or it is not connected appropriately, the R&S Cable Rider ZPH shows nothing.

If there are communication problems between the R&S Cable Rider ZPH and the power sensor, the R&S Cable Rider ZPH displays one of the following error messages that indicate the possible cause.

Table 8-1: Error message for power sensor

Message	Cause	Remedy
Error in zeroing: signal at sensor	A signal was present at the power sensor when zeroing was performed.	Unscrew the power sensor from the device under test and repeat zeroing.
Warning: Input overloaded	The power at the input of the power sensor exceeds the permitted power (23 dBm = 200 mW).	Reduce the power at the sensor input.
Power sensor hardware error	Communication error between the R&S Cable Rider ZPH and the power sensor.	Unscrew the sensor from the R&S Cable Rider ZPH and check the connectors. If the problem persists, contact a Rohde & Schwarz service center.
Power sensor error	The power sensor signals an error to the R&S Cable Rider ZPH	Contact a Rohde & Schwarz service center.
Unknown power sensor model connected	The R&S Cable Rider ZPH cannot identify the device connected to the power sensor interface.	

8.1.2 Performing and Configuring Measurements

After you have connected a power sensor, the R&S Cable Rider ZPH immediately starts to measure the signal power.

Defining the center frequency

Power sensors have a memory containing correction values that are dependent on the frequency. Hence, measurement results are the most accurate for signals whose frequency you know.

Note that the R&S Cable Rider ZPH maintains the center frequency that you have set in another operating mode. In that case, it uses that frequency as the power sensor frequency.

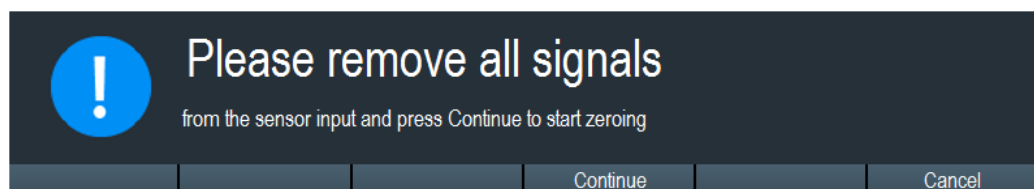
If you want to perform measurements on another known signal, you can change the power sensor frequency manually.

1. Select the "Freq" softkey.
The R&S Cable Rider ZPH opens an input field to define the frequency opens.
2. Enter the frequency of the signal.
The R&S Cable Rider ZPH transfers the new frequency to the power sensor which then corrects the measured power readings.

Zeroing the power sensor

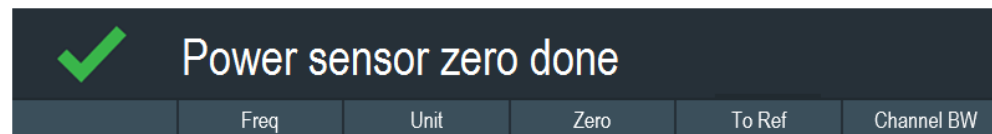
Offset voltages and currents have most effect on the power readout when measuring low powers. You can compensate for these offsets by zeroing the power sensor.

Do not apply power during the zeroing process, as the power sensor cannot distinguish between external powers and internal offsets.



1. Select the "Zero" softkey.
2. The R&S Cable Rider ZPH asks you not to apply any signals to the power sensor during the zeroing process.
3. Disconnect the power sensor from any signal sources.
4. Select the "Continue" softkey to start zeroing.
5. Select "Cancel" softkey to abort zeroing, for example, if you cannot disconnect the signal source.
The R&S Cable Rider ZPH immediately starts power sensor zeroing.
While zeroing is in progress, the R&S Cable Rider ZPH shows the message "Zeroing power sensor, please wait while the system is zeroing the power sensor".

When zeroing is over, the R&S Cable Rider ZPH displays the message "✓ Power sensor zero done".



Selecting the unit for the power readout

The R&S Cable Rider ZPH can display measured power in relative units (dBm) or in absolute units (W, mW, μ W, nW and ρ W). It is also possible to set a reference level in dB.

1. Select the "Unit" softkey.
A submenu to select the unit opens.
2. Select the unit you require.
The R&S Cable Rider ZPH adjusts the result display accordingly.

Setting the reference level

If you have selected the unit dB Rel, the R&S Cable Rider ZPH opens an input field to set the reference level. The R&S Cable Rider ZPH shows the currently set reference level in the diagram header.

1. Enter the reference level you require.
Alternatively, you can set the current level readout as the reference level.
2. Select the "To Ref" softkey.
The R&S Cable Rider ZPH sets the current result as the reference level.
It then displays the measured level relative to the reference level in dB. The unit is automatically set to dB Rel.

Setting the averaging time

The averaging time determines the length of the measurement. The longer the averaging time, the more stable the display, particularly if signals have low power or are noisy.

The averaging time is either "Short", "Normal" or "Long".

- A short measurement time provides stable and accurate results for stationary sine signals with high levels (> -40 dBm). It is also appropriate for measurements that require a high repetition rate.
- A normal measurement time increases the stability of results for signals with low levels or modulated signals.
- A long measurement time is appropriate for signals with very low-power levels (< -50 dBm).

To eliminate noise and the effects of noise on the measurement effectively, use the R&S FSH-Z1 power sensor.

1. Select the "MT" softkey.
2. Select the measurement time most suitable for your test setup.

Taking additional loss or gain into account

At high powers that cause the power sensor maximum input level to be exceeded or at very low levels that are below the R&S Cable Rider ZPH minimum sensitivity, the R&S Cable Rider ZPH can take additional loss or gain between the DUT and the power sensor into account. These differences are defined in terms of an offset in dB relative to the measured level. A positive offset corresponds to a loss and a negative offset corresponds to a gain.

The R&S Cable Rider ZPH shows the current offset in the diagram header.

1. Press the SCALE key.
2. Select the "Ref Offset" softkey.
The entry box for the reference offset opens.
3. Enter the offset you require.
The offset is taken into account in the power or level display.

8.2 Using a Directional Power Sensor

For power measurements in both directions (forward and reverse), you can connect directional power sensors to the R&S Cable Rider ZPH. The R&S Cable Rider ZPH supports the following directional power sensors:

- R&S FSH-Z14
- R&S FSH-Z44

With a directional power sensor, the R&S Cable Rider ZPH measures the power of a signal from source to load (forward power) and from load to source (reverse power). The ratio of forward and reverse power is a measure of the load matching. The R&S Cable Rider ZPH displays the results as the return loss or the standing wave ratio.

1. Press the MODE key.
2. Select the "Power Meter" softkey
The R&S Cable Rider ZPH activates the mode for power measurements.

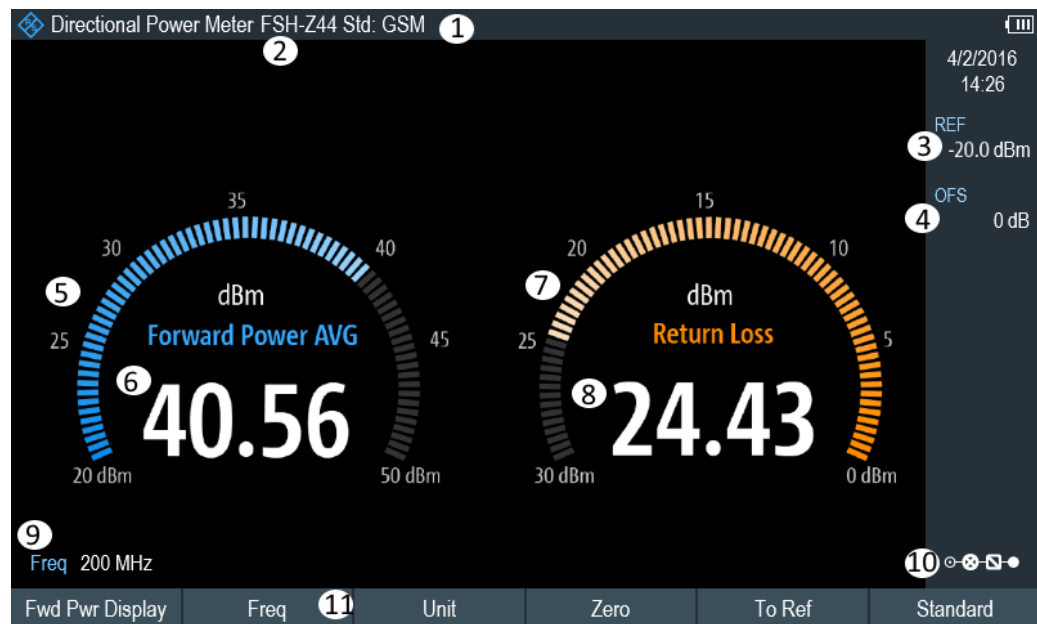


Figure 8-2: Screen layout of the directional power mode

- 1 = Selected transmission standard
- 2 = Connected power sensor model
- 3 = Reference for relative power measurements
- 4 = Power offset
- 5 = Readout of the forward power
- 6 = Analog readout of the forward power
- 7 = Readout of the matching value
- 8 = Analog readout of the matching value
- 9 = Measurement frequency
- 10 = Configuration overview icon
- 11 = Directional power sensor "MEAS" softkey menu

8.2.1 Connecting a Directional Power Sensor

The R&S Cable Rider ZPH controls and powers the directional power sensors via a special interface on the top of the instrument.

Connect the power sensor cable via the USB to binder adapter to the USB port of R&S Cable Rider ZPH. The power sensor itself is located between the source and the load of the test setup.

For the test setup of the directional power sensor, see ["Test setup"](#) on page 60.

If the R&S Cable Rider ZPH recognizes a power sensor, it sets up a connection via the interface and after a few seconds shows the results. It displays the type of the power sensor in the display header. If an error occurs, the R&S Cable Rider ZPH shows a corresponding message.

For more information, see [Chapter 8.1.1, "Connecting a Power Sensor"](#), on page 133.

8.2.2 Performing and Configuring Measurements

After you have connected a power sensor, the R&S Cable Rider ZPH immediately starts to measure the signal power.

When measuring high powers, pay strict attention to the following instructions to avoid personal injury and to prevent the power sensor from being destroyed

CAUTION

Risk of skin burns and / or damage to the R&S Cable Rider ZPH

Measuring high powers may lead to skin burns and / or damage to the R&S Cable Rider ZPH. You can avoid it by:

- Never exceeding the permissible continuous power. The permissible continuous power is indicated on a diagram on the back of the power sensor.
 - Turning off the RF power when connecting the power sensor.
 - Connecting the RF connectors tightly.
-

Defining the center frequency

To get the most accurate results, you should synchronize the frequency to that of the signal.

Note that the R&S Cable Rider ZPH maintains the center frequency that you have set in another operating mode. In that case, it uses that frequency as the power sensor frequency.

If you want to perform measurements on another known signal, you can change the power sensor frequency manually.

1. Select the "Freq" softkey.
The R&S Cable Rider ZPH opens an input field to define the frequency opens.
2. Enter the frequency of the signal.
The R&S Cable Rider ZPH transfers the new frequency to the power sensor which then corrects the measured power readings.

Zeroing the power sensor

For more information, see ["Zeroing the power sensor"](#) on page 135.

Setting the power measurement weighting mode

For forward power display, the R&S Cable Rider ZPH provides both average power and peak envelope power.

1. Press the MEAS key.
2. Select the "Fwr Pwr Display" softkey.
3. Select the weighting mode you require.

The R&S Cable Rider ZPH indicates the weighting mode at the forward power heading.

- "Average" = average power
- "Peak Envelope" = peak envelope power

Selecting the unit for the power readout

When using a directional power sensor, the R&S Cable Rider ZPH displays the forward power as a logarithmic level value in dBm (relative value) or as a linear value in W or mW (absolute value). In addition, you can define a reference level relative to which the R&S Cable Rider ZPH indicates the level difference in dB. Load matching is indicated as return loss in dB or as voltage standing wave ratio (VSWR). In addition, the absolutely reflected power can be displayed in W, or the reflected level in dBm.

For more information, see ["Selecting the unit for the power readout"](#) on page 136.

Setting the reference level

If you have selected the unit dB Rel for the forward power, the R&S Cable Rider ZPH opens an input field to set the reference level. The R&S Cable Rider ZPH shows the currently set reference level in the diagram header.

For more information, see ["Setting the reference level"](#) on page 136.

Selecting a standard

To ensure that true results are output when measuring modulated signals, the R&S Cable Rider ZPH offers the possibility of taking correction values into account for several common telecommunications standards.

1. Select the "Standard" softkey.
A menu to select a standard opens.
2. Select the standard you require.
The R&S Cable Rider ZPH takes the selected standard into account. The currently active standard is displayed in the display header.

Taking additional attenuation into account

When the directional power sensor is connected to a test point not directly but via a cable, the influence of cable attenuation can be taken into account. For this purpose, the cable attenuation for the measurement frequency in question is to be entered is based on the following condition:

Condition for setting cable attenuation

- As a positive dB value if the power and matching are to be measured at the source and the cable is connected between the source and the power sensor
- As a negative dB value if the power and matching are to be measured at the load and the cable is connected between the load and the power sensor

The directional power sensor then corrects the power and matching values to produce the results that would have been obtained if it had been directly connected to the test point.

1. Press the "SCALE" key.
2. Select the "Ref Offset" softkey.
The R&S Cable Rider ZPH opens an input field to define the reference offset.
3. Enter the offset you require.
The selected offset displayed as "OFS" in the parameter view is taken into account in the power (level) and matching results.
If high powers are applied that exceed the maximum input level of the R&S FSH-Z14 or R&S FSH-Z44, a directional coupler or an attenuator has to be connected ahead of the power sensor.
In such cases, the coupling attenuation of the directional coupler or the attenuation value of the attenuator are entered as positive dB values (see [condition to set cable attenuation](#)) into the R&S Cable Rider ZPH to ensure true measured power readout. In both cases, a termination or an attenuator of sufficient power-handling capacity has to be connected to the power sensor at the load end. The matching readout is irrelevant in such case since it is likewise corrected by taking into account the attenuation value of the termination or attenuator.

9 Using the Internal Power Meter



R&S Cable Rider ZPH option

R&S ZPH-K19 (order number: 1321.0409.02) option is required to operate the R&S Cable Rider ZPH in the internal power mode.

With the installation of internal power meter option, the R&S Cable Rider ZPH supports power measurements using the built-in power sensor. You can connect the DUT directly to the R&S Cable Rider ZPH to perform power measurements.



- 1 = Power meter mode
- 2 = Readout of the measured power
- 3 = Reference for relative power measurements
- 4 = Power offset
- 5 = Analog readout of the measured power
- 6 = Measurement frequency
- 7 = Configuring overview
- 8 = Power meter softkey menu

Performing and configuring power meter measurements

The configuration of power meter measurements is similar to measurement with a power sensor.

The following features are available:

- Defining the frequency
- Zeroing the measurement
- Selecting the unit
- Defining the reference level
- Taking additional loss or gain into account

For more information, see [Chapter 8.1.2, "Performing and Configuring Measurements"](#), on page 135.

10 Performing Pulse Power Measurements



R&S Cable Rider ZPH option

R&S ZPH-K29 (order number: 1321.0421.02) option is required to operate the R&S Cable Rider ZPH in the pulse power meter mode.

When you equip the R&S Cable Rider ZPH with the pulse power measurement option and connect one of the wideband power sensors available from Rohde & Schwarz (R&S NRP-Z81, -Z85 or -Z86), you can perform pulse power measurements with your R&S Cable Rider ZPH.

Like the normal power meter application, the pulse power application measures the power of the whole signal in the frequency range of the (wideband) power sensor.

1. Press the MODE key.
2. Select the "Power Meter" softkey
The R&S Cable Rider ZPH activates the mode for power measurements.

Connecting the power sensor

You can connect the wideband power sensors to the USB port of the R&S Cable Rider ZPH. For more information, see [Chapter 8.1.1, "Connecting a Power Sensor"](#), on page 133.

The measurement starts as soon as the power sensor is connected.

Numerical result display

1. Press the MEAS key.
2. Select the "Meas Mode" softkey.
3. Select the "Average" menu item.

The layout and contents of the numerical result display are the same as those described in [Figure 8-1](#).

Graphical result display (Power vs Time)

The graphical representation of the results is a special feature only available with the firmware option R&S ZPH-K29.

1. Press the MEAS key.
2. Select the "Meas mode" softkey.
3. Select the "Power vs Time" menu item.

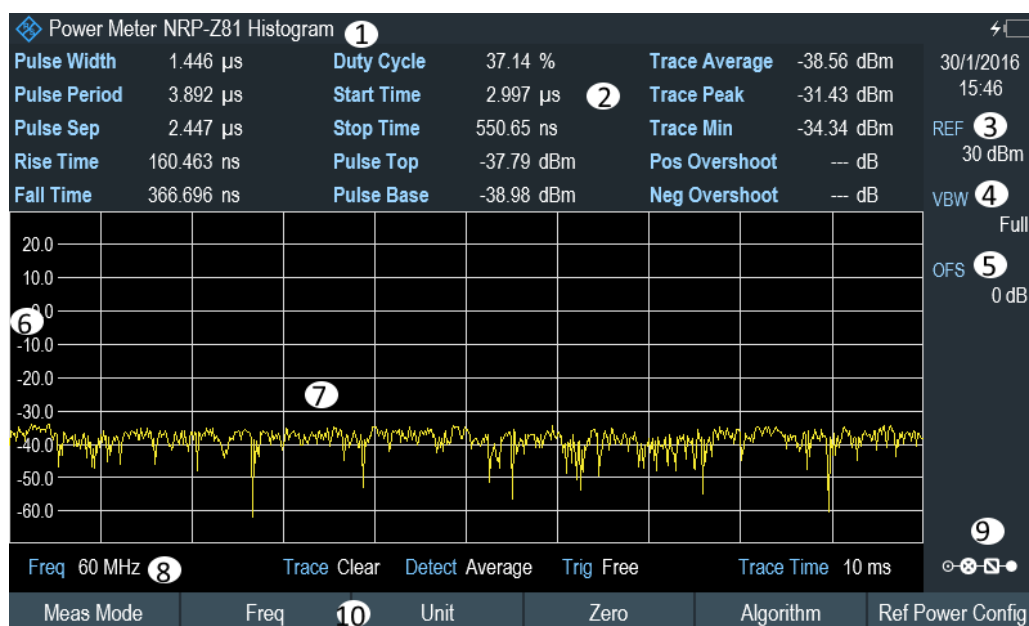


Figure 10-1: Power vs time display

- 1 = Connected power sensor model and type of algorithm for power calculation
- 2 = Numerical results showing the pulse characteristics
- 3 = Reference for relative power measurements
- 4 = Power offset
- 5 = Video bandwidth
- 6 = Scale of the x-axis
- 7 = Diagram showing the pulse characteristics in a graphical format (trace display)
- 8 = Measurement frequency
- 9 = Configuring overview icon
- 10 = Softkey menu of the pulse power measurement application

The following power characteristics are calculated and displayed as numerical values. See [Figure 10-2](#) for a graphical representation of the parameters.

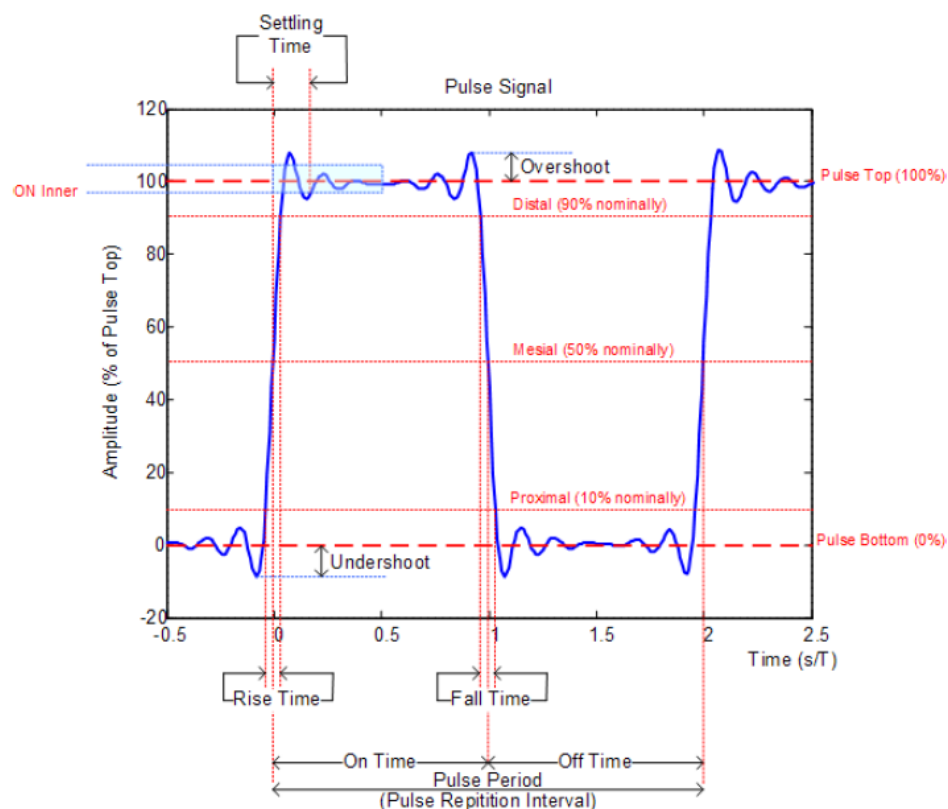


Figure 10-2: Graphical representation of pulse characteristic

Pulse characteristic	Description
Pulse Width	Time that the pulse remains at the top level ("ON"). This is the time between the first positive edge and the subsequent negative edge of the pulse in seconds, where the edges occur at crossings of the mid threshold.
Pulse Period	Time that is elapsing from the beginning of one pulse to the beginning of the next pulse.
Pulse Off Time	Time in the displayed trace that is not occupied by the pulse.
Rise Time	Time required for the pulse to transition from the base to the top level. This is the difference between the time at which the pulse exceeds the lower and upper thresholds.
Fall Time	Time required for the pulse to transition from the top to the base level. This is the difference between the time at which the pulse drops below the upper and lower thresholds.
Duty Cycle	Ratio of the "Pulse Width" to "Pulse Repetition Interval" expressed as a percentage (requires at least two measured pulses).

Pulse characteristic	Description
Start Time	Time offset, relative to the beginning of the trace (0 sec), where the pulse begins (start of the rise time).
Stop Time	Time offset, relative to the beginning of the trace (0 sec), where the pulse stops (end of the fall time).
Pulse Top	Median pulse ON power. The value of this parameter is used as a reference (100%) to determine other parameter values such as the rising / falling thresholds.
Pulse Base	Median pulse OFF power. The value of this parameter is used as a reference (0 %) to determine other parameter values such as the rising / falling thresholds.
Trace Avg	Average power of the signal displayed in the diagram.
Trace Peak	Maximum power of the signal displayed in the diagram.
Trace Min	Minimum power of the signal displayed in the diagram.
Positive Overshoot	Height of the local maximum after a rising edge, divided by the pulse amplitude. The result is a percentage of the pulse amplitude.
Negative Overshoot	Height of the local minimum after a rising edge, divided by the pulse amplitude. The result is a percentage of the pulse amplitude.

10.1 Configuring the Numerical Result Display

The functions available for the numerical result display are the same as those available for normal power sensor measurements.

For more information, see [Chapter 8.1.2, "Performing and Configuring Measurements"](#), on page 135.

10.2 Configuring the Power vs Time Result Display

The R&S Cable Rider ZPH allows you to configure several aspects of the power vs time result display and the way the pulse is measured.

- [Determining Pulse Characteristics](#)..... 148
- [Selecting the Video Bandwidth](#)..... 149
- [Averaging Traces](#)..... 149
- [Triggering Measurements](#)..... 150

- [Selecting the Result Unit](#)..... 151
- [Scaling the Y-Axis](#)..... 151
- [Using Markers](#)..... 151

10.2.1 Determining Pulse Characteristics

Selecting an algorithm for base and top power calculation

The R&S Cable Rider ZPH provides several methods (or algorithms) to calculate the base and top power of a pulse.

- "Histogram"
Calculates the top and base power of the pulse by analyzing the histogram of the trace data. The level of the pulse top calculated by the mean value of all points representing the pulse top. Similarly the level of the pulse base is calculated by the points representing the pulse base.
This algorithm is recommended for analyzing most of the pulse signals
- "Integration"
Calculates the top power of the pulse by fitting a rectangle pulse of same energy into the pulse signal as a reference.
This algorithm is recommended for modulated pulse signals or when the pulse energy must be taken into account, for example when you want to compare the measurement result with that of a thermal power sensor.
- "Peak"
Assumes that the peak power of the pulse is also the top level of the pulse.

The top and base power is also the reference point for the calculation of pulse timing characteristics.

1. Press the MEAS key.
2. Select the "Algorithm" softkey.
3. Select the algorithm you prefer for your measurement.
The R&S Cable Rider ZPH adjusts the results accordingly.

Defining reference levels for pulse timing calculation

To calculate pulse timing parameters, like the rise and fall time of the pulse, you have to define several reference levels. All reference levels are a percentage of the pulse amplitude, either expressed in terms of power (Watt) or voltage (Volt).

The "Low Reference Power" and "High Reference Power" are required to calculate the fall and rise times of the measured pulse. The "Low Reference Power" defines the level at the start of the rising edge and the level at the end of the falling edge of the pulse. The "High Reference Power" defines the level at end of the rising edge and the level at the start of the falling edge.

The "Reference Power" is required to calculate the pulse width, its start time and its stop time.

1. Press the MEAS key.
2. Select the "Ref Power Config" softkey.
3. Define the reference levels as required.

You can always reset the reference levels to their default value with the "Set to Default" menu item.

All the reference levels can be relative to the power or the voltage of the signal. Depending on this selection, different measurement points are being analyzed, so the results may be different.

1. Press the MEAS key.
2. Select the "Ref Power Config" softkey.
3. Select either the "Power" or the "Voltage" menu item as the reference.

10.2.2 Selecting the Video Bandwidth

When you are using a wideband power sensor, you can change the video bandwidth used for the measurement. The main effect of using a small video bandwidth is that it reduces the displayed inherent noise.

Using a small video bandwidth thus increases the measurement sensitivity and allows you to accurately determine the pulse peak power even for weak pulses. Reducing the video bandwidth also increases the trigger sensitivity of the power sensor.

Note that the video bandwidth should not be smaller than the RF bandwidth of the measured signal. Otherwise, measurement results may become invalid.

10.2.3 Averaging Traces

Selecting the trace mode

The Power vs Time result display provides two trace modes.

- The "Clear / Write" mode overwrites the trace data after each measurement.
- The "Average" mode forms an average over several measurements and displays the data according to the selected detector.
When you select this mode, you can define the number of measurements over which the trace data is calculated. When you select this mode, you can define the number of measurements over which the trace data is calculated.

1. Select the "Trace" softkey
2. Select the trace mode you prefer for the measurement.

Selecting the detector

When you are averaging traces, you can also select a detector. The detector defines the way the measured data is evaluated and which data is displayed.

In the Power vs Time result display, you can select the "Average" detector or the "Max Peak" detector. The "Average" detector displays the averaged measurement data, while the "Max Peak" detector displays the highest values that have been measured on each pixel.

1. Select the "Detect" softkey.
2. Select the detector you prefer.

10.2.4 Triggering Measurements

In its default state, the R&S Cable Rider ZPH starts a measurement on completion of the previous measurement ("Free Run" measurements).

However, you can also perform triggered measurements with the power sensor. When you choose to do so, the trigger event (the moment when the actual measurement starts) is either a rising slope in the signal or a falling slope ("Positive" or "Negative" trigger).

1. Press the SWEEP key.
2. Select the "Trigger" softkey.
3. Select either the "Positive" or "Negative" menu item.
The R&S Cable Rider ZPH stops measuring the signal until a trigger event occurs.

In case of triggered measurements, you have to define a trigger level by which the signal must rise or fall in order to be recognized.

1. Press the SWEEP softkey.
2. Select the "Trigger" softkey.
3. Select either the "Trigger Level" menu item and define a trigger level.

In addition, you can define a trigger delay time. The trigger delay time defines a time that must pass after the trigger event has occurred before the measurement starts. A negative trigger delay time is called a pre-trigger.

1. Press the SWEEP softkey.
2. Select the "Trigger" softkey.
3. Select either the "Trigger Delay" menu item and define a delay time.
When a trigger event occurs, the R&S Cable Rider ZPH takes the delay time into account when drawing the trace.

10.2.5 Selecting the Result Unit

In the pulse measurement application, the R&S R&S Cable Rider ZPH can display measured power in relative units (dBm) or in absolute units (W).

1. Press the SCALE key.
2. Select the "Unit" softkey.
3. Select the unit you prefer.
The R&S Cable Rider ZPH adjusts the y-axis accordingly.

10.2.6 Scaling the Y-Axis

For more information, see [Chapter 7.2.3, "Configuring the Vertical Axis"](#), on page 118.

10.2.7 Using Markers

The Power vs Time diagram supports markers.

For more information, see [Chapter 7.3.2, "Using Markers"](#), on page 123 (note that the marker functions are not available in the "Power Meter" mode).

11 Remote Commands

The commands required to perform measurements in the Cable and Antenna Test application in a remote environment are described here.

• Interfaces and Protocols	152
• Setting Up the Remote Control Connection	155
• Instrument Model and Command Processing	156
• SCPI Command Structure and Syntax	159
• Command Sequence and Command Synchronization	168
• Remote Control - Commands	168

11.1 Interfaces and Protocols

The R&S Cable Rider ZPH supports two different interfaces for remote control.

- [LAN Interface](#): The protocol is based on TCP/IP and supports the VXI-11 standard
- [USB Interface](#)

The connectors are located at the side of the instrument and permit a connection to a controller for remote control via a local area network (LAN) or directly via USB.

SCPI

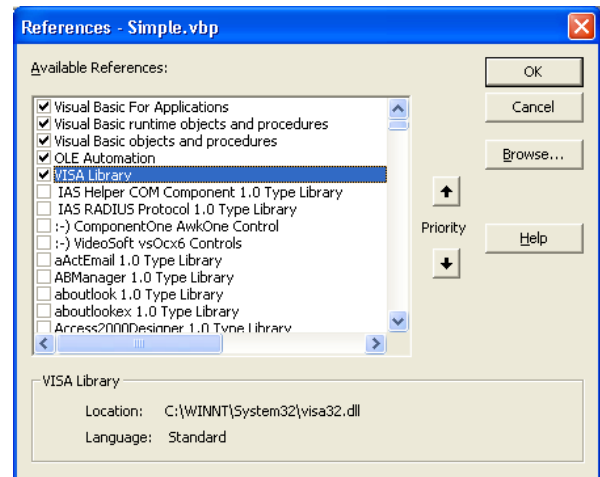
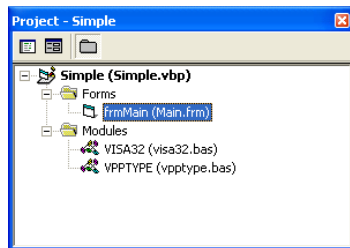
SCPI (Standard Commands for Programmable Instruments) commands - messages - are used for remote control. Commands that are not taken from the SCPI standard follow the SCPI syntax rules. The instrument supports the SCPI version 1999. The SCPI standard is based on standard IEEE 488.2 and aims at the standardization of device-specific commands, error handling and the status registers. The tutorial "Automatic Measurement Control - A tutorial on SCPI and IEEE 488.2" from John M. Pieper (order number 0002.3536.00) offers detailed information on concepts and definitions of SCPI.

The requirements that the SCPI standard places on command syntax, error handling and configuration of the status registers are explained in detail in the following sections. Tables provide a fast overview of the bit assignment in the status registers. The tables are supplemented by a comprehensive description of the status registers.

VISA

VISA is a standardized software interface library providing input and output functions to communicate with instruments. The I/O channel (LAN or USB) is selected at initialization time by means of a channel-specific resource string. For more information about VISA refer to its user documentation.

The programming examples for remote control, are all written in Microsoft® VISUAL BASIC®. Access to the VISA functions require the declaration of the functions and constants before their use in the project. This can be accomplished either by adding the modules VISA32.BAS and VPPTYPE.BAS or a reference to the VISA32.DLL to the project.



The modules VISA32.BAS and VPPTYPE.BAS can be found in the following location:
 <VXIbnpPath>\WinNT\Include (typically C:\VXIbnp\WinNT\Include).



Resetting the R&S Cable Rider ZPH

Manual operation is designed for maximum possible operating convenience. In contrast, the priority of remote control is the "predictability" of the device status. Therefore, control programs should always define an initial device status (e.g. with the command *RST) and then implement the required settings.

11.1.1 LAN Interface

To be integrated in a LAN, the instrument is equipped with a standard LAN interface, consisting of a connector, a network interface and protocols (VXI-11).

Instrument access via VXI-11 is usually achieved from high level programming platforms by using VISA as an intermediate abstraction layer. VISA encapsulates the low level VXI-11 (LAN) or USB function calls and thus makes the transport interface transparent for the user. The necessary VISA library is available as a separate product. For details, contact your local R&S sales representative.

11.1.2 USB Interface

For remote control via the USB connection, the PC and the instrument must be connected via the USB interface. The required driver comes with the R&S InstrumentView software package and is automatically installed on the PC with the software package.

The driver addressed the instrument via the USB interface with the fix IP address 172.16.10.10.

In addition, a remote control connection via the SCPI interface requires the VISA library to be installed on the PC.

11.1.3 Protocols

VXI-11 Basics

The VXI-11 standard is based on the ONC-RPC protocol which in turn relies on TCP/IP as the network/transport layer. The TCP/IP network protocol and the associated network services are preconfigured. TCP/IP ensures connection-oriented communication, where the order of the exchanged messages is adhered to and interrupted links are identified. With this protocol, messages cannot be lost.

Remote control of an instrument via a network is based on standardized protocols which follow the OSI reference model (see Fig. below).

Application	SCPI
Presentation	XDR (VXI-11)
Session	ONC-RPC
Transport	TCP / UDP
Network	IP
Data Link	Ethernet/802.3
Physical	802.3/10BASE-T

Figure 11-1: Example for LAN remote control based on the OSI reference model

Based on TCP/UDP, messages between the controller and the instrument are exchanged via open network computing (ONC) - remote procedure calls (RPC). With XDR (VXI-11), legal RPC messages are known as VXI-11 standard. Based on this standard, messages are exchanged between the controller and the instrument. The messages are identical with SCPI commands. They can be organized in four groups:

- Program messages (control command to the instrument).
- Response messages (values returned by the instrument).
- Service request (spontaneous queries of the instrument).
- Low-level control messages (interface messages).

A VXI-11 link between a controller and an instrument uses three channels: core, abort and interrupt channel. Instrument control is mainly performed on the core channel (program, response and low-level control messages). The abort channel is used for immediate abort of the core channel; the interrupt channel transmits spontaneous service requests of the instrument. Link setup itself is very complex. For more details, refer to the VXI-11 specification.

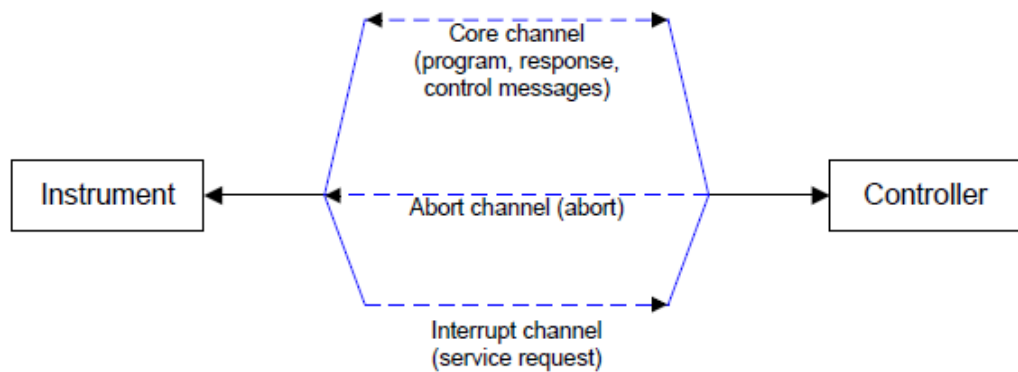


Figure 11-2: VXI-11 channels between instrument and controller

The number of controllers that can address an instrument is practically unlimited in the network. In the instrument, the individual controllers are clearly distinguished. This distinction continues up to the application level in the controller, i.e. two applications on a computer are identified by the instrument as two different controllers.

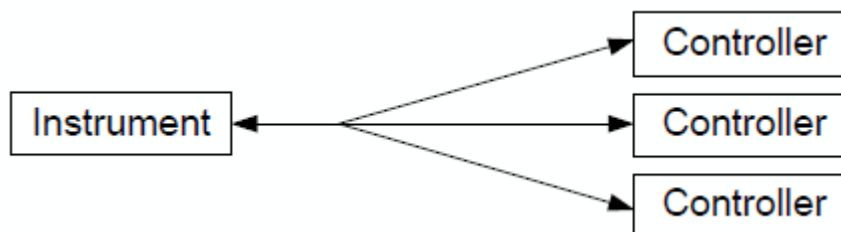


Figure 11-3: Remote control via LAN from several controllers

The controllers can lock and unlock the instrument for exclusive access. This regulates access to the instrument of several controllers.

11.2 Setting Up the Remote Control Connection

11.2.1 Preparing for Remote Control

The short and simple operating sequence below shows how to put the instrument into operation and quickly set its basic functions. The current IP address for LAN operation is shown in the SETUP – Instrument Setup Menu. In case of USB connection, the IP address is fixed to 172.16.10.10.

Refer [Chapter 4.3, "Connecting the R&S Cable Rider ZPH to a PC"](#), on page 43 for instructions on how to change the IP address.

- Connect the instrument to the LAN or directly to the controller via USB.
- Switch on the instruments.
- Write and start the following program on the controller:

```

- status = viOpenDefaultRM(defaultRM)
  'open default resource manager
- status = viOpen(DefaultRM, "TCPIP::172.16.10.10", 0, 0,
  vi)
  'in case of USB connection
- status = viopen(DefaultRM, "TCPIP::xxx.xxx.xxx.xxx", 0, 0,
  vi)
  'in case of a LAN connection, with xxx.xxx.xxx.xxx = IP address
- cmd = "*RST;*CLS"
- status = viWrite(vi, Cmd, Len(Cmd), retCount)
  'reset instrument and clear status registers
- cmd = "FREQ:CENT 100MHz"
- status = viWrite(vi, Cmd, Len(Cmd), retCount)
  'set center frequency to 100 MHz
- cmd = "FREQ:SPAN 10MHz"
- status = viWrite(vi, Cmd, Len(Cmd), retCount)
  'set span to 10 MHz
- cmd = "DISP:TRAC:Y:RLEV -10dBm"
- status = viWrite(vi, Cmd, Len(Cmd), retCount)
  'set reference level to -10 dBm
- viclose vi
- viclose default RM

```

The instrument now performs a sweep in the frequency range of 95 MHz to 105 MHz.

Changing the IP Address

In order to operate the instrument via remote control, it must be accessed via LAN (IP address) or USB (fixed IP address). If the factory-set remote control address does not fit in the network environment, it can be changed.

Refer [Chapter 4.3, "Connecting the R&S Cable Rider ZPH to a PC"](#), on page 43 for instructions on how to change the IP address.

11.3 Instrument Model and Command Processing

The block diagram in [Figure 11-4](#) shows how SCPI commands are serviced in the instrument. The individual components work independently and simultaneously. They communicate with each other by means of so-called "messages".

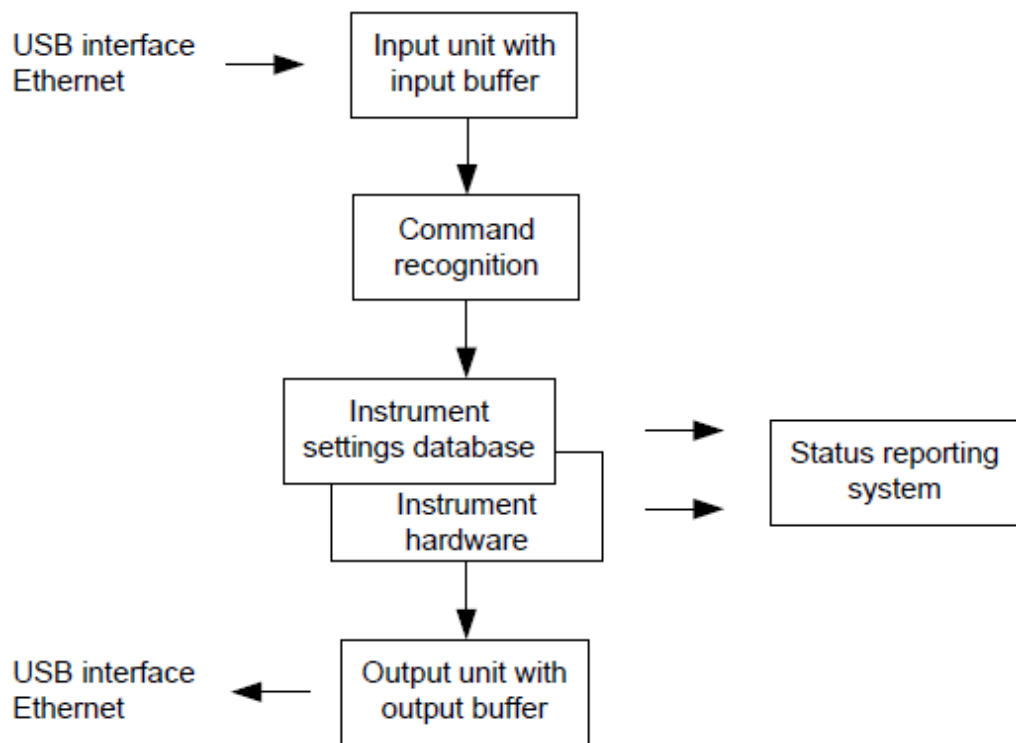


Figure 11-4: Instrument model in the case of remote control

• Input Unit	157
• Command Recognition	157
• Data Base and Instrument Hardware	158
• Status Reporting System	158
• Output Unit	158

11.3.1 Input Unit

The input unit receives commands character by character from the controller and collects them in the input buffer. The input unit sends a message to the command recognition as soon as the input buffer is full or as soon as it receives a delimiter, <PROGRAM MESSAGE TERMINATOR>, as defined in IEEE 488.2, or the interface message DCL.

If the input buffer is full, the traffic is stopped and the data received up to then are processed. Subsequently the traffic is continued. If, however, the buffer is not yet full when receiving the delimiter, the input unit can already receive the next command during command recognition and execution. The receipt of DCL clears the input buffer and immediately resets the command recognition.

11.3.2 Command Recognition

The command recognition analyses the data received from the input unit. It proceeds in the order in which it receives the data. Only DCL is serviced with priority, for exam-

ple GET (Group Execute Trigger) is only executed after the commands received before. Each recognized command is immediately transferred to the internal instrument settings data base but not executed immediately.

The command recognition detects syntax errors in the commands and transfers them to the status reporting system. The rest of a program message after a syntax error is analyzed further if possible and serviced. After the syntax test, the value range of the parameter is checked, if necessary.

If the command recognition detects a delimiter, it passes the command to an execution unit that performs the instrument settings. In the meantime, the command recognition is ready to process new commands (overlapping execution). A DCL command is processed in the same way.

11.3.3 Data Base and Instrument Hardware

Here the expression "instrument hardware" denotes the part of the instrument fulfilling the actual instrument function - signal generation, measurement etc. The controller is not included. The term "data base" denotes a database that manages all the parameters and associated settings required for setting the instrument hardware.

Setting commands lead to an alteration in the data set. The data set management enters the new values (e.g. frequency) into the data set, however, only passes them on to the hardware when requested by the command recognition. This only takes place at the end of a program message.

The data are checked for compatibility with the current instrument settings before they are transmitted to the instrument hardware. If the execution is not possible, an "execution error" is signaled to the status reporting system. The corresponding settings are discarded.

Before passing on the data to the hardware, the settling bit in the STATUS:OPERation register is set (refer to section "[STATUS:OPERation Register](#)" on page 239). The hardware executes the settings and resets the bit again as soon as the new state has settled. This fact can be used to synchronize command servicing.

Queries induce the data set management to send the desired data to the output unit.

11.3.4 Status Reporting System

For detailed information, refer to [Status Reporting System](#).

11.3.5 Output Unit

The output unit collects the information requested by the controller, which it receives from the data base management. It processes it according to the SCPI rules and makes it available in the output buffer.

If the instrument is addressed as a talker without the output buffer containing data or awaiting data from the data base management, the output unit sends error message

"Query UNTERMINATED" to the status reporting system. No data are sent to the controller, the controller waits until it has reached its time limit. This behavior is defined by IEEE 488.2 and SCPI.

11.4 SCPI Command Structure and Syntax

SCPI (Standard Commands for Programmable Instruments) describes a standard command set for programming instruments, irrespective of the type of instrument or manufacturer. The goal of the SCPI consortium is to standardize the device-specific commands to a large extent. For this purpose, a model was developed which defines the same functions inside a device or for different devices. Command systems were generated which are assigned to these functions. Thus it is possible to address the same functions with identical commands. The command systems are of a hierarchical structure.

SCPI is based on standard IEEE 488.2, i.e. it uses the same syntactic basic elements as well as the common commands defined in this standard. Part of the syntax of the device responses is defined with greater restrictions than in standard IEEE 488.2 (see [Chapter 11.4.4, "Responses to Queries"](#), on page 167).



Remote command examples

Not all commands used in the following examples are implemented in the instrument.

• Structure of a Command	159
• Parameters	164
• Structure of a Program Message	166
• Responses to Queries	167

11.4.1 Structure of a Command

The commands consist of a so-called header and, in most cases, one or more parameters. Header and parameter are separated by a "white space" (ASCII code 0 to 9, 11 to 32 decimal, e.g. blank). The headers may consist of several key words. Queries are formed by directly appending a question mark to the header.

• Common Commands	159
• Device-Specific Commands	160
• Overview of Syntax Elements	163

11.4.1.1 Common Commands

Common commands consist of a header preceded by an asterisk "*" and one or several parameters, if any.

Table 11-1: Examples

Command	Operation	Description
*RST	RESET	Resets the device.
*ESE 253	EVENT STATUS ENABLE	Sets the bits of the EVENT STATUS ENABLE register.
*ESR?	EVENT STATUS QUERY	Queries the contents of the EVENT STATUS register.

11.4.1.2 Device-Specific Commands

- Hierarchy.....160
- Multiple keywords.....161
- Optional Keywords.....161
- Long and Short Form.....161
- Parameter.....162
- Special Characters.....162
- Numeric Suffix.....163

Hierarchy

Device-specific commands are of hierarchical structure. The different levels are represented by combined headers. Headers of the highest level (root level) have only one key word. This key word denotes a complete command system.

Example:

SENSe

This key word denotes the SENSe command system.

For commands of lower levels, the complete path has to be specified, starting on the left with the highest level, the individual key words being separated by a colon ":".

Example:

SENSe:FREQuency:SPAN 10MHZ

This command lies in the third level of the SENSe system. It sets the frequency span.

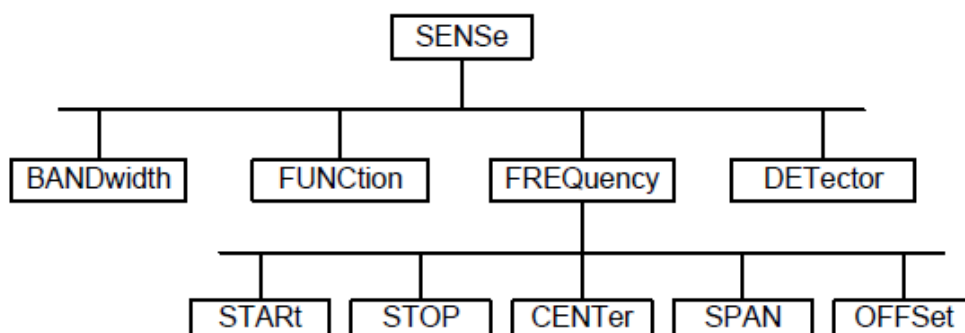


Figure 11-5: Tree structure the SCPI command systems using the SENSe system as example

Multiple keywords

Some key words occur in several levels within one command system. Their effect depends on the structure of the command, i.e. at which position in the header of a command they are inserted.

Example:

```
SOURce:FM:POLarity NORMal
```

This command contains key word `POLarity` in the third command level. It defines the polarity between modulator and modulation signal.

Example:

```
SOURce:FM:EXternal:POLarity NORMal
```

This command contains key word `POLarity` in the fourth command level. It defines the polarity between modulation voltage and the resulting direction of the modulation only for the external signal source indicated.

Optional Keywords

Some command systems permit certain key words to be inserted into the header or omitted. These key words are marked by square brackets in the description. The full command length must be recognized by the instrument for reasons of compatibility with the SCPI standard. Some commands are considerably shortened by these optional key words.

Example:

```
[SENSe]:BANDwidth[:RESolution]:AUTO
```

This command couples the resolution bandwidth of the instrument to other parameters. The following command has the same effect:

```
BANDwidth:AUTO
```



Optional keywords with numeric suffixes

Do not omit an optional keyword if it includes a numeric suffix that is relevant for the effect of the command.

Example:

```
DISPlay[:WINDow<1..4>]:MAXimize <Boolean>
```

Command `DISP:MAX ON` refers to window 1.

In order to refer to a window other than 1, you must include the optional `WINDow` parameter with the suffix for the required window.

```
DISP:WIND2:MAX ON
```

refers to window 2.

Long and Short Form

The key words feature a long form and a short form. Either the short form or the long form can be entered, other abbreviations are not permitted.

Example:

```
STATus:QUEStionable:ENABle 1
```

is equivalent to

```
STAT:QUES:ENAB 1
```

**Upper and lower case notation of commands**

Upper-case and lower-case notation only serves to distinguish the two forms in the manual, the instrument itself does not distinguish upper-case and lower-case letters.

Parameter

The parameter must be separated from the header by a "white space". If several parameters are specified in a command, they are separated by a comma ",". A few queries permit the parameters MINimum, MAXimum and DEFault to be entered. Refer to [Chapter 11.4.2, "Parameters"](#), on page 164 for a detailed description of the various parameters.

Example:

```
SENSe:FREQuency:STOP? MAXimum
```

Response: 3.5E9

This query requests the maximal value for the stop frequency.

Special Characters

- **Vertical stroke |**

A vertical stroke in parameter definitions indicates alternative possibilities in the sense of "or". The effect of the command differs, depending on which parameter is used.

Example

- `DISPlay:FORMat SINGLE | SPLit`

If parameter `SINGLE` is selected, full screen is displayed, in the case of `SPLIT`, split screen is displayed.

A selection of key words with an identical effect exists for several commands.

These keywords are indicated in the same line; they are separated by a vertical stroke. Only one of these keywords needs to be included in the header of the command. The effect of the command is independent of which of the keywords is used.

- `SENSe:BANDwidth|BWIDth[:RESolution]`

The two following commands with identical meaning can be created. They set the frequency of the fixed frequency signal to 1 kHz:

```
SENSe:BAND 1
```

```
SENSe:BWID 1
```

- **Square Brackets []**

Key words in square brackets can be omitted when composing the header. The full command length must be accepted by the instrument for reasons of compatibility with the SCPI standards.

Example

- [SENSe:]BANDwidth|BWIDth[:RESolution] or SENS:BAND:RES

is equivalent to

BAND

Parameters in square brackets can be incorporated optionally in the command or omitted as well

- MMEMory:NETWork:MAP<string>,<string>[,<string>,<string>,<boolean>]

Entries in square brackets are optional or can be omitted.

- **Braces { }**

Parameters in curly brackets are optional and can be inserted once or several times, or omitted.

Example

- SENSE:LIST:FREQuency <numeric_value>{,<numeric_value>}

The following are valid commands:

SENS:LIST:FREQ 10

SENS:LIST:FREQ 10,20

SENS:LIST:FREQ 10,20,30,40

Numeric Suffix

If a device features several functions or features of the same kind, e.g. inputs, the desired function can be selected by a suffix added to the command. Entries without suffix are interpreted like entries with the suffix 1. Optional keywords must be specified if they select a function with the suffix.

Example:

SYSTem:COMMUnicate:SERial2:BAUD 9600

This command sets the baud rate of a second serial interface.

**Suffix counting**

In case of remote control, suffix counting may differ from the numbers of the corresponding selection used in manual operation. SCPI prescribes that suffix counting starts with 1. Suffix 1 is the default state and used when no specific suffix is specified.

Some standards define a fixed numbering, starting with 0. With GSM, for instance, slots are counted from 0 to 7. In the case of remote control, the slots are selected with the suffixes 1 to 8. If the numbering differs in manual operation and remote control, it is indicated with the respective command.

11.4.1.3 Overview of Syntax Elements

The following table offers an overview of the syntax elements.

Syntax Element	Description
:	The colon separates the key words of a command. In a program message, the separating semicolon marks the uppermost command level.
;	The semicolon separates two commands within a program message. It does not alter the path.
,	The comma separates several parameters of a command.
?	The question mark forms a query.
*	The asterisk marks a common command.
"	Quotation marks introduce a string and terminate it.
#	The hash symbol # introduces binary, octal, hexadecimal and block data. • Binary: #B10110 • Octal: #O7612 • Hex: #HF3A7
" "	A "white space" (ASCII-Code 0 to 9, 11 to 32 decimal, e.g. blank) separates header and parameter.

11.4.2 Parameters

For most commands, a parameter needs to be supplemented. The parameter has to be separated from the header by a "white space".

The type of parameter required for each command and the allowed range of values are specified in the command description.

• Numeric Values	164
• Special Numeric Values	165
• Boolean Parameters	165
• Text	165
• Strings	166
• Block Data	166

11.4.2.1 Numeric Values

Numeric values can be entered in any form, i.e. with sign, decimal point and exponent. Values exceeding the resolution of the instrument are rounded up or down. The mantissa may comprise up to 255 characters, the exponent must lie inside the value range -32000 to 32000. The exponent is introduced by an "E" or "e". Entry of the exponent alone is not permissible. In the case of physical quantities, the unit can be entered. Permissible unit prefixes are G (giga), MA (mega), MOHM and MHZ are also possible), K (kilo), M (milli), U (micro) and N (nano). If the unit is missing, the basic unit is used.

Example:

```
SENSe:FREQuency:STOP 1.5GHz = SENSe:FREQuency:STOP 1.5E9
```

11.4.2.2 Special Numeric Values

The texts MINimum, MAXimum, DEFault, UP and DOWN are interpreted as special numeric values. In case of a query, the numeric value is returned.

- MIN/MAX
MINimum and MAXimum denote the minimum and maximum value.
- DEF
DEFault denotes a preset value which has been stored in the EPROM. This value conforms to the default setting, as it is called by the *RST command
- UP/DOWN
UP, DOWN increases or reduces the numerical value by one step. The step width can be specified via an allocated step command for each parameter which can be set via UP, DOWN.
- INF/NINF
INFinity, Negative INFinity (NINF) Negative INFinity (NINF) represent the numerical values -9.9E37 or 9.9E37, respectively. INF and NINF are only sent as device response.
- NAN
Not A Number (NAN) represents the value 9.91E37. NAN is only sent as device response. This value is not defined. Possible causes are the division of zero by zero, the subtraction of infinite from infinite and the representation of missing values.

Example:

Setting command: `SENSe:FREQuency:STOP MAXimum`

Query: `SENSe:FREQuency:STOP?`, Response: `3.5E9`

11.4.2.3 Boolean Parameters

Boolean parameters represent two states. The ON state (logically true) is represented by ON or a numerical value unequal to 0. The OFF state (logically untrue) is represented by OFF or the numerical value 0. The numerical values are provided as response for query.

Example:

Setting command: `CALCulate:MARKer:STATe ON`

Query: `CALCulate:MARKer:STATe?`, Response: `1`

11.4.2.4 Text

Text parameters observe the syntactic rules for key words, i.e. they can be entered using a short or long form. Like any parameter, they have to be separated from the header by a white space. In the case of a query, the short form of the text is provided.

Example:

Setting command: `INPut:COUPling GROund`

Query: `INPut:COUPling?`, Response: `GRO`

11.4.2.5 Strings

Strings must always be entered in quotation marks (' or ").

Example:

`SYSTem:LANGuage "SCPI"` or `SYSTem:LANGuage 'SCPI'`

11.4.2.6 Block Data

Block data are a transmission format which is suitable for the transmission of large amounts of data. A command using a block data parameter has the following structure:

Example:

`HEADer:HEADer #45168xxxxxxxxx`

ASCII character # introduces the data block. The next number indicates how many of the following digits describe the length of the data block. In the example, the four following digits indicate the length to be 5168 bytes. The data bytes follow. During the transmission of these data bytes all end or other control signs are ignored until all bytes are transmitted.

11.4.3 Structure of a Program Message

A program message may consist of one or several commands. It is terminated by the program message terminator which is the NL (New Line) character for LAN and USB connections.

Several commands in a program message must be separated by a semicolon ";". If the next command belongs to a different command system, the semicolon is followed by a colon. A colon ":" at the beginning of a command marks the root node of the command tree.

Example:

`CALL InstrWrite(analyzer, "SENSe:FREQuency:CENTer 100MHz::INPut:ATTenuation 10")`

This program message contains two commands. The first one is part of the SENSE command system and is used to determine the center frequency of the instrument. The second one is part of the INPut command system and sets the input signal attenuation. If the successive commands belong to the same system, having one or several levels in common, the program message can be abbreviated. For that purpose, the second command after the semicolon starts with the level that lies below the common levels. The colon following the semicolon must be omitted in this case.

Example:

```
CALL InstrWrite(analyzer, "SENSe:FREQuency:START 1E6;:SENSe:
FREQuency:STOP 1E9")
```

This program message is represented in its full length and contains two commands separated from each other by the semicolon. Both commands are part of the SENSe command system, subsystem FREQuency, i.e. they have two common levels.

When abbreviating the program message, the second command begins with the level below SENSe:FREQuency. The colon after the semicolon is omitted. The abbreviated form of the program message reads as follows:

```
CALL InstrWrite(analyzer, "SENSe:FREQuency:START 1E6;STOP 1E9")
```

However, a new program message always begins with the complete path.

Example:

```
CALL InstrWrite(analyzer, "SENSe:FREQuency:START 1E6")
CALL InstrWrite(analyzer, "SENSe:FREQuency:STOP 1E9")
```

11.4.4 Responses to Queries

A query is defined for each setting command unless explicitly specified otherwise. It is formed by adding a question mark to the associated setting command. According to SCPI, the responses to queries are partly subject to stricter rules than in standard IEEE 488.2.

- The requested parameter is transmitted without header.

Example

```
INPut:COUPling?
```

Response: DC

- Maximum values, minimum values and all further quantities, which are requested via a special text parameter are returned as numerical values.

Example

```
SENSe:FREQuency:STOP? MAX
```

Response: 3.5E9

- Numerical values are output without a unit. Physical quantities are referred to the basic units or to the units set using the Unit command.

Example

```
SENSe:FREQuency:CENTer?
```

Response: 1E6 (for 1 MHz)

- Truth values <Boolean values> are returned as 0 (for OFF) and 1 (for ON).

Example

```
SENSe:BANDwidth:AUTO?
```

Response: 1 (for ON)

- Text (character data) is returned in a short form.

Example

```
SYSTem:COMMunicate:SERial:CONTrol:RTS?
```

Response: STAN (for standard)

11.5 Command Sequence and Command Synchronization

What has been said above makes clear that all commands can potentially be carried out overlapping. In order to prevent an overlapping execution of commands, one of the commands `*OPC`, `*OPC?` or `*WAI` must be used. All three commands cause a certain action only to be carried out after the hardware has been set. By suitable programming, the controller can be forced to wait for the respective action to occur.

For more information, see [Table 11-2](#)

Table 11-2: Synchronization using `*OPC`, `*OPC?` and `*WAI`

Command	Action	Programming the controller
<code>*OPC</code>	Sets the Operation Complete bit in the ESR after all previous commands have been executed.	- Setting bit 0 in the ESE - Setting bit 5 in the SRE - Waiting for service request (SRQ)
<code>*OPC?</code>	Stops command processing until 1 is returned. This is only the case after the Operation Complete bit has been set in the ESR. This bit indicates that the previous setting has been completed.	Sending <code>*OPC?</code> directly after the command whose processing should be terminated before other commands can be executed.
<code>*WAI</code>	Stops further command processing until all commands sent before <code>*WAI</code> have been executed.	Sending <code>*WAI</code> directly after the command whose processing should be terminated before other commands are executed.

For a couple of commands, the synchronization to the end of command execution is mandatory in order to obtain the desired result. The affected commands require either more than one measurement in order to accomplish the desired instrument setting (e.g. auto range functions), or they require a longer period of time for execution. If a new command is received during execution of the corresponding function, this may either lead to either to an aborted measurement or to incorrect measurement data.

The following list includes the commands, for which a synchronization via `*OPC`, `*OPC?` or `*WAI` is mandatory:

Table 11-3: Commands with mandatory synchronization (overlapping commands)

Command	Purpose
<code>INIT</code>	start measurement (sweep)
<code>INIT:CONT OFF</code>	Set to single sweep
<code>CALC:MARK:FUNC:xx?</code>	All Marker function queries

11.6 Remote Control - Commands

The following chapters provide a detailed description of all the remote control commands currently available for the R&S Cable Rider ZPH and its firmware options.

Each section describes the commands for one of the operating modes available in the R&S Cable Rider ZPH, beginning with the description of common commands required to operate the instrument. The structure is based on that of the R&S Cable Rider ZPH user manual.

- [Chapter 11.6.1, "Common Commands"](#), on page 169
- [Chapter 11.6.3, "Remote Commands of the Power Meter"](#), on page 206

Each section is subdivided into various tasks required to perform measurements with the R&S Cable Rider ZPH, also based on the structure of the R&S Cable Rider ZPH user manual. Some commands like those for controlling markers or configuring the frequency axis are available for all operating modes. In that case, you can find a list of these commands in the corresponding section.



Availability of commands

The cable and antenna test modes are implemented in the basic unit. For the other modes, the corresponding options are required.

Following the remote control commands required to perform specific measurements, you can find a description of general commands used to set up and control basic instrument functions. These commands are independent of the operating mode. Therefore they are listed separately.

- [Chapter 11.6.4, "File Management"](#), on page 212
- [Chapter 11.6.5, "Making and Storing Screenshots"](#), on page 217
- [Chapter 11.6.6, "Configuring Data Capture"](#), on page 219
- [Chapter 11.6.7, "Configuring the Instrument"](#), on page 220
- [Chapter 11.6.8, "Status Reporting System"](#), on page 234

All chapters begin with a list of commands available in the context of that chapter. Following that list, you can find a detailed description of all the commands.

All individual descriptions contain:

- Complete notation and syntax of the command
- Description of the effects of the command
- A list of all parameters available for that command or the type of data the command returns in case of query commands
- An example of how a program message would look like
- The *RST value

An alphabetical list of all available commands is provided at the end of this manual.

11.6.1 Common Commands

The common commands are taken from the IEEE 488.2 (IEC 625-2) standard. A particular command has the same effect on different devices. The headers of these commands consist of an asterisk "*" followed by three letters. Some of the common commands refer to the [Chapter 11.6.8, "Status Reporting System"](#), on page 234.

List of Common Commands

- *CLS on page 170
- *ESE on page 170
- *ESR? on page 170
- *IDN? on page 171
- *IST? on page 171
- *OPC on page 171
- *OPT? on page 171
- *RST on page 171
- *SRE on page 171
- *STB? on page 172
- *TRG on page 172
- *TST? on page 172
- *WAI on page 172

*CLS

Clear status

Sets the status byte (STB), the standard event register (ESR) and the `EVENT` part of the `QUESTIONABLE` and the `OPERATION` registers to zero. The command does not alter the mask and transition parts of the registers. It clears the output buffer.

Usage: Setting only

*ESE <Value>

Event status enable

Sets the event status enable register to the specified value. The query returns the contents of the event status enable register in decimal form.

Parameters:

<Value> Range: 0 to 255

*ESR?

Event status read

Returns the contents of the event status register in decimal form and subsequently sets the register to zero.

Return values:

<Contents> Range: 0 to 255

Usage: Query only

***IDN?**

Identification

Returns the instrument identification.

Usage: Query only

***IST?**

Individual status query

Returns the contents of the IST flag in decimal form. The IST flag is the status bit which is sent during a parallel poll.

Return values:

<ISTflag> 0 | 1

Usage: Query only

***OPC**

Operation complete

Sets bit 0 in the event status register when all preceding commands have been executed. This bit can be used to initiate a service request. The query form writes a "1" into the output buffer as soon as all preceding commands have been executed. This is used for command synchronization.

***OPT?**

Option identification query

Queries the options included in the instrument. For a list of all available options and their description refer to the data sheet.

Usage: Query only

***RST**

Reset

Sets the instrument to a defined default status. The default settings are indicated in the description of commands.

The command is equivalent to `SYSTem:PRESet`.

Usage: Setting only

***SRE <Contents>**

Service request enable

Sets the service request enable register to the indicated value. This command determines under which conditions a service request is triggered.

Parameters:

<Contents> Contents of the service request enable register in decimal form.
 Bit 6 (MSS mask bit) is always 0.
 Range: 0 to 255

***STB?**

Status byte query

Reads the contents of the status byte in decimal form.

Usage: Query only

***TRG**

Trigger

Triggers all actions waiting for a trigger event. In particular, *TRG generates a manual trigger signal. This common command complements the commands of the TRIGger subsystem.

Usage: Event

***TST?**

Self-test query

Initiates self-tests of the instrument and returns an error code

Note: If you start a self-test remotely, then select the "Local" softkey while the test is still running, the instrument only returns to the manual operation state after the test is completed. In this case, the self-test cannot be aborted.

Return values:

<ErrorCode> **integer > 0 (in decimal format)**
 An error occurred.
 0
 No errors occurred.

Usage: Query only

***WAI**

Wait to continue

Prevents servicing of the subsequent commands until all preceding commands have been executed and all signals have settled (see also command synchronization and *OPC).

Usage: Event

11.6.2 Remote Commands of the Cable and Antenna Analyzer

This section provides a detailed description of all remote control commands required to configure and perform measurements in Cable and Antenna Test (CAT) mode.

- [Configuring the Horizontal Axis](#)..... 173
- [Configuring the Vertical Axis](#)..... 176
- [Performing and Triggering Measurements](#)..... 180
- [Working with Traces](#)..... 182
- [Using Markers](#)..... 186
- [Using Limit Lines](#)..... 193
- [Configuring and Using Measurement Functions](#)..... 198

11.6.2.1 Configuring the Horizontal Axis

The following commands configure the horizontal (frequency) axis of the active display.



Commands independent of the operating mode

Note that some of the commands for configuring the horizontal axis are also valid for other operating modes. If a command is available in another mode, it is indicated by the list in the respective section.

List of commands

- [\[SENSe:\] FREQuency:CENTer](#) on page 173
- [\[SENSe:\] FREQuency:CENTer:STEP](#) on page 174
- [\[SENSe:\] FREQuency:CENTer:STEP:LINK](#) on page 174
- [\[SENSe:\] FREQuency:SPAN](#) on page 174
- [\[SENSe:\] FREQuency:SPAN:AUTO](#) on page 174
- [\[SENSe:\] FREQuency:START](#) on page 175
- [\[SENSe:\] FREQuency:STOP](#) on page 175
- [CALCulate<1...2>:DTF:DISTance:START](#) on page 175
- [CALCulate<1...2>:DTF:DISTance:STOP](#) on page 176

[SENSe:]FREQuency:CENTer <CenterFrequency>

This command defines the center frequency of the R&S Cable Rider ZPH.

In spectrum analyzer mode, the command also defines the measuring frequency for time domain measurements (span = 0).

Parameters:

<CenterFrequency>	Range:	Depends on the operating mode and is specified in the data sheet.
	*RST:	fmax /2 with fmax = maximum frequency
	Default unit:	MHz

Example:

```
FREQ:CENT 100MHz
Defines a center frequency of 100 MHz.
```

[SENSe:]FREQuency:CENTer:STEP <Stepsize>

This command defines the center frequency step size.

Parameters:

<Stepsize> Range: 1 Hz to fmax
 *RST: - (AUTO 0.1*SPAN is switched on)
 Default unit: MHz

Example: `FREQ:CENT:STEP 120MHz`
 Defines a CF step size of 120 MHz.

[SENSe:]FREQuency:CENTer:STEP:LINK <CouplingState>

This command couples and decouples the center frequency step size to the span.

For time domain measurements, the command couples the step size to the resolution bandwidth.

Parameters:

<CouplingState> CENTERf | DIVTen | OFF
CENTERf
 Sets the step size equal to the center frequency.
DIVTen
 Couples the step size to the span (10 %).
OFF
 Turns off the coupling (manual step size).
 *RST: DIVTen

Example: `FREQ:CENT:STEP:LINK DIVT`
 Couples the step size to 10% of the span.

[SENSe:]FREQuency:SPAN <FrequencySpan>

This command defines the frequency span.

If you set a span of 0 Hz, the R&S Cable Rider ZPH starts a measurement in the time domain.

Parameters:

<FrequencySpan> Range: Specified in the data sheet.
 *RST: fmax with fmax = maximum frequency
 Default unit: GHz

Example: `FREQ:SPAN 10MHz`
 Defines a span of 10 MHz.

[SENSe:]FREQuency:SPAN:AUTO <State>

This command turns on or off the automatic calculation of the ideal span.

Parameters:

<State> ON | OFF
 *RST: OFF

Example:

FREQ:SPAN:AUTO ON
 Turns on the automatic span determination.

[SENSe:]FREQuency:STARt <StartFrequency>

This command defines the start frequency for measurements in the frequency domain (span > 0).

Parameters:

<StartFrequency> Range: Depends on the operating mode and is specified in the datasheet.
 *RST: 0 Hz
 Default unit: GHz

Example:

FREQ:STAR 20MHz
 Defines a start frequency of 20 MHz.

[SENSe:]FREQuency:STOP <StopFrequency>

This command defines the stop frequency for measurements in the frequency domain (span > 0).

Parameters:

<StopFrequency> Range: Depends on the operating mode and is specified in the datasheet.
 *RST: fmax
 Default unit: GHz

Example:

FREQ:STOP 2000MHz
 Defines a stop frequency of 2 GHz.

CALCulate<1...2>:DTF:DIStance:STARt <DtfDistanceStart>

This command defines the start distance of the cable measurement.

The numeric suffix at CALCulate is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<DtfDistanceStart> Numeric value in the range from 3 m (10 ft) to 1500 m (4921 ft)
 The unit is either meter or feet, depending on your selection.
 *RST: 3 m (10 ft)
 Default unit: m

Example:

CALC:DTF:DIST:STAR 50m
 Sets the starting point of the measurement to 50 m.

CALCulate<1...2>:DTF:DISTance:STOP <DtfDistanceStop>

This command defines the end point of the cable measurement.

The numeric suffix at CALCulate is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<DtfDistanceStop> Numeric value in the range from 3 m (10 ft) to 1500 m (4921 ft)
The unit is either meter or feet, depending on your selection.

*RST: 1500 m (4921 ft)

Default unit: m

Example:

CALC:DTF:DIST:STOP 500m

Sets the end point of the measurement to 500 m.

11.6.2.2 Configuring the Vertical Axis

The following commands configure the vertical (level) axis and level parameters of the active display.

**Commands independent of the operating mode**

Note that some of the commands for configuring the vertical axis are also valid for other operating modes. If a command is available in another mode, it is indicated by the list in the respective section.

List of commands

- [DISPlay<1...2>\[:WINDow\]:TRACe<1...2>:Y\[:SCALE\]:ADJust](#) on page 176
- [DISPlay<1...2>:LOSS:REFerence](#) on page 177
- [DISPlay<1...2>:LOSS:REFerence:POSition](#) on page 177
- [DISPlay<1...2>:LOSS:Y:SCALE](#) on page 177
- [DISPlay<1...2>:MAGNitude:REFerence](#) on page 178
- [DISPlay<1...2>:MAGNitude:REFerence:POSition](#) on page 178
- [DISPlay<1...2>:MAGNitude:Y:SCALE](#) on page 178
- [DISPlay<1...2>:MAGNitude:Y:SPACing](#) on page 179
- [DISPlay<1...2>:VSWR:Y:SCALE:MINimum](#) on page 179
- [DISPlay<1...2>:VSWR:Y:SCALE:MAXimum](#) on page 180
- [DISPlay<1...2>:VSWR:Y:SCALE](#) on page 180

DISPlay<1...2>[:WINDow]:TRACe<1...2>:Y[:SCALE]:ADJust

This command automatically scales the vertical axis for optimum display results.

This command is an event and therefore has no query and no *RST value.

The numeric suffix at DISPlay and TRACe is irrelevant for this command.

Example: `DISP:TRAC:Y:ADJ`
Adjusts the y-axis.

Usage: Event

DISPlay<1...2>:LOSS:REfERENCE <RefLevel>

This command defines the reference level for the cable loss measurement format.

The numeric suffix at DISPlay is irrelevant for this command.

Suffix:
<1...2> 1...2

Parameters:
<RefLevel> Numeric value in the range from -100 dB to 100 dB.
*RST: 0 dB
Default unit: dB

Example: `DISP:LOSS:REF 10`

Defines a reference level of 10 dB.

DISPlay<1...2>:LOSS:REfERENCE:POSition <RefPosition>

This command defines the position of the reference value in the diagram for the cable loss measurement format.

Each step shifts the reference position one grid line up or down.

The numeric suffix at DISPlay is irrelevant for this command.

Suffix:
<1...2> 1...2

Parameters:
<RefPosition> Numeric value in the range from 0 to 10.
*RST: 10

Example: `DISP:LOSS:REF:POS 5`
Moves the reference to the fifth grid line from the bottom.

DISPlay<1...2>:LOSS:Y:SCALE <DisplayRange>

This command defines the display range of the vertical axis for the cable loss measurement format.

The numeric suffix at DISPlay is irrelevant for this command.

Suffix:
<1...2> 1...2

Parameters:

<DisplayRange> Numeric value in the range from 1 dB to 100 dB.

*RST: 100 dB

Default unit: dB

Example:

DISP:LOSS:Y:SCAL 20

Defines a display range of 20 dB

DISPlay<1...2>:MAGNitude:REFerence <RefLevel>

This command defines the reference value for the magnitude measurement format.

The numeric suffix at DISPlay is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<RefLevel> Numeric value in the range from -80 dB to 30 dB

*RST: 0 dB

Default unit: dB

Example:

DISP:MAGN:REF -10

Defines a reference level of -10 dB.

DISPlay<1...2>:MAGNitude:REFerence:POSition <RefPosition>

This command defines the position of the reference value in the diagram for the magnitude measurement format.

Each step shifts the reference position one grid line up or down.

The numeric suffix at DISPlay is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<RefPosition> Numeric value in the range from 0 to 10.

*RST: 10

Example:

DISP:MAGN:REF:POS 5

Moves the reference to the fifth grid line from the bottom.

DISPlay<1...2>:MAGNitude:Y:SCALE <DisplayRange>

This command defines the display range of the vertical axis for the magnitude measurement format.

Note that you have to set a logarithmic scaling before you can use this command with [DISPlay<1...2>:MAGNitude:Y:SPACing](#) on page 179.

The numeric suffix at DISPlay is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<DisplayRange>

Numeric value in the range from 1 dB to 150 dB.

The number you enter is rounded up to the next possible display range. For example, if you enter 9, the R&S Cable Rider ZPH automatically sets the display range to 10.

*RST: 100 dB

Default unit: dB

Example:

DISP:MAGN:Y:SCAL 50 DB

Defines a display range of 50 dB.

DISPlay<1...2>:MAGNitude:Y:SPACing <ScalingType>

This command selects the scaling of the vertical axis for the magnitude measurement format.

The numeric suffix at DISPlay is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<ScalingType>

LINear | LOGarithmic

LINear

Selects a linear scale (%).

LOGarithmic

Selects a logarithmic scale (dB).

*RST: LOGarithmic

Example:

DISP:MAGN:Y:SPAC LIN

Selects linear scaling.

DISPlay<1...2>:VSWR:Y:SCALE:MINimum <DisplayRange>

This command defines the bottom value of the vertical axis for the VSWR measurement format.

The numeric suffix at DISPlay is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<DisplayRange>

Numeric value in the range from 1.0 to 70.

*RST: 1.0

Example:

DISP:VSWR:Y:SCALE:MIN 3

Defines a bottom value of 3 for the vertical axis.

DISPlay<1...2>:VSWR:Y:SCALe:MAXimum <DisplayRange>

This command defines the top value of the vertical axis for the VSWR measurement format.

The numeric suffix at DISPlay is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<DisplayRange> Numeric value in the range from 1.1 to 71.
*RST: 21

Example:

DISP:VSWR:Y:SCAL:MAX 25
Defines a top value of 25 for the vertical axis.

DISPlay<1...2>:VSWR:Y:SCALe <DisplayRange>

This command defines the bottom value of the vertical axis for the VSWR measurement format.

The numeric suffix at DISPlay is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<DisplayRange> Numeric value in the range from 1.1 to 71.
The number you enter is rounded up to the next possible display range. For example, if you enter 5, the R&S Cable Rider ZPH automatically sets the display range to 1...6.
*RST: 1...21

Example:

DISP:VSWR:Y:SCAL 50
Defines a display range of 1...71.

11.6.2.3 Performing and Triggering Measurements

The following commands control the actual measurement process, including trigger functionality.

Performing the Measurement

The following commands configure the sweep.

List of commands

- [INITiate:CONTInuous](#) on page 180
- [\[SENSe:\]SWEep:POINts](#) on page 181

INITiate:CONTInuous <State>

This command selects the sweep mode.

Parameters:

<State> ON | OFF
ON
 Selects continuous sweeps.
OFF
 Selects single sweep.
 *RST: ON

Example:

INIT:CONT OFF
 Turns on single sweep mode.

[SENSe:]SWEep:POINts <NrofPoints>

This command queries the number of measurement points in a single sweep.
 This command is a query and therefore has no *RST value.

Parameters:

<NrofPoints> Returns the number of sweep points.

Example:

SWE:POIN?
 Returns the number of sweep points.

Triggering Measurements

The following commands set up trigger conditions if you are using a trigger for the measurement.

List of commands

- [TRIGger\[:SEquence\]:HOLDoff\[:TIME\]](#) on page 181
- [TRIGger\[:SEquence\]:SLOPe](#) on page 181
- [TRIGger\[:SEquence\]:SOURce](#) on page 182

TRIGger[:SEquence]:HOLDoff[:TIME] <TriggerDelay>

This command defines the length of the trigger delay.

Parameters:

<TriggerDelay> Range: 0 s to 100 s
 *RST: 0 s
 Default unit: s

Example:

TRIG:HOLD 500us
 Sets the trigger delay to 500 µs.

TRIGger[:SEquence]:SLOPe <TriggerSlope>

This command selects the slope of the trigger signal.

The trigger slope applies to all trigger sources.

Parameters:

<TriggerSlope> POSitive | NEGative
 *RST: POSitive

Example: TRIG:SLOP NEG

TRIGger[:SEquence]:SOURce <TriggerSource>

This command selects the trigger source.

Parameters:

<TriggerSource> IMMediate | EXTernal | VIDEo | INTernal

IMMediate

Selects Free Run measurements.

EXTernal

Selects an external trigger.

VIDeo

Selects the video trigger.

INTernal

Selects an internal trigger.

*RST: IMMediate

For more information, see chapter "Setting the Sweep".

Example: TRIG:SOUR EXT

Selects the external trigger input as source of the trigger signal.

11.6.2.4 Working with Traces

The following commands set up the trace and the various functions associated with it, e.g. trace mathematics or the selection of the detector.

List of commands

- [CALCulate<1...2>:MATH<1...2>:COPY:MEMory](#) on page 182
- [DISPlay<1...2>\[:WINDow\]:TRACe<1...2>:MEMory\[:STATe\]](#) on page 183
- [DISPlay<1...2>\[:WINDow\]:TRACe<1...2>:MODE](#) on page 183
- [FORMat\[:DATA\]](#) on page 184
- [TRACe<1...2>\[:DATA\]?](#) on page 184
- [UNIT<1...2>:LENGth](#) on page 185

CALCulate<1...2>:MATH<1...2>:COPY:MEMory [<MemorySlot>]

This command stores the selected trace into the memory trace of the R&S Cable Rider ZPH.

This command is an event and therefore has no query and no *RST value.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at MATH selects the number of the trace.

Parameters:

<MemorySlot>

Example:

CALC:MATH:COPY:MEM

Usage:

Setting only

Copies the trace into the memory.

CALCulate<1...2>:MATH<1...2>:STATe <State>

This command turns trace mathematics on and off.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at MATH selects the number of the trace.

Parameters:

<State>

ON | OFF

*RST: OFF

Example:

CALC:MATH:STAT ON

Switches on the trace mathematics.

DISPlay<1...2>[:WINDow]:TRACe<1...2>:MEMory[:STATe] <State>

This command turns the memory trace on and off.

The numeric suffix at DISPlay is irrelevant for this command. The numeric suffix at TRACe selects the number of the trace.

Parameters:

<State>

ON | OFF

*RST: OFF

Example:

DISP:TRAC:MEM ON

Activates the memory trace.

DISPlay<1...2>[:WINDow]:TRACe<1...2>:MODE <DisplayMode>

This command selects the trace mode.

If you are using the average, max hold or min hold trace mode, you can set the number of measurements with [SENSe:] SWEep:COUNT<SweepCount>. Note that synchronization to the end of the average count is possible only in single sweep mode.

The numeric suffix at DISPlay is irrelevant for this command. The numeric suffix at TRACe selects the number of the trace.

Parameters:

<DisplayMode> WRITe | AVERAge | MINHold | MAXHold | VIEW | FREeze | INFinite
 *RST: WRITe
 You can turn off the trace with
 DISPlay<1...2>[:WINDow]:TRACe<1...2>[:STATe] .
 For more information, see chapter "Trace Mode".

Example:

```
SWE:CONT OFF
SWE:COUN 16
```

Turn on single sweep mode and sets the number of measurements to 16.

```
DISP:TRAC:MODE MAXH
```

Activates MAXHold mode for the trace.

```
INIT;*WAI
```

Starts the measurement and waits for the end of the 16 sweeps.

FORMat[:DATA] <Format>[, <>]

This command selects the data format that is used for transmission of trace data from the R&S Cable Rider ZPH to the controlling computer.

Note that the command has no effect for data that you send to the R&S Cable Rider ZPH. The R&S Cable Rider ZPH automatically recognizes the data it receives, regardless of the format.

Parameters:

<Format> ASCii | REAL

<>

ASCii

Returns the data in ASCII format, separated by commas.

REAL

Returns the data as 32-bit IEEE 754 floating point numbers in the "definite length block format".

*RST: ASCii

In REAL, 32 format, a string of return values would look like:

```
#42424<value 1><value 2>...<value n>
```

with

#4 representing the number of digits of the following number of data bytes (= 4 in this example);

2524 representing the number of following data bytes (2524, corresponds to the 711 sweep points of the R&S Cable Rider ZPH;

<value> representing 4-byte floating point value.

Example:

```
FORM ASC
```

Selects the ASCII data format.

TRACe<1...2>[:DATA]? [<arg0>]

This command queries the trace data of the current measurement.

It also transfers data from a file to a particular trace.

With `FORMat [:DATA]` command, you can set the data format.

The numeric suffix at `TRACe` selects the number of the trace.

Suffix:

<1...2> 1...2

Parameters:

<arg0> TRACe1 | TRACe2 | LIST

TRACe1

Queries the data of trace 1.

TRACe2

Queries the data of trace 2.

LIST

Queries the peak list of the measurement.

The R&S Cable Rider ZPH returns 711 values. Each value corresponds to one pixel of a trace.

The unit depends on the measurement and the unit you have set with `UNIT<1...2>:POWer`.

Note: If you use the auto peak detector, the command reads out positive peak values only.

Example:

TRAC:DATA? TRACE1
Reads out the data for trace 1.

Usage:

Query only

UNIT<1...2>:LENGth <LengthUnit>

This command selects the length unit.

The numeric suffix at `UNIT` is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<LengthUnit> METer | FEET

METer

Selects meter as the length unit.

FEET

Selects feet as the length unit.

*RST: METer

Example:

UNIT:LENGth FEET
Selects feet as the length unit.

11.6.2.5 Using Markers

The following commands control the operation of marker, delta markers and marker functions.

Markers and Delta Markers

The following commands are for setting and controlling markers and deltamarkers.

List of commands

- `CALCulate<1...2>:DELTamarker<1...6>[:STATe]` on page 186
- `CALCulate<1...2>:DELTamarker<1...6>:AOFF` on page 187
- `CALCulate<1...2>:DELTamarker<1...6>:MAXimum[:PEAK]` on page 187
- `CALCulate<1...2>:DELTamarker<1...6>:MAXimum:NEXT` on page 187
- `CALCulate<1...2>:DELTamarker<1...6>:MINimum[:PEAK]` on page 188
- `CALCulate<1...2>:DELTamarker<1...6>:X` on page 188
- `CALCulate<1...2>:DELTamarker<1...6>:X:RELative` on page 188
- `CALCulate<1...2>:DELTamarker<1...6>:Y?` on page 189
- `CALCulate<1...2>:MARKer<1...6>[:STATe]` on page 189
- `CALCulate<1...2>:MARKer<1...6>:AOFF` on page 190
- `CALCulate<1...2>:MARKer<1...6>:MAXimum[:PEAK]` on page 190
- `CALCulate<1...2>:MARKer<1...6>:MAXimum:NEXT` on page 190
- `CALCulate<1...2>:MARKer<1...6>:MINimum[:PEAK]` on page 191
- `CALCulate<1...2>:MARKer<1...6>:X` on page 191
- `CALCulate<1...2>:MARKer<1...6>:X:SLIMits<1...2>[:STATe]` on page 191
- `CALCulate<1...2>:MARKer<1...6>:X:SLIMits<1...2>:LEFT` on page 192
- `CALCulate<1...2>:MARKer<1...6>:X:SLIMits<1...2>:RIGHT` on page 192
- `CALCulate<1...2>:MARKer<1...6>:Y?` on page 193

CALCulate<1...2>:DELTamarker<1...6>[:STATe] <State>

This command turns delta markers on and off.

If you set the suffix at DELTmarker to 1, or use no suffix, the R&S Cable Rider ZPH interprets this as delta marker 2 because the first marker has to be a normal marker. If more than one normal marker (2 to 6) is already active, the command turns these markers into delta markers. If no delta marker is active yet, the command activates the delta marker and positions it on the trace maximum.

The numeric suffix at CALCulate selects the trace. The numeric suffix at DELTmarker selects the deltamarker.

Parameters:

<State> ON | OFF
 *RST: OFF

Example:

CALC:DELT3 ON
 Turns on delta marker 3 or turn marker 3 into a delta marker.

CALCulate<1...2>:DELTamarker<1...6>:AOFF

This command turns off all active delta markers.

This command is an event and therefore has no query and no *RST value.

The numeric suffix at CALCulate selects the trace. The numeric suffix at DELTmarker is irrelevant for this command.

Example:

CALC:DELT:AOFF
 Turns off all delta markers.

Usage:

Event

CALCulate<1...2>:DELTamarker<1...6>:MAXimum[:PEAK]

This command positions a delta marker on the current trace maximum.

If necessary, the corresponding delta marker is activated first.

This command is an event and therefore has no *RST value and no query.

The numeric suffix at CALCulate selects the trace. The numeric suffix at DELTmarker selects the deltamarker.

Example:

CALC:DELT3:MAX
 Moves delta marker 3 to the maximum peak.

Usage:

Event

CALCulate<1...2>:DELTamarker<1...6>:MAXimum:NEXT

This command positions a delta marker on the next smaller trace maximum.

If necessary, the corresponding delta marker is activated first.

This command is an event and therefore has no *RST value and no query.

The numeric suffix at CALCulate selects the trace. The numeric suffix at DELTmarker selects the deltamarker.

Example:

CALC:DELT2:MAX:NEXT
 Moves delta marker 2 to the next smaller maximum peak.

Usage:

Event

CALCulate<1...2>:DELTamarker<1...6>:MINimum[:PEAK]

This command positions a delta marker on the current trace minimum.

If necessary, the corresponding delta marker is activated first.

This command is an event and therefore has no *RST value and no query.

The numeric suffix at CALCulate selects the trace. The numeric suffix at DELTmarker selects the deltamarker.

Example: `CALC:DELT3:MIN`
 Moves delta marker 3 to the trace minimum.

Usage: Event

CALCulate<1...2>:DELTamarker<1...6>:X <FrequencyOrTime>

This command positions a delta marker on a particular coordinate on the horizontal axis.

Note that it is possible to place the marker outside the visible trace. In that case, this value is invalid.

If necessary, the corresponding delta marker is activated first.

The numeric suffix at CALCulate selects the trace. The numeric suffix at DELTmarker selects the deltamarker.

Parameters:

<FrequencyOrTime> Numeric value that indicates the coordinate on the horizontal axis.

Range: Maximum span.

Default unit: GHz

Example: `CALC:DELT:MOD REL`
 Delta marker positions are relative to marker 1.
 `CALC:DELT2:X 10.7MHz`
 Positions delta marker 2 10.7 MHz to the right of marker 1.
 `CALC:DELT2:X?`
 `CALC:DELT2:X:REL?`
 Queries the absolute and relative position of delta marker 2.

CALCulate<1...2>:DELTamarker<1...6>:X:RELative <FrequencyOrTime>

This command positions a delta marker on a position relative to the reference marker.

If necessary, the corresponding delta marker is activated first.

The numeric suffix at CALCulate selects the trace. The numeric suffix at DELTmarker selects the deltamarker.

Parameters:

<FrequencyOrTime> Defines the distance of the marker to the reference marker.
 Range: Depends on the current scaling of the horizontal axis.
 Default unit: GHz

Example:

`CALC:DELT3:X:REL 5 kHz`

Sets the delta marker at a distance of 5 kHz to the reference position.

CALCulate<1...2>:DELTamarker<1...6>:Y?

This command queries the vertical position of a delta marker. The result is always a relative value in relation marker 1.

If necessary, the corresponding delta marker is activated first.

To get a valid result, you have to perform a complete sweep with synchronization to the sweep end between activating the delta marker and reading out the result. This is only possible in single sweep mode.

In spectrum analyzer mode, the unit depends on the unit you have set and the scaling of the vertical axis.

Parameter or measuring functions	Output unit
DBM DBPW DBUV DBMV DBUA	dB (lin/log)
WATT VOLT AMPere	dB (lin), % (log)

The numeric suffix at CALCulate selects the trace. The numeric suffix at DELTmarker selects the deltamarker.

Parameters:

<MarkerPosition>

Example:

`INIT:CONT OFF`

`CALC:DELT2 ON`

Turns on single sweep mode and delta marker 2.

`INIT;*WAI`

Starts a sweep and waits for its end.

`CALC:DELT2:Y?`

Queries the position of delta marker 2.

Usage:

Query only

CALCulate<1...2>:MARKer<1...6>[:STATe] <State>

This command turns markers on and off.

If you do not use a suffix at MARKer, marker 1 is selected. If one or more delta markers (2 to 6) are already active, the command turns these delta markers into normal markers.

The numeric suffix at CALCulate selects the trace. The numeric suffix at MARKer selects the marker.

Parameters:

<State> ON | OFF
 *RST: OFF

Example: CALC:MARK3 ON
 Turns on marker 3.

CALCulate<1...2>:MARKer<1...6>:AOFF

This command turns off all active markers, delta markers and active marker measurement functions.

This command is an event and therefore has no query and no *RST value.

The numeric suffix at CALCulate selects the trace. The numeric suffix at MARKer is irrelevant for this command.

Example: CALC:MARK:AOFF
 Switches off all markers.

Usage: Event

CALCulate<1...2>:MARKer<1...6>:MAXimum[:PEAK]

This command positions a marker on the current trace maximum.

If necessary, the corresponding marker is activated first.

This command is an event and therefore has no *RST value and no query.

The numeric suffix at CALCulate selects the trace. The numeric suffix at MARKer selects the marker.

Example: CALC:MARK2:MAX
 Moves marker 2 to the maximum peak.

Usage: Event

CALCulate<1...2>:MARKer<1...6>:MAXimum:NEXT

This command positions a marker on the next smaller trace maximum.

If necessary, the corresponding marker is activated first.

This command is an event and therefore has no *RST value and no query.

The numeric suffix at CALCulate selects the trace. The numeric suffix at MARKer selects the marker.

Example: CALC:MARK2:MAX:NEXT
 Moves marker 2 to the next smaller maximum peak.

Usage: Event

CALCulate<1...2>:MARKer<1...6>:MINimum[:PEAK]

This command positions a marker on the current trace minimum.

If necessary, the corresponding marker is activated first.

This command is an event and therefore has no *RST value and no query.

The numeric suffix at CALCulate selects the trace. The numeric suffix at MARKer selects the marker.

Example: `CALC:MARK2:MIN`
Moves marker 2 to the trace minimum.

Usage: Event

CALCulate<1...2>:MARKer<1...6>:X <FrequencyOrTime>

This command positions a marker on a particular coordinate on the horizontal axis.

If one or more delta markers (2 to 6) are already active, the command turns these delta markers into normal markers.

Note that it is possible to place the marker outside the visible trace. In that case, this value is invalid.

If necessary, the corresponding delta marker is activated first.

The numeric suffix at CALCulate selects the trace. The numeric suffix at MARKer selects the marker.

Parameters:

<FrequencyOrTime> Indicates the coordinate on the horizontal axis.
The unit in spectrum analyzer mode depends on the measurement, e.g. Hz for measurements in the frequency domain and seconds for measurements in the time domain.
Range: Maximum span.
Default unit: GHz

Example: `CALC:MARK2:X 10.7MHz`
Positions marker 2 to frequency 10.7 MHz.

CALCulate<1...2>:MARKer<1...6>:X:SLIMits<1...2>[:STATe] <State>

This command turns marker search limits on and off.

The search limit restricts the evaluation range of the trace when "set marker" functions are performed. For example, marker set to peak with command `CALCulate<1...2>:MARKer<1...6>:MAXimum[:PEAK]` on page 190 sets the marker only at the peak of the trace within the search limit.

The numeric suffix at CALCulate selects the trace. The numeric suffix at MARKer selects the marker.

Parameters:

<State> ON | OFF
 *RST: OFF

Example:

See [CALCulate<1...2>:MARKer<1...6>:X:SLIMits<1...2>:RIGHT](#) on page 192.

CALCulate<1...2>:MARKer<1...6>:X:SLIMits<1...2>:LEFT <SearchLimit>

This command defines the left limit of the marker search range.

To use the command, you first have to turn on search limits with [CALCulate<1...2>:MARKer<1...6>:X:SLIMits<1...2>\[:STATe\]](#) on page 191.

The numeric suffix at CALCulate selects the trace. The numeric suffix at MARKer selects the marker.

Parameters:

<SearchLimit> Sets the left marker search limit.
 The unit in the spectrum analyzer mode depends on the measurement, e.g. Hz for measurements in the frequency domain and seconds for measurements in the time domain.
 Range: Maximum span.
 *RST: – (is set to the left diagram border when switching on search limits)
 Default unit: GHz

Example:

See [CALCulate<1...2>:MARKer<1...6>:X:SLIMits<1...2>:RIGHT](#) on page 192.

CALCulate<1...2>:MARKer<1...6>:X:SLIMits<1...2>:RIGHT <SearchLimit>

This command defines the right limit of the marker search range.

To use the command, you first have to turn on search limits with [CALCulate<1...2>:MARKer<1...6>:X:SLIMits<1...2>\[:STATe\]](#) on page 191.

The numeric suffix at CALCulate selects the trace. The numeric suffix at MARKer selects the marker.

Parameters:

<SearchLimit> Sets the right marker search limit.
 The unit depends on the measurement, e.g. Hz for measurements in the frequency domain and seconds for measurements in the time domain.
 Range: Maximum span.
 *RST: – (is set to the right diagram border when switching on search limits)
 Default unit: GHz

Example:

```
CALC:MARK:X:SLIM ON
CALC:MARK:X:SLIM:LEFT 10MHz
CALC:MARK:X:SLIM:RIGH 100MHz
```

Turns on search limits and defines a search range from 10 MHz to 100 MHz.

CALCulate<1...2>:MARKer<1...6>:Y?

This command queries the absolute vertical position of a marker.

If necessary, the corresponding marker is activated first.

To get a valid result, you have to perform a complete sweep with synchronization to the sweep end between activating the delta marker and reading out the result. This is only possible in single sweep mode.

The unit of the return value depends on `UNIT<1...2>:POWer`.

The numeric suffix at `CALCulate` selects the trace. The numeric suffix at `MARKer` selects the marker.

Parameters:

<MarkerPosition> Numeric value of the marker position.

Example:

```
INIT:CONF OFF
CALC:MARK2 ON
```

Turns on single sweep mode and marker 2.

```
INIT;*WAI
```

Starts a sweep and waits for the end.

```
CALC:MARK2:Y?
```

Queries the position of marker 2.

Usage: Query only

11.6.2.6 Using Limit Lines

The following commands define limit lines and perform the corresponding limit checks.

List of commands

- [CALCulate<1...2>:LIMit<1...2>:BEEP\[:STATe\]](#) on page 194
- [CALCulate<1...2>:LIMit<1...2>:COMMENT?](#) on page 194
- [CALCulate<1...2>:LIMit<1...2>:DELeTe](#) on page 195
- [CALCulate<1...2>:LIMit<1...2>:FAIL?](#) on page 195
- [CALCulate<1...2>:LIMit<1...2>:STATe](#) on page 196
- [CALCulate<1...2>:LIMit<1...2>:UNIT:X?](#) on page 196
- [CALCulate<1...2>:LIMit<1...2>:UNIT\[:Y\]?](#) on page 196
- [CALCulate<1...2>:LIMit<1...2>:LOWer:SELeCt](#) on page 197
- [CALCulate<1...2>:LIMit<1...2>:UPPer:SELeCt](#) on page 197
- [CALCulate<1...2>:LIMit<1...2>:LOWer:THReshold](#) on page 197

- [CALCulate<1...2>:LIMit<1...2>:UPPer:THReshold](#) on page 198

CALCulate<1...2>:LIMit<1...2>:BEEP[:STATe] <State>

This command turns the beeper that beeps if a limit line is violated on and off.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at LIMit selects the limit line.

Parameters:

<State> ON | OFF
 *RST: OFF

Example: CALC:LIM:BEEP ON
 Activates the audio beep.

CALCulate<1...2>:LIMit<1...2>:COMMeNt?

This command queries the description of a limit line.

This command is a query and therefore has no RST value.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at LIMit selects the limit line.

Suffix:

<1...2> 1...2
 <1...2> 1...2

Example: CALC:LIM:COMM?
 Queries the description of limit line 1.

Usage: Query only

CALCulate<1...2>:LIMit<1...2>:DEFine <Name>, <Description>, <X-unit>, <X-scale>, <Y-unit>, <X0...X99>, <Y0...Y99>

This command defines the shape of a limit line.

After you have defined the shape of the limit line, you still have to activate it with [CALCulate<1...2>:LIMit<1...2>:UPPer:SElect](#) on page 197 before it takes effect.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at LIMit selects the limit line.

Parameters:

<Name> String containing the name of the limit line.
 Note: if a limit line with the same name already exists, it is over-written.

<Description> String containing a comment for the limit line.

<X-unit> HZ | S | M
 Unit of the x-axis.

<X-scale>	ABSolute RELative Scale of the x-axis.
<Y-unit>	DB DBM DBMV DBUV V VOLT W WATT DBUVM DBUAM V_M W_M2 VSWR Unit of the y-axis.
<X0...X99>	Data points on the x-axis. Note: a limit line may consist of up to 100 horizontal data points.
<Y0...Y99>	Data points on the y-axis.
Example:	<code>CALC:LIM:DEF 'Line','Example',HZ,ABS,DBM, 10000000,-10, 10000000,0,20000000,0</code> Defines a limit line with three data points.
Usage:	Setting only

CALCulate<1...2>:LIMit<1...2>:DELe

This command deletes a limit line.

This command is an event and therefore has no *RST value and no query.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at LIMit selects the limit line.

Suffix:

<1...2> 1...2

<1...2> 1...2

Example:

`CALC:LIM2:DEL`
Deletes the second limit line.

CALCulate<1...2>:LIMit<1...2>:FAIL?

This command queries the result of a limit check.

To get a valid result, you have to perform a complete sweep with synchronization to the sweep end before reading out the result. This is only possible in single sweep mode.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at LIMit selects the limit line.

Suffix:

<1...2> 1...2

<1...2> 1...2

Example:

`INIT;*WAI`
`CALC:LIM1:FAIL?`
Performs a measurement and queries the result of the check for limit line 1.

Usage: Query only

CALCulate<1...2>:LIMit<1...2>:STATe <State>

This command turns a limit check on and off.

You can query the result of the limit check with `CALCulate<1...2>:LIMit<1...2>:FAIL?` on page 195.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at LIMit selects the limit line.

Parameters:

<State> ON | OFF
*RST: OFF

Example: `CALC:LIM:STAT ON`
Switches on the limit check for limit line 1.

CALCulate<1...2>:LIMit<1...2>:UNIT:X?

This command queries the horizontal unit of a limit line.

This command is a query and therefore has no *RST value.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at LIMit selects the limit line.

Suffix:

<1...2> 1...2

<1...2> 1...2

Example: `CALC:LIM:UNIT:X?`
Queries the x-unit of the first limit line.

Usage: Query only

CALCulate<1...2>:LIMit<1...2>:UNIT[:Y]?

This command queries the vertical unit of a limit line.

This command is a query and therefore has no *RST value.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at LIMit selects the limit line.

Suffix:

<1...2> 1...2

<1...2> 1...2

Example: `CALC:LIM1:UNIT?`
Queries the y-unit of the first limit line.

Usage: Query only

CALCulate<1...2>:LIMit<1...2>:LOWer:SElect <LimitLine>

This command selects the lower limit line.

This command is an event and therefore has no *RST value and no query.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at LIMit selects the limit line.

Suffix:

<1...2> 1...2

<1...2> 1...2

Parameters:

<LimitLine> String containing the filename of the lower limit line.

Example:

CALC:LIM:LOW:SEL 'GSM_Lower.rellim'

Selects the lower limit line.

Usage:

Setting only

CALCulate<1...2>:LIMit<1...2>:UPPer:SElect <LimitLine>

This command selects the upper limit line.

This command is an event and therefore has no *RST value and no query.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at LIMit selects the limit line.

Suffix:

<1...2> 1...2

<1...2> 1...2

Parameters:

<LimitLine> String containing the filename of the upper limit line.

Example:

CALC:LIM:UPP:SEL 'GSM_Upper.rellim'

Selects the upper limit line.

Usage:

Setting only

CALCulate<1...2>:LIMit<1...2>:LOWer:THReshold <Threshold>

This command defines the level of a lower threshold limit line.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at LIMit selects the limit line.

Suffix:

<1...2> 1...2

<1...2> 1...2

Parameters:

<Threshold>

Numeric value whose unit depends on the unit you have currently selected for the vertical axis.

Default unit: dBm

Example:

```
CALC:LIM:LOW:THR -10DBM
```

Defines a threshold of -10 dBm.

CALCulate<1...2>:LIMit<1...2>:UPPer:THReshold <Threshold>

This command defines the level of an upper threshold limit line.

The numeric suffix at CALCulate is irrelevant for this command. The numeric suffix at LIMit selects the limit line.

Suffix:

<1...2> 1...2

<1...2> 1...2

Parameters:

<Threshold>

Numeric value whose unit depends on the unit you have currently selected for the vertical axis.

Default unit: dBm

Example:

```
CALC:LIM:UPP:THR -10DBM
```

Defines a threshold of -10 dBm.

11.6.2.7 Configuring and Using Measurement Functions

This chapter provides information on how to configure one-port measurements with the signal source. The structure follows the order of the actual operation sequence used when performing a measurement:

To perform the actual measurement, use the commands described in [Chapter 11.6.2.3, "Performing and Triggering Measurements"](#), on page 180.

- ["Selecting the Cable Characteristics"](#) on page 198
- ["Selecting the Measurement Mode"](#) on page 199
- ["Selecting the Measurement Format"](#) on page 199
- ["Reading Out Measurement Results"](#) on page 201
- ["Calibrating the Measurement"](#) on page 202
- ["Working with a DTF List"](#) on page 204

Selecting the Cable Characteristics

The following commands define the cable characteristics for the cable you are testing.

List of commands

- [CALCulate<1...2>:DTF:CABLe:PRESet](#) on page 199

CALCulate<1...2>:DTF:CABLe:PRESet <CableModel>

This command selects the cable model.

The numeric suffix at CALCulate is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<CableModel> String containing the filename of the cable model.

Example:

CALC:DTF:CAB:PRESet '5088-HLFR.CBLMOD'
Selects the cable model from the file 5088-HLFR.CBLMOD

Selecting the Measurement Mode

The following commands select the measurement mode.

List of commands

- [MEASurement<1...2>:MODE](#) on page 199

MEASurement<1...2>:MODE <MeasMode>

This command selects the measurement mode.

The numeric suffix at MEASurement is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<MeasMode> DTFault | REFlection | LOSS

DTFault

Selects the distance-to-fault measurement.

REFlection

Selects the reflection measurement (S11).

LOSS

Selects the cable loss measurement.

*RST: REFlection

Example:

MEAS:MODE LOSS
Activates cable loss measurement.

Selecting the Measurement Format

The following commands select the measurement format in CAT mode.

List of commands

- [CALCulate<1...2>:TRACe:VSWR:MAX\[:STATe\]](#) on page 200
- [MEASurement<1...2>:FORMat](#) on page 200

CALCulate<1...2>:TRACe:VSWR:MAX[:STATe] <State>

This command turns the display of the maximum and average VSWR on and off.

Use `CALCulate<1...2>:TRACe:VSWR:AVG:RESult?` on page 201 and `CALCulate<1...2>:TRACe:VSWR:MAX:RESult?` on page 201 to query the corresponding results.

The numeric suffix at CALCulate is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<State> ON | OFF

ON

Turns on the display of the maximum and average VSWR.

OFF

Turns off the display of the maximum and average VSWR.

*RST: OFF

Example:

`CALC:TRAC:VSWR:MAX:STAT ON`

Displays the VSWR results.

MEASurement<1...2>:FORMat <MeasFormat>

This command selects the measurement format.

The numeric suffix at MEASurement is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<MeasFormat> MAGNitude | PHASe | VSWR | REFlection | SMITh | LOSS

MAGNitude

Selects the magnitude format.

PHASe

Selects the phase format.

VSWR

Selects the VSWR format.

REFlection

Selects the reflection coefficient format.

SMITh

Selects the smith chart.

LOSS

Selects the cable loss format.

*RST: MAGNitude

Example:

`MEAS:FORM SMIT`

Displays the reflection in a Smith Chart.

Reading Out Measurement Results

The following commands query various measurement results.

List of commands

- [CALCulate<1...2>:TRACe:CABLe:LOSS:RESult?](#) on page 201
- [CALCulate<1...2>:TRACe:VSWR:AVG:RESult?](#) on page 201
- [CALCulate<1...2>:TRACe:VSWR:MAX:RESult?](#) on page 201

CALCulate<1...2>:TRACe:CABLe:LOSS:RESult?

This command queries the cable loss measurement result.

The numeric suffix at CALCulate is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<Return values> Cable loss in dB.

Example:

CALC:TRAC:CABL:LOSS:RES?
Returns the cable loss in dB.

Usage:

Query only

CALCulate<1...2>:TRACe:VSWR:AVG:RESult?

This command queries the average VSWR measurement result.

The command is available when the calculation of the VSWR has been turned on with [CALCulate<1...2>:TRACe:VSWR:MAX\[:STATe\]](#) on page 200.

The numeric suffix at CALCulate is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<Return values> Average VSWR (no unit)

Example:

CALC:TRAC:VSWR:MAX:STAT ON
CALC:TRAC:VSWR:AVG:RES?
Queries the average VSWR.

Usage:

Query only

CALCulate<1...2>:TRACe:VSWR:MAX:RESult?

This command queries the maximum VSWR measurement result.

The command is available when the calculation of the VSWR has been turned on with [CALCulate<1...2>:TRACe:VSWR:MAX\[:STATe\]](#) on page 200.

The numeric suffix at CALCulate is irrelevant for this command.

Suffix:	
<1...2>	1...2
Parameters:	
<Return values>	Maximum VSWR (no unit)
Example:	CALC:TRAC:VSWR:MAX:STAT ON CALC:TRAC:VSWR:MAX:RES? Queries the maximum VSWR.
Usage:	Query only

Calibrating the Measurement

The following commands control calibration of cable measurements.

- [CALibration<1...2>:ABORt](#) on page 202
- [CALibration<1...2>:ATTenuation:STATus?](#) on page 202
- [CALibration<1...2>:CONTInue?](#) on page 203
- [CALibration<1...2>:MODE?](#) on page 203
- [CALibration<1...2>:START?](#) on page 204
- [SYSTem:PRESet:CALibration:DISCard](#) on page 204

CALibration<1...2>:ABORt

This command aborts calibration.

The numeric suffix at CALibration is irrelevant for this command.

This command is an event and therefore has no query and no *RST value.

Suffix:	
<1...2>	1...2
Example:	CAL:ABOR Aborts calibration.
Usage:	Event

CALibration<1...2>:ATTenuation:STATus?

This command queries the current calibration state.

The numeric suffix at CALibration is irrelevant for this command.

This command is a query and therefore has no *RST value.

Suffix:	
<1...2>	1...2

Parameters:

<Return values> <NORMalized>
 Full calibration
 <APPRoximate>
 Approximate calibration (caused by a change of attenuation, for example): measurement uncertainty must be anticipated

Example:

CAL:STAT?
 Queries the calibration status of the R&S Cable Rider ZPH.

Usage:

Query only

CALibration<1...2>:CONTinue?

This command resumes calibration after a calibration standard has been connected.

After the command has been sent, it returns instructions on what to do to continue the calibration process and finish it successfully.

The numeric suffix at CALibration is irrelevant for this command.

This command is a query and therefore has no *RST value.

Suffix:

<1...2> 1...2

Example:

CAL:CONT?
 Resumes calibration and would return, e.g.:
 'Connect Load to Port 1'
 Connect the load before resuming calibration.

Usage:

Query only

CALibration<1...2>:MODE?

This command queries the general current calibration state.

The numeric suffix at CALibration is irrelevant for this command.

This command is a query and therefore has no *RST value.

Suffix:

<1...2> 1...2

Parameters:

<Return values> <0>
 Not calibrated
 <1>
 Calibrated

Example:

CAL:MODE?
 If current calibration state is not calibrated, a '0' is returned.

Usage:

Query only

CALibration<1...2>:STARt? <CalibrationType>

This command selects a calibration method and initiates calibration.

After the command has been sent, it returns instructions on what to do to continue the calibration process and finish it successfully.

The numeric suffix at CALibration is irrelevant for this command.

This command is a query and therefore has no *RST value.

Suffix:

<1...2> 1...2

Parameters:

<CalibrationType> S11Cal | S11easy

S11Cal

Full 1-Port calibration

S11easy

Easy 1-Port calibration (Port 1) (CAT mode only)

<Return values>

<Connect Open to Port 1>

Connect the open to port 1 before resuming calibration.

<Connect Short to port 1>

Connect the short to port 1 before resuming calibration.

<Connect Load to port 1>

Connect the short to port 1 before resuming calibration.

<Disconnect DUT from port 1>

<Calibration done>

Calibration has been finished. No further actions required.

Example:

CAL:STAR? S11easy

Selects and initiates an Easy 1-Port calibration and would return e.g.:

Calibration done

Calibration has been finished. No further actions required.

Usage:

Query only

SYSTem:PRESet:CALibration:DISCard <Disc>**Parameters:**

<Disc>

Working with a DTF List

The following commands configure the DTF peak list. The peak list is available for DTF measurements only.

- [CALCulate<1...2>:TRANSform:DTFault:PEAK:COUNt?](#) on page 205
- [CALCulate<1...2>:TRANSform:DTFault:PEAK:DATA<1...10>?](#) on page 205
- [CALCulate<1...2>:TRANSform:DTFault:PEAK:STATe](#) on page 205

- [CALCulate<1...2>:TRANSform:DTFault:PEAK:THReshold](#) on page 206

CALCulate<1...2>:TRANSform:DTFault:PEAK:COUNT?

The following commands configure the DTF peak list. The peak list is available for DTF measurements only.

The numeric suffix at CALibration is irrelevant for this command.

This command is a query and therefore has no *RST value.

Suffix:

<1...2> 1...2

Parameters:

<Return values> <DTFListEntries>

Example:

CALC:TRAN:DTF:PEAK:COUN?Z

Queries the number of values in the DTF list.

Usage:

Query only

CALCulate<1...2>:TRANSform:DTFault:PEAK:DATA<1...10>?

This command queries the DTF list.

The numeric suffix at CALibration is irrelevant for this command and the number suffix at DATA selects an entry in the DTF list.

This command is a query and therefore has no *RST value.

Suffix:

<1...2> 1...2

<1...10> 1...10

Parameters:

<Return values> <distance>,<return loss>

The number of values depends on the number of peaks that exceed the threshold you can set with [CALCulate<1...2>:TRANSform:DTFault:PEAK:THReshold](#) on page 206.

Example:

CALC:TRAN:DTF:PEAK:RES2?

Reads out the second result in the DTF peak list.

Usage:

Query only

CALCulate<1...2>:TRANSform:DTFault:PEAK:STATe <State>

This command turns the display of the DTF list on and off.

Suffix:

<1...2> 1...2

Parameters:

<State> ON | OFF

ON
DTF list turns on.

OFF
DTF list turns off.

Example:

CALC:TRAN:DTF:PEAK ON
Turns on the DTF peak list.

CALCulate<1...2>:TRANSform:DTFault:PEAK:THReshold <Threshold>

This command defines the threshold for the DTF list.

All values that exceed the threshold are in the DTF list. You can query the list with [CALCulate<1...2>:TRANSform:DTFault:PEAK:DATA<1...10>?](#) on page 205.

The numeric suffix at CALibration is irrelevant for this command.

Suffix:

<1...2> 1...2

Parameters:

<Threshold> The unit depends on the measurement format.

Example:

CALC:TRAN:DTF:PEAK:THR -20
Sets the threshold to -20 dB.

11.6.3 Remote Commands of the Power Meter

The chapter provides information on remote commands that configure and perform power measurements with the power sensor. These commands are available in power meter mode only.



Availability of remote commands for Power Sensor measurements

Note that the listed remote commands take effect only if a power sensor is connected.

Contents

- [Chapter 11.6.3.1, "Setting the Frequency"](#), on page 207
- [Chapter 11.6.3.2, "Configuring Power Level Readout"](#), on page 207
- [Chapter 11.6.3.3, "Defining the Measurement Time"](#), on page 208
- [Chapter 11.6.3.4, "Zeroing of the Power Sensor"](#), on page 209
- [Chapter 11.6.3.5, "Forward Power Display"](#), on page 209
- [Chapter 11.6.3.6, "Defining the Video Bandwidth"](#), on page 210
- [Chapter 11.6.3.7, "Reading Out Measurement Results"](#), on page 210
- [Chapter 11.6.3.8, "Selecting a Telecommunication Standard"](#), on page 211

11.6.3.1 Setting the Frequency

The following chapter describes commands necessary to define frequency settings.

List of commands

- [\[SENSe:\]PMETer:FREQuency](#) on page 207

[SENSe:]PMETer:FREQuency <Frequency>

This command sets the frequency of the power sensor.

Parameters:

<Frequency> Specified in the data sheet.
 Default unit: GHz

Example:

PMET:FREQ 500 MHZ
 Sets the power sensor's frequency to 500 MHz.

11.6.3.2 Configuring Power Level Readout

The following chapter describes commands that configure the power level readout.

List of commands

- [CALCulate<1...2>:PMETer:RELative\[:MAGNitude\]](#) on page 207
- [CALCulate<1...2>:PMETer:RELative\[:MAGNitude\]:AUTO](#) on page 207
- [CALCulate<1...2>:PMETer:RELative\[:MAGNitude\]:OFFSet](#) on page 208
- [UNIT<1...2>:PMETer:POWer](#) on page 208

CALCulate<1...2>:PMETer:RELative[:MAGNitude] <RefLevel>

This command sets the reference value for relative measurements.

The numeric suffix at CALCulate is irrelevant for this command.

Parameters:

<RefLevel> Default unit: dBm

Example:

CALC:PMET:REL 30
 The reference value to 30 dBm.

CALCulate<1...2>:PMETer:RELative[:MAGNitude]:AUTO <ONCE>

This command sets the current measurement result as the reference level for relative measurements.

This command is an event and therefore has no *RST value and no query.

The numeric suffix at CALCulate is irrelevant for this command.

Parameters:

<ONCE> ONCE

Example: `CALC:PMET:REL ONCE`

CALCulate<1...2>:PMETer:RELative[:MAGNitude]:OFFSet <RefLvloffset>

This command sets an offset for the reference value.

The numeric suffix at CALCulate is irrelevant for this command.

Parameters:

<RefLvloffset> Default unit: dB

Example: `CALC:PMET:REL -10`

UNIT<1...2>:PMETer:POWER <Unit>

This command selects the unit of the power sensor.

The numeric suffix at UNIT has the following effects:

Table 11-4: Power measurement with R&S FSH-Z1, R&S FSH-Z18 and USB power sensors:

Unit 1	Power unit.
Unit 2	Not available.

Table 11-5: Power measurement with R&S FSH-Z14 and R&S FSH-Z44:

Unit 1	Forward power.
Unit 2	Reflected power.

Suffix:

<1...2> 1...2

Parameters:

<Unit> DBM | DB | WATT | VSWR | W | DUVM | DBUV | W_M2 | V_M
 Note on the parameter DB: when applied to UNIT1, the power is relative to the reference level, when applied to UNIT2, the return loss is displayed.
 Note on the parameter VSWR: the parameter is only available if applied to UNIT2.

Example: `UNIT1:PMET:POW DBM`
 When measuring with the R&S FSH-Z1, R&S FSH-Z18 or USB power sensors: sets unit to dBm.
 When measuring with the R&S FSH-Z14 or R&S FSH-Z44: sets unit of forward power to dBm.

11.6.3.3 Defining the Measurement Time

The following chapter describes commands to define the measurement time of the power sensor.

List of commands

- [\[SENSe:\]PMETer:MTIME](#) on page 209

[SENSe:]PMETer:MTIME <MeasTime>

This command sets the duration of measurements.

Available for measurements with a power sensor.

Parameters:

<MeasTime> SHORT | NORMAl | LONG

Example:

PMET:MTIME SHOR

Sets a short measurement time for power measurements.

11.6.3.4 Zeroing of the Power Sensor**List of commands**

- [CALibration<1...2>:PMETer:ZERO:AUTO](#) on page 209

CALibration<1...2>:PMETer:ZERO:AUTO <ONCE>

This command starts to zero the power sensor.

This command is an event and therefore has no *RST value and no query.

The numeric suffix at CALibration is irrelevant for this command.

Parameters:

<ONCE> ONCE

Example:

CAL:PMET:ZERO:AUTO ONCE

Starts to zero the power meter.

11.6.3.5 Forward Power Display

Note that the forward power is only available in conjunction with the R&S FSH-Z14 or R&S FSH-Z44.

List of commands

- [\[SENSe:\]PMETer:DETEctor\[:FUNCTion\]](#) on page 209

[SENSe:]PMETer:DETEctor[:FUNCTion] <Detector>

This command selects the forward power display of the power sensor.

Parameters:

<Detector> AVERage | PENvelope

AVERage
Displays the average power.

PENvelope
Displays the peak envelope power.

*RST: -

Example:

PMET:DET AVER
Selects the Average weighting mode.

11.6.3.6 Defining the Video Bandwidth

Selecting a video bandwidth is only possible when you are measuring the peak envelope power with the R&S FSH-Z44 power sensor based on a customized (= user) standard.

See the following commands for more information about these conditions:

- `[SENSe:]PMETer:DETECTOR[:FUNCTION]` on page 209
- `CALCulate<1...2>:PMETer:PRESet[:STATe]` on page 211
- `CALCulate<1...2>:PMETer:PRESet:SElect` on page 211

List of commands

- `CALCulate<1...2>:PMETer:PRESet:BANDwidth:VIDeo` on page 210

CALCulate<1...2>:PMETer:PRESet:BANDwidth:VIDeo <VideoBW>

This command defines the video bandwidth of the R&S FSH-Z44 power sensor.

The numeric suffix at CALCulate is irrelevant for this command.

Parameters:

<VideoBW> Default unit: GHz

Example:

CALC:PMET:PRESet:BAND:VID 10MHZ
Defines a video bandwidth of 10 MHz.

11.6.3.7 Reading Out Measurement Results**List of commands**

- `FETCH<1...2>:PMETer` on page 210

FETCH<1...2>:PMETer

This command queries the results of measurements with the power sensor.

Parameters:

<Return values>

The return values depend on the power sensor in use and the selected suffix at FETCh.

Measurements with R&S FSH-Z1 or R&S FSH-Z18:

FETC1:PMET? power in dBm.

FETC2:PMET? n/a

Measurements with R&S FSH-Z14 or R&S FSH-Z44:

FETC1:PMET? forward power in dBm.

FETC2:PMET? reflected power in dBm.

Example:

FETC2:PMET?

Returns nothing for R&S FSH-Z1 / R&S FSH-Z18 and the reflected power for R&S FSH-Z14 / R&S FSH-Z44.

11.6.3.8 Selecting a Telecommunication Standard

These commands apply radio communication standards to measurements with the power sensor.

Note that the selection of a standard is available only for the power sensors R&S FSH-Z1, -Z14, -Z18 and Z-44.

List of commands

- `CALCulate<1...2>:PMETer:PRESet[:STATe]` on page 211
- `CALCulate<1...2>:PMETer:PRESet:SElect` on page 211

CALCulate<1...2>:PMETer:PRESet[:STATe] <State>

This command turns on or off the use of a standard.

The numeric suffix at CALCulate is irrelevant for this command.

Parameters:

<State>

ON | OFF

Example:

CALC:PMET:PRESet ON

Activates usage of a standard.

CALCulate<1...2>:PMETer:PRESet:SElect <Standard>

This command selects the standard for power sensor measurements.

The numeric suffix at CALCulate is irrelevant for this command.

Parameters:

<Standard>

E.g. GSM | EDGE | WCDMA | CDMAOne | CDMA2000 | DVBT | DAB | TETRA | USER

Example:

CALC:PMET:PRESet:SEL GSM

Selects the GSM standard for power sensor measurements.

11.6.4 File Management

The following commands perform various tasks in the context of file management.

These commands are independent from the operating mode.

List of commands

- [MMEMory:CATalog?](#) on page 212
- [MMEMory:CATalog:DIRectories?](#) on page 212
- [MMEMory:CDIRectory](#) on page 213
- [MMEMory:COpy](#) on page 213
- [MMEMory:DATA](#) on page 213
- [MMEMory:DELeTe](#) on page 214
- [MMEMory:FILE](#) on page 214
- [MMEMory:FILE:DATE](#) on page 214
- [MMEMory:FILE:TIME](#) on page 215
- [MMEMory:INIT](#) on page 215
- [MMEMory:LOAD:STATe](#) on page 215
- [MMEMory:MDIRectory](#) on page 216
- [MMEMory:MOVE](#) on page 216
- [MMEMory:RDIRectory](#) on page 216
- [MMEMory:STORe:STATe](#) on page 217
- [SYSTem:SET:LOCK](#) on page 217
- [SYSTem:SET:UNLock](#) on page 217

MMEMory:CATalog?

This command queries the files of the current directory.

You can select directories with [MMEMory:CDIRectory](#) on page 213.

This command is a query and therefore has no *RST value.

Example: MMEM:CDIR '\Public\Limit Lines'
 Opens directory 'Limit Lines'.
 MMEM:CAT?
 Returns all files in \Public\Limit Lines.

Usage: Query only

MMEMory:CATalog:DIRectories?

This command queries the directories of the current directory.

This command is a query and therefore has no *RST value.

Example: MMEM:CDIR '\Public'
 Opens directory \Public.
 MMEM:CAT:DIR?
 Returns all directories in the \Public directory.

Usage: Query only

MMEMory:CDIRectory <PathName>

This command changes the current directory.

Parameters:

<PathName> String containing the path to another directory.

Example: MMEM:CDIR '\Public'
 Opens directory \Public.

MMEMory:COPY <SourceFile>, <Destination>

This command copies one or more files to another directory.

This command is an event and therefore has no *RST value and no query.

Parameters:

<SourceFile> String containing the path and filename of the source file.

<Destination> String containing the path and name of the destination file.

Example: MMEM:COPY '\Public\Standards\cdmaOne.obwstd',
 '\USB\cdmaOne.std'
 Copies the cdmaOne standard file to a memory stick.

Usage: Setting only

MMEMory:DATA <TargetFile>[, <Block>]

This command writes block data into a file. The delimiter must be set to EOI to obtain error-free data transfer.

When you query the contents of a file, you can save them in a file on the remote control computer.

The command is useful for reading stored settings files or trace data from the instrument or for transferring them to the instrument.

Parameters:

<TargetFile> String containing the path and filename.

<Block> <block_data>
 Data block with the structure:
 # represents hash sign
 <number> represents length of the length information
 <number> represents length information of the binary data
 (number of bytes)
 <data> binary data with the indicated number of bytes

Example:

```
MMEM:NAME '\Public\User\Testfile.txt'
Creates a new file called 'Testfile.txt'.
MMEM:DATA
'\Public\User\Testfile.txt',#220Contents of the
file
The parameters mean:
- '\Public\...' selects the target file
- #2: hash sign and length of the length information (20 bytes = 2
digits)
- 20: indicates the number of subsequent binary data bytes
- Contents of the file: store 20 binary bytes (characters) to the
file
MMEM:DATA? '\Public\User\Testfile.txt'
Transfers the contents of the file 'Testfile.txt' to the control com-
puter.
```

MMEMory:DELeTe <File>

This command deletes a file.

Parameters:

<File> String containing the path and filename of the file to delete.

Example:

```
MMEM:DEL '\Public\Screen Shots\Screen0001.png'
Deletes the file Screen0001.png.
```

Usage:

Setting only

MMEMory:FILE <FileName>[, <Block>]

This command creates a file.

Parameters:

<FileName> String containing the filename.

<Block> <block_data>

Example:

```
MMEM:FILE 'TEST.TXT'
Creates the file TEST.TXT.
```

MMEMory:FILE:DATE <FileName>[, <Year>, <Month>, <Day>]

This command sets the date of a file.

Parameters:

<FileName>	String containing the path and filename.
<Year>	Range: 1980 to 2099
<Month>	Range: 1 to 12
<Day>	Range: 1 to 31

Example:

```
MMEM:FILE:DATE '\Public\Screen
Shots\Screen0001.png',2006,04,01
Sets the date to April, 1st, 2006.
MMEM:FILE:DATE? '\Public\Screen
Shots\Screen0001.png'
Returns the modification date of the file Screen0001.png.
```

MMEMory:FILE:TIME <FileName>[, <Hour>, <Minutes>, <Seconds>]

This command sets the time of a file. The sequence of entry is hour, minute, second.

Parameters:

<FileName>	String containing the path and filename.
<Hour>	Range: 0 to 23
<Minutes>	Range: 0 to 59
<Seconds>	Range: 0 to 59

Example:

```
MMEM:FILE:TIME '\Public\Screen
Shots\Screen0006.png',11,04,00
Sets the time to 11:04:00.
```

MMEMory:INIT [<DriveName>]

This command formats the indicated drive.

Note: Formatting deletes all data stored on the memory drive.

This command is an event and therefore has no *RST value and no query.

Parameters:

<DriveName>

Example:

```
MMEM:INIT
Formats and deletes all data from the drive.
```

Usage:

Setting only

MMEMory:LOAD:STATe <1>, <SettingsFile>

This command loads the settings from a *.set file.

Parameters:

<1>

<SettingsFile> String containing the path and filename.

Example: `MMEM:LOAD:STAT 1,`
`'\Public\Datasets\Dataset001.set'`
 Loads the settings from the file Dataset001.

Usage: Setting only

MMEMory:MDIRectory <DirectoryName>

This command creates a new directory.

This command is an event and therefore has no *RST value and no query.

Parameters:

<DirectoryName> String containing the path and new directory name.

Example: `MMEM:MDIR '\Public\USER'`
 Creates a directory called 'User'.

Usage: Setting only

MMEMory:MOVE <SourceFile>, <Destination>

This command renames files, if <file_destination> contains no path. Otherwise the file is moved to the indicated path and stored under the filename specified there.

This command is an event and therefore has no *RST value and no query.

Parameters:

<SourceFile> String containing the path and filename of the source file.

<Destination> String containing the path and name of the destination file.

Example: `MMEM:MOVE '\Public\Screen`
`Shots\Screen0002.png', '\Public\Screen`
`Shots\Screen0001.png'`
 Renames Screen0002.png to Screen0001.png
`MMEM:MOVE '\Public\Screen`
`Shots\Screen0001.png', '\Public\Test\Pic1.png'`
 Moves file Screen0006.png to the 'Test' folder and renames the
 file Pic1.png.

Usage: Setting only

MMEMory:RDIRectory <DirectoryName>

This command deletes the indicated directory. The directory name includes the path and may also include the drive name. The path name complies with DOS conventions.

This command is an event and therefore has no *RST value and no query.

Parameters:

<DirectoryName> String containing the path of the directory to delete.

Example: `MMEM:RDIR '\Public\Screen Shots\`
Deletes the directory 'Screen Shots'.

Usage: Setting only

MMEMory:STORe:STATe <1>, <TargetFile>

This command stores the current device settings in a *set file.

This command is an event and therefore has no *RST value and no query.

Parameters:

<1>

<TargetFile>

Example: `MMEM:STOR:STAT 1, 'DATASET001.SET'`
Saves the current device settings in the file DATASET001.SET.

Usage: Setting only

SYSTem:SET:LOCK <arg0>

This command adds write-protection to a dataset.

Parameters:

<arg0> String containing the path and name of the dataset.

Example: `SYST:SET:LOCK 'Dataset001.set'`
Protects the file Dataset001.set from overwriting.

SYSTem:SET:UNLock <arg0>

This command removes write-protection from a dataset.

Parameters:

<arg0> String containing the path and name of the dataset.

Example: `SYST:SET:UNL 'Dataset001.set'`
Removes write-protection from the file Dataset001.set.

11.6.5 Making and Storing Screenshots

The following commands manage screenshots.

These commands are independent from the operating mode.

List of commands

- [DISPlay<1...2>\[:WINDow\]:STORe](#) on page 218
- [HCOPy:DEVice:LANGUage](#) on page 218
- [HCOPy\[:IMMediate\]](#) on page 218

- [MMEMory:NAME](#) on page 219

DISPlay<1...2>[:WINDow]:STORe <TargetFile>

This command makes a screenshot of the current display content in png or jpg format and stores it on the R&S Cable Rider ZPH internal memory.

You can select a filename for the screenshot in png format with [MMEMory:NAME](#) on page 219 and select the file format of the screenshot with [HCOPy:DEvice:LANGUage](#) on page 218.

This command is an event and therefore has no *RST value and no query.

The numeric suffix at DISPlay is irrelevant for this command.

Parameters:

<TargetFile>

Example:

```
HCOP:DEV:LANG PNG
MMEM:NAME '\Public\Screen Shots\Test.png'
DISP:WIND:STOR
Makes and stores a screenshot of the current screen in a file
'Test.png'.
```

Usage:

Setting only

HCOPy:DEvice:LANGUage <Format>

This command selects the file format for screenshots.

Parameters:

<Format> PNG | JPG

Example:

```
HCOP:DEV:LANG PNG
Selects the png format for screenshots.
```

HCOPy[:IMMediate]

This command makes a screenshot of the current display content in png format and stores it on the R&S Cable Rider ZPH internal memory.

You can select a filename for the screenshot in png format with [MMEMory:NAME](#) on page 219 and select the file format of the screenshot with [HCOPy:DEvice:LANGUage](#) on page 218.

To make a screenshot in jpg format, use [DISPlay<1...2>\[:WINDow\]:STORe](#) on page 218.

This command is an event and therefore has no *RST value and no query.

Example:

```
HCOP:DEV:LANG PNG
MMEM:NAME '\Public\Screen Shots\Test.png'
HCOP
Makes and stores a screenshot of the current screen in a file
'Test.png'.
```

Usage: Event

MMEMory:NAME <FileName>

This command defines the path and filename that the R&S Cable Rider ZPH uses for storing screenshots (see [HCOPY\[:IMMediate\]](#) on page 218). The path and filename comply with DOS conventions.

This command is an event and therefore has no *RST value and no query.

Parameters:

<FileName> String containing the filename.

Example:

MMEM:NAME 'Public\Screenshots\Test.png'
Stores the screenshot in the corresponding directory on the R&S Cable Rider ZPH.

11.6.6 Configuring Data Capture

The following commands configure the data capture.

These commands are independent from the operating mode.

List of commands

- [SYSTem:CAPTure:COUNter](#) on page 219
- [SYSTem:CAPTure:DATaset\[:STATe\]](#) on page 219
- [SYSTem:CAPTure:MODE](#) on page 220
- [SYSTem:CAPTure:SCReen\[:STATe\]](#) on page 220

SYSTem:CAPTure:COUNter <CaptureCounter>

This command defines the start of the filename counter.

The counter numbers the files stored when you capture data (screenshots, datasets etc.).

Parameters:

<CaptureCounter> String containing the number with which to start numbering files.
*RST: '0000'

Example:

SYST:CAPT:COUN '0100'
Starts numbering files with 0100, e.g. Measurement0100.png.

SYSTem:CAPTure:DATaset[:STATe] <State>

This command includes or excludes datasets from the data capture.

Parameters:

<State> ON | OFF
*RST: OFF

Example: `SYST:CAPT:DAT ON`
Includes datasets into the data capture.

SYSTem:CAPTure:MODE <CaptureMode>

This command selects the data types that the R&S Cable Rider ZPH saves when you capture the current measurement data.

Parameters:

<CaptureMode> SCReen | DATaset | BOTH

SCReen
Saves a screenshot.

DATaset
Saves a dataset.

BOTH
Saves a screenshot and a dataset.

*RST: SCReen

Example: `SYST:CAPT:MODE BOTH`
Captures both a screenshot and a dataset of the current measurement.

SYSTem:CAPTure:SCReen[:STATe] <State>

This command includes or excludes screenshots from the data capture.

Parameters:

<State> ON | OFF

*RST: ON

Example: `SYST:CAPT:SCR ON`
Includes screenshots into the data capture.

11.6.7 Configuring the Instrument

The following commands configure general instrument settings.

These commands are independent from the operating mode.

Contents

- [Chapter 11.6.7.1, "Mode Selection"](#), on page 221
- [Chapter 11.6.7.2, "Controlling the GPS Receiver"](#), on page 222
- [Chapter 11.6.7.3, "Display Configuration"](#), on page 224
- [Chapter 11.6.7.4, "Audio Settings"](#), on page 225
- [Chapter 11.6.7.5, "Setting up a Network Connection"](#), on page 226
- [Chapter 11.6.7.6, "System Settings"](#), on page 227

11.6.7.1 Mode Selection

This chapter describes all commands that select the operating mode of the R&S Cable Rider ZPH.

List of commands

- `INSTrument[:SElect]` on page 221
- `INSTrument:NSElect` on page 221

INSTrument[:SElect] <OperatingMode>

This command selects the operating mode.

Parameters:

<OperatingMode> SANalyzer | PM | ADEModulation | RECeiver | ACT

SANalyzer
spectrum analyzer

PM
power meter

ADEModulation
analog modulation

RECeiver
receiver

MAPS
map

ACT
cable and antenna analyzer

*RST: SAN

Example:

INST SAN
Selects spectrum analyzer mode.

INSTrument:NSElect <OperatingMode>

This command selects the operating mode.

Parameters:

<OperatingMode> 1
spectrum analyzer

5
power meter

18
analog modulation

*RST: 1

Example:

INST:NSEL 1
Selects spectrum analyzer mode.

11.6.7.2 Controlling the GPS Receiver

This chapter describes all commands that control the GPS receiver.

List of commands

- `SYSTem:POSition:ALTitude?` on page 222
- `SYSTem:POSition:GPS:CONNected?` on page 222
- `SYSTem:POSition:GPS:CORRection:FREQuency?` on page 222
- `SYSTem:POSition:GPS:QUALity?` on page 223
- `SYSTem:POSition:GPS:SATellites?` on page 223
- `SYSTem:POSition:GPS[:STATe]` on page 223
- `SYSTem:POSition:LATitude?` on page 223
- `SYSTem:POSition:LONGitude?` on page 223
- `SYSTem:POSition:VALid?` on page 224

SYSTem:POSition:ALTitude?

This command queries the altitude of the current position of the R&S Cable Rider ZPH.

Example: `SYST:POS:ALT?`
Return value would be, for example, 554.1.

Usage: Query only

SYSTem:POSition:GPS:CONNected?

This command queries if the R&S Cable Rider ZPH is currently connected to the GPS receiver.

Example: `SYST:POS:GPS:CONN?`

Usage: Query only

SYSTem:POSition:GPS:CORRection:FREQuency?

This command queries the frequency correction factor.

The R&S Cable Rider ZPH calculates this factor from a reference signal provided by the GPS receiver. The reference signal is used to determine the deviation of the internal clock of the instrument. The deviation can be turned into a correction factor for the measured frequency.

Example: `SYST:POS:GPS:CORR:FREQ?`
Queries the frequency correction factor.

Usage: Query only

SYSTem:POSition:GPS:QUALity?

This command queries the quality of the GPS signal.

Example: SYST:POS:GPS:QUAL?

Usage: Query only

SYSTem:POSition:GPS:SATellites?

This command queries the number of tracked satellites.

Example: SYST:POS:GPS:SAT?

Usage: Query only

SYSTem:POSition:GPS[:STATe] <State>

This command turns the GPS receiver on and off.

Note that the GPS receiver only works if a connection between the R&S Cable Rider ZPH and a GPS signal transmitter is established.

Parameters:

<State> ON | OFF
*RST: OFF

Example: SYST:POS:GPS ON
Activates the GPS receiver.

SYSTem:POSition:LATitude?

This command queries the latitude of the current position of the R&S Cable Rider ZPH.

Example: SYST:POS:LAT?
Return value would be, for example, 48,7,40.0 for 48°, 7 ', 40.0" in the northern hemisphere.

Usage: Query only

SYSTem:POSition:LONGitude?

This command queries the longitude of the current position of the R&S Cable Rider ZPH.

Example: SYST:POS:LONG?
Return value would be, for example, 11,36,46.2 for 11°, 36', 46.2" East.

Usage: Query only

SYSTem:POSition:VALid?

This command queries if the current position is valid.

Example: SYST:POS:VAL?

Usage: Query only

11.6.7.3 Display Configuration

This chapter describes commands to set up the display of the R&S Cable Rider ZPH via remote control.

List of commands

- [DISPlay:BRIGhtness](#) on page 224
- [DISPlay:CMAP](#) on page 224
- [DISPlay:CMAP:DEFault](#) on page 225
- [DISPlay:DATE:FORMat](#) on page 225

DISPlay:BRIGhtness <Brightness>

This command sets the brightness of the display backlight.

Parameters:

<Brightness> Range: 0.01 to 1
 *RST: 0.5

Example: DISP:BRIG 0.80
 Sets the brightness of the display to 80%.

DISPlay:CMAP <ColorScheme>

This command sets the color scheme of the display.

Parameters:

<ColorScheme> COLor | BW | PF
 COLor
 Color
 BW
 Black & white
 PF
 Printer-friendly
 *RST: COLor

Example: DISP:CMAP BW
 Sets the screen colors to black and white.

DISPlay:CMAP:DEFault

This command sets the display to the default state.

This command is an event and therefore has no query and no *RST value.

Example: `DISP:CMAP:DEF`
Restores the original color scheme.

Usage: Event

DISPlay:DATE:FORMat <DateFormat>

This command sets the display date format.

Parameters:
<DateFormat> `DDMMyyyy | MMDDyyyy`
*RST: `DDMMyyyy`

Example: `DISP:DATE:FORM DDMMyyyy`

11.6.7.4 Audio Settings

This chapter describes all commands to control the audio functions of the R&S Cable Rider ZPH.

List of commands

- [SYSTem:AUDio:VOLume](#) on page 225
 - [SYSTem:BEEPer:VOLume](#) on page 225
 - [SYSTem:BEEPer:KEY:VOLume](#) on page 226
-

SYSTem:AUDio:VOLume <Volume>

This command sets the volume of the internal speaker.

Parameters:
<Volume> Range: 0 to 1
*RST: 0.3

Example: `SYST:AUD:VOL 0.40`
Sets the volume to 40%.

SYSTem:BEEPer:VOLume <Volume>

This command sets the volume of the system beeper.

Parameters:
<Volume> Range: 0 to 1
*RST: 0.3

Example: `SYST:BEEP:VOL 0.50`
Sets the volume of the beeper to 50%.

SYSTem:BEEP:KEY:VOLUME <Volume>

This command sets the volume of the keyboard click noise.

Parameters:

<Volume> Range: 0 to 1
 *RST: 0.3

Example: SYST:BEEP:KEY:VOL 0.10
 Sets of keyboard clicking volume to 10%.

11.6.7.5 Setting up a Network Connection

This chapter describes all commands that are used if the R&S Cable Rider ZPH is part of a network.

List of commands

- [SYSTem:COMMunicate:LAN:ETHernet](#) on page 226
- [SYSTem:COMMunicate:LAN:GATeway](#) on page 226
- [SYSTem:COMMunicate:LAN:SUBMask](#) on page 226
- [SYSTem:COMMunicate:SOCKet:ADDRes](#) on page 227
- [SYSTem:COMMunicate:SOCKet:DHCP\[:STATe\]](#) on page 227
- [SYSTem:COMMunicate:SOCKet:PORT](#) on page 227

SYSTem:COMMunicate:LAN:ETHernet

This command queries the MAC address of the R&S Cable Rider ZPH.

This command is a query and therefore has no *RST value.

Example: SYST:COMM:LAN:ETH?
 Returns the MAC address.

SYSTem:COMMunicate:LAN:GATeway <Gateway>

This command sets the gateway in the LAN.

Parameters:

<Gateway> String containing the identifier of the gateway.

SYSTem:COMMunicate:LAN:SUBMask <Submask>

This command sets the subnet mask of the R&S Cable Rider ZPH

Parameters:

<Submask> String containing the subnet mask ('x.x.x.x').
 *RST: 255.255.255.0

Example: SYST:COMM:LAN:SUBM '255.255.255.0'
 Sets the subnet mask address to 255.255.255.0.

SYSTem:COMMunicate:SOCKet:ADDRess <IPAddress>

This command sets the IP address of the R&S Cable Rider ZPH.

Parameters:

<IPAddress> String containing the IP address ('x.x.x.x').
*RST: 172.76.68.24

Example:

SYST:COMM:SOCK:ADDR '172.76.68.30'
Sets the IP address of the R&S Cable Rider ZPH to 172.76.68.30.

SYSTem:COMMunicate:SOCKet:DHCP[:STATe] <State>

This command turns the Dynamic Host Configuration Protocol (DHCP) on and off.

Parameters:

<State> ON | OFF
*RST: ON

Example:

SYST:COMM:SOCK:DHCP ON
Activates DHCP.

SYSTem:COMMunicate:SOCKet:PORT <Port>

This command sets the port number for the connection.

Parameters:

<Port> Port number.
*RST: 5555

Example:

SYST:COMM:SOCK:PORT 1000
Sets the port number to 1000.

11.6.7.6 System Settings

This chapter describes all commands that define or query general system settings.

List of commands

- [INPut:IMPedance:PAD](#) on page 228
- [\[SENSe:\]ROSCillator:SOURce](#) on page 228
- [SYSTem:ACCessory](#) on page 229
- [SYSTem:ACCessory:AUTO](#) on page 229
- [SYSTem:BNC:MODE](#) on page 229
- [SYSTem:DATE](#) on page 229
- [SYSTem:ERRor\[:NEXT\]?](#) on page 230
- [SYSTem:ERRor:ALL?](#) on page 230
- [SYSTem:ERRor:CODE\[:NEXT\]?](#) on page 230

- `SYSTem:ERRor:CODE:ALL?` on page 230
- `SYSTem:ERRor:COUNT?` on page 230
- `SYSTem:FORMat:IDENT` on page 231
- `SYSTem:HELP:HEADers?` on page 231
- `SYSTem:HELP:SYNTax?` on page 231
- `SYSTem:LANGuage` on page 231
- `SYSTem:LANGuage:CATalog?` on page 232
- `SYSTem:POWer:SOURce?` on page 232
- `SYSTem:POWer:STATus?` on page 232
- `SYSTem:PRESet` on page 232
- `SYSTem:PRESet:FACTory` on page 232
- `SYSTem:PRESet:MODE` on page 233
- `SYSTem:PRESet:USER` on page 233
- `SYSTem:REBoot` on page 233
- `SYSTem:SHUTdown` on page 233
- `SYSTem:TZONee` on page 234
- `SYSTem:VERSion?` on page 234

INPut:IMPedance:PAD <PadType>

This command selects the matching pad connected to the R&S Cable Rider ZPH.

Parameters:

<PadType> RAM | RAZ | HZTE

Example:

`INPut:IMP 75;PAD RAZ`

Selects 75 Ω input impedance and the R&S RAZ as the matching pad.

[SENSe:]ROSCillator:SOURce <Format>

This command selects the source of the frequency reference oscillator.

If you use an external reference signal, make sure to connect the signal to the Ext Ref BNC connector of the R&S Cable Rider ZPH.

Parameters:

<Format> INTernal | EXTernal

INTernal

Internal reference.

EXTernal

External reference.

Example:

`ROSC:SOUR EXT`

Activates external source as reference signal.

SYSTem:ACCEssory <Accessory>

This command queries the type of measurement accessory, if one is connected to the R&S Cable Rider ZPH (for example a power sensor).

Parameters:

<Accessory> Z1 | Z2 | Z3 | Z14 | Z18 | Z44 | TS_emf | NONE | UNKNown
Name of the accessory.

Example:

SYST:ACC?
Queries connected measurement accessories.

SYSTem:ACCEssory:AUTO <State>

This command turns automatic detection of connected measurement accessories on and off.

Parameters:

<State> ON | OFF

Example:

SYST:ACC:AUTO ON
Turns on automatic accessory detection.

SYSTem:BNC:MODE <BNCUsage>

This command configures the BNC sockets.

Parameters:

<BNCUsage> REFerence | TRIGger | BIAS
REFerence
Input for external reference signal.
TRIGger
Input for external trigger.
BIAS
BIAS port.
*RST: TRIGger

Example:

SYST:BNC:MODE BIAS
Sets the BNC socket to bias.

SYSTem:DATE <Year>, <Month>, <Day>

This command sets the date for the internal calendar.

Parameters:

<Year> Range: 1980 to 2099
<Month> Range: 1 to 12
<Day> Range: 1 to 31

Example: `SYST:DATE 2000,6,1`
Sets the date to 1/6/2000.

SYSTem:ERRor[:NEXT]?

This command queries the oldest entry in the error queue and deletes it.

This command is a query and therefore has no *RST value.

Example: `STAT:ERR?`

Usage: Query only

SYSTem:ERRor:ALL?

This command queries the complete error queue.

This command is a query and therefore no *RST value.

Example: `SYST:ERR:ALL?`

Usage: Query only

SYSTem:ERRor:CODE[:NEXT]?

This command queries the code of the next error in the error queue.

This command is a query and therefore has no *RST value.

Example: `STAT:ERR:CODE?`

Usage: Query only

SYSTem:ERRor:CODE:ALL?

This command queries the complete error queue.

This command is a query and therefore no *RST value.

Example: `SYST:ERR:CODE:ALL?`

Usage: Query only

SYSTem:ERRor:COUNt?

This command queries the number of errors currently in the error queue.

This command is a query and therefore no *RST value.

Example: `SYST:ERR:COUN?`

Usage: Query only

SYSTem:FORMat:IDENt <Format>

This command sets the response format to the *IDN? query. This function is intended for re-use of existing control programs together with the R&S Cable Rider ZPH.

Parameters:

<Format> LEGacy | NEW

LEGacy

Format that is compatible to the older R&S Cable Rider ZPH version.

NEW

Format that is compatible to the newer R&S Cable Rider ZPH version.

Example:

```
SYST:FORM:IDEN LEG
```

```
*IDN?
```

IDN would return the older R&S Cable Rider ZPH version.

```
SYST:FORM:IDEN NEW
```

```
*IDN?
```

IDN would return the newer R&S Cable Rider ZPH version.

SYSTem:HELP:HEADers?

This command returns a list of all available remote control commands.

This command is a query and therefore no *RST value.

Example:

```
SYST:HELP:HEAD?
```

Returns the syntax of all available commands.

Usage:

Query only

SYSTem:HELP:SYNTax? <arg0>

This command returns the full syntax of the specified command.

This command is a query and therefore no *RST value.

Parameters:

<arg0> String containing the command you want to query.

Example:

```
SYST:HELP:SYNT? 'SYST:ERR?'
```

Returns the full syntax. In this case: 'SYSTem:ERRor[:NEXT]'.

Usage:

Query only

SYSTem:LANGuage <Language>

This command sets the language of the user interface. You can query a list of available languages with [SYSTem:LANGuage:CATalog?](#) on page 232.

Parameters:

<Language> String containing the language.

Example: `SYST:LANG 'english'`
Sets the system language to English.

SYSTem:LANGuage:CATalog?

This command lists all languages available for the user interface.

This command is a query and therefore no *RST value.

Example: `SYST:LANG:CAT?`

Usage: Query only

SYSTem:POWer:SOURce?

This command queries the current R&S Cable Rider ZPH power source.

This command is a query and therefore has no *RST value.

Example: `SYST:POW:SOUR?`

Usage: Query only

SYSTem:POWer:STATus?

This command queries the remaining power of the battery.

This command is a query and therefore has no *RST value.

Example: `SYST:POW:STAT?`

Usage: Query only

SYSTem:PRESet

Resets the R&S Cable Rider ZPH to its default state or a state defined by the user, depending on SYSTem:PRESet:MODE.

This command is an event and therefore has no *RST value and no query.

Example: `SYST:PRES`

Usage: Event

SYSTem:PRESet:FACTory

This command initiates an instrument reset back to factory settings.

This command is an event and therefore has no query and no *RST value.

Example: `SYST:PRES:FACT`
Resets the R&S Cable Rider ZPH to its factory settings.

Usage: Event

SYSTem:PRESet:MODE <Mode>

This command selects the preset mode.

Parameters:

<Mode> DEFault | USER
DEFault
Default preset state.
USER
User defined preset state.

Example: SYST:PRESet:MODE USER
Selects a user defined preset.

SYSTem:PRESet:USER <PathName>

This command selects a file containing a user defined preset state.

Parameters:

<PathName> Filename of the user defined preset state.

SYSTem:REBoot

This command initiates a reboot of the R&S Cable Rider ZPH.

This command is an event and therefore has no *RST value and no query.

Example: SYST:REB
Restarts the R&S Cable Rider ZPH.

Usage: Event

SYSTem:SHUTdown

This command turns the R&S Cable Rider ZPH off.

This command is an event and therefore has no *RST value and no query.

Example: SYST:SHUT
Turns the R&S Cable Rider ZPH off.

Usage: Event

SYSTem:TIME <Hour>, <Minutes>, <Seconds>

This command sets the internal clock.

Parameters:

<Hour> Range: 0 to 23
<Minutes> Range: 0 to 59
<Seconds> Range: 0 to 59

Example: `SYST:TIME 12,30,30`

SYSTem:TZONee <Hour>, <Minutes>

This command defines a shift of the system time to select another time zone.

Parameters:

<Hour>	Range:	0 to 23
<Minutes>	Range:	0 to 59
	*RST:	0,0

Example: `SYST:TZON 01,00`
Shifts the time an hour ahead.

SYSTem:VERSion?

This command queries the SCPI version the remote control is based on.

This command is a query and therefore has no *RST value.

Example: `SYST:VERS?`

Usage: Query only

11.6.8 Status Reporting System

The status reporting system stores all information on the present operating state of the instrument, and on errors which have occurred. This information is stored in the status registers and in the error queue. The status registers and the error queue can be queried via Ethernet.

The information is of a hierarchical structure. The register status byte (STB) defined in IEEE 488.2 and its associated mask register service request enable (SRE) form the uppermost level. The STB receives its information from the standard event status register (ESR) which is also defined in IEEE 488.2 with the associated mask register standard event status enable (ESE) and registers `STATus:OPERation` and `STATus:QUESTionable` which are defined by SCPI and contain detailed information on the instrument.

The output buffer contains the messages the instrument returns to the controller. It is not part of the status reporting system but determines the value of the MAV bit in the STB.

11.6.8.1 Structure of an SCPI Status Register

Each standard SCPI register consists of 5 parts which each have a width of 16 bits and have different functions. The individual bits are independent of each other, i.e. each hardware status is assigned a bit number that applies to all five parts. For example, bit 0 of the `STATus:OPERation` register is assigned to the calibration status of the R&S

Cable Rider ZPH. Bit 15 (the most significant bit) is set to zero for all parts. Thus the contents of the register parts can be processed by the controller as positive integer.

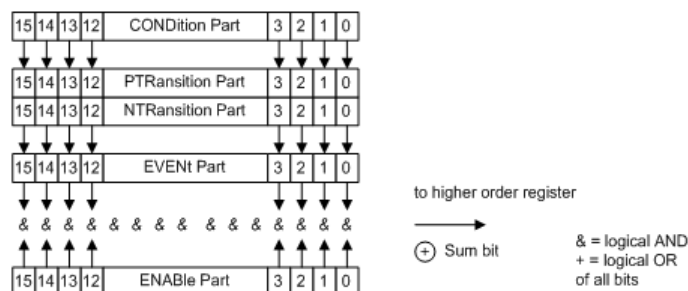


Figure 11-6: The status-register model

CONDition part

The CONDition part is directly written into by the hardware or the sum bit of the next lower register. Its contents reflects the current instrument status. This register part can only be read, but not written into or cleared. Its contents is not affected by reading.

PTRansition part

The Positive-TRansition part acts as an edge detector. When a bit of the CONDition part is changed from 0 to 1, the associated PTR bit decides whether the EVENT bit is set to 1.

PTR bit =1: the EVENT bit is set.

PTR bit =0: the EVENT bit is not set.

This part can be written into and read at will. Its contents is not affected by reading.

NTRansition part

The Negative-TRansition part also acts as an edge detector. When a bit of the CONDition part is changed from 1 to 0, the associated NTR bit decides whether the EVENT bit is set to 1.

NTR-Bit = 1: the EVENT bit is set.

NTR-Bit = 0: the EVENT bit is not set.

This part can be written into and read at will. Its contents is not affected by reading.

With these two edge register parts, you can define which state transition of the condition part (none, 0 to 1, 1 to 0 or both) is stored in the EVENT part.

EVENT part

The EVENT part indicates whether an event has occurred since the last reading, it is the "memory" of the condition part. It only indicates events passed on by the edge filters. It is permanently updated by the instrument. This part can only be read by you. Reading the register clears it. This part is often equated with the entire register.

ENABLE part

The ENABLE part determines whether the associated EVENT bit contributes to the sum bit (see below). Each bit of the EVENT part is ANDed with the associated ENABLE bit (symbol '&'). The results of all logical operations of this part are passed on to the sum bit via an OR function (symbol '+').

ENABLE-Bit = 0: the associated EVENT bit does not contribute to the sum bit

ENABLE-Bit = 1: if the associated EVENT bit is "1", the sum bit is set to "1" as well.

This part can be written into and read by you at will. Its contents is not affected by reading.

Sum bit

As indicated above, the sum bit is obtained from the EVENT and ENABLE part for each register. The result is then entered into a bit of the CONDition part of the higher-order register.

The instrument automatically generates the sum bit for each register. Thus an event, e.g. a PLL that has not locked, can lead to a service request throughout all levels of the hierarchy.



The service request enable register SRE defined in IEEE 488.2 can be taken as ENABLE part of the STB if the STB is structured according to SCPI. By analogy, the ESE can be taken as the ENABLE part of the ESR.

11.6.8.2 Overview of the Status Register

The following figure shows the status registers used by the R&S Cable Rider ZPH.

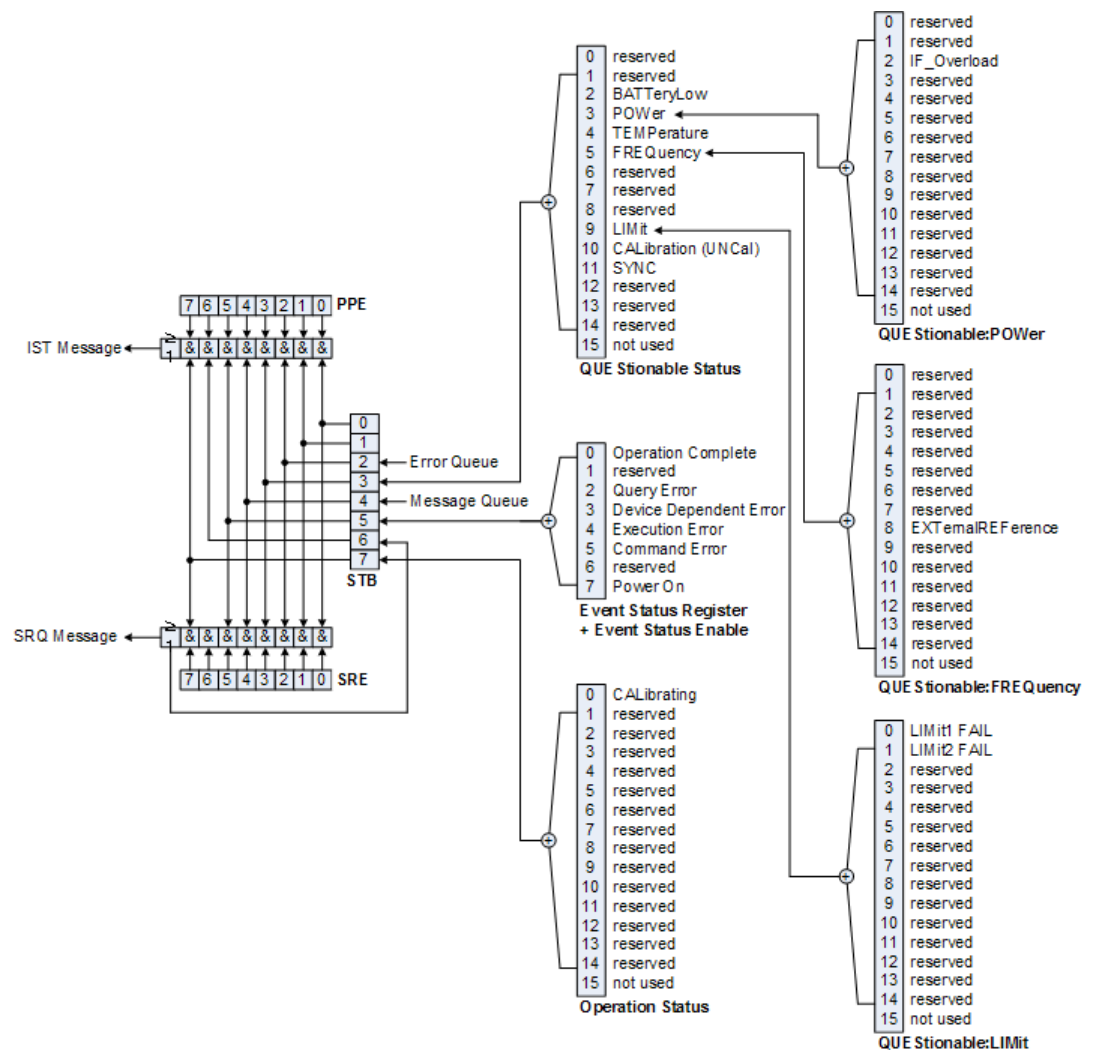


Figure 11-7: Overview of the status registers

11.6.8.3 Status Byte (STB) & Service Request Enable Register (SRE)

The STB is already defined in IEEE 488.2. It provides a rough overview of the instrument status by collecting the pieces of information of the lower registers. It can thus be compared with the CONDition part of an SCPI register and assumes the highest level within the SCPI hierarchy. A special feature is that bit six acts as the sum bit of the remaining bits of the status byte.

The STATUS BYTE is read using the command `*STB?` or a serial poll.

The STB is linked to the SRE. The latter corresponds to the ENABLE part of the SCPI registers in its function. Each bit of the STB is assigned a bit in the SRE. Bit 6 of the SRE is ignored. If a bit is set in the SRE and the associated bit in the STB changes from 0 to 1, a service request (SRQ) is generated, which triggers an interrupt in the controller if this is appropriately configured and can be further processed there. The SRE can be set using the command `"*SRE"` and read using the command `*SRE?`

Table 11-6: Meaning of the bits used in the Status Byte

Bit No.	Meaning
0 to 1	Not used
2	Error Queue not empty The bit is set when an entry is made in the error queue. If this bit is enabled by the SRE, each entry of the error queue generates a service request. Thus an error can be recognized and specified in greater detail by polling the error queue. The poll provides an informative error message. This procedure is to be recommended since it considerably reduces the problems involved with remote control.
3	QUESTionable status sum bit The bit is set if an EVENT bit is set in the QUESTionable: status register and the associated ENABLE bit are set to 1. A set bit indicates a questionable instrument status, which can be specified in greater detail by polling the QUESTionable status register.
4	MAV bit (message available) The bit is set if a message is available in the output buffer which can be read. This bit can be used to enable data to be automatically read from the instrument to the controller.
5	ESB bit Sum bit of the event status register. It is set if one of the bits in the event status register is set and enabled in the event status enable register. Setting of this bit indicates a serious error which can be specified in greater detail by polling the event status register.
6	MSS bit (master status summary bit) The bit is set if the instrument triggers a service request. This is the case if one of the other bits of this register is set together with its mask bit in the service request enable register SRE.
7	OPERation status register sum bit The bit is set if an EVENT bit is set in the OPERation status register and the associated ENABLE bit is set to 1. A set bit indicates that the instrument is just performing an action. The type of action can be determined by polling the OPERation status register.

11.6.8.4 Event Status Register (ESR) and Event Status Enable Register (ESE)

The ESR is defined in IEEE 488.2. It can be compared with the EVENT part of an SCPI register. The event status register can be read out using command *ESR?.

The ESE is the associated ENABLE part. It can be set using the command *ESE and read using the command *ESE?.

Table 11-7: Meaning of the bits in the event status register

Bit No.	Meaning
0	Operation Complete This bit is set on receipt of the command *OPC exactly when all previous commands have been executed.
1	Not used

Bit No.	Meaning
2	Query Error This bit is set if either the controller wants to read data from the instrument without having sent a query, or if it does not fetch requested data and sends new instructions to the instrument instead. The cause is often a query which is faulty and hence cannot be executed.
3	Device-dependent Error This bit is set if a device-dependent error occurs. An error message with a number between -300 and -399 or a positive error number, which denotes the error in greater detail, is entered into the error queue.
4	Execution Error This bit is set if a received command is syntactically correct but cannot be performed for other reasons. An error message with a number between -200 and -300, which denotes the error in greater detail, is entered into the error queue.
5	Command Error This bit is set if a command is received, which is undefined or syntactically incorrect. An error message with a number between -100 and -200, which denotes the error in greater detail, is entered into the error queue.
6	Not used
7	Power On (supply voltage on) This bit is set on switching on the instrument.

STATus:OPERation Register

In the CONDition part, this register contains information on which actions the instrument is being executing or, in the EVENT part, information on which actions the instrument has executed since the last reading. It can be read using the commands `STATus:OPERation:CONDition?` or `STATus:OPERation[:EVENT]?`.

Table 11-8: Meaning of the bits in the STATus:OPERation register

Bit No.	Meaning
0	CALibrating This bit is set as long as the instrument is performing a calibration.
1 to 14	Not used
15	This bit is always 0

STATus:QUEStionable Register

This register contains information about indefinite states which may occur if the unit is operated without meeting the specifications. It can be read using the commands `STATus:QUEStionable: CONDition?` and `STATus:QUEStionable[:EVENT]?`.

Table 11-9: Meaning of bits in `STATUS:QUESTIONable` register

Bit No.	Meaning
0 to 1	These bits are not used
2	BATTERY LOW If the instrument is running without any external power supply and the charging level of the internal battery is approximately lower than 5%, this bit is set to indicate that the system is shut down automatically in approximately 5 minutes.
3	Not used
4	TEMPerature This bit is set if a questionable temperature occurs.
5 to 8	Not used
9	LIMit (device-specific) This bit is set if a limit value is violated
10	CALibration The bit is set if a measurement is performed unaligned (label UNCAL)
11 to 14	Not used
15	This bit is always 0.

STATUS:QUESTIONable:FREQUENCY Register

This register contains information about the reference frequency. It can be read using the commands `STATUS:QUESTIONable:LIMit:FREQUENCY?` and `STATUS:QUESTIONable:FREQUENCY[:EVENT]?`.

Table 11-10: Meaning of bits in `STATUS:QUESTIONable:FREQUENCY` register

Bit No.	Meaning
0 to 7	Not used
8	EXTernal REFerence This bit is set if an external reference is used.
9 to 14	Not used
15	This bit is always 0.

STATUS:QUESTIONable:LIMit Register

This register contains information about the observance of limit lines. It can be read using the commands `STATUS:QUESTIONable:LIMit:CONDition?` and `STATUS:QUESTIONable:LIMit[:EVENT]?`.

Table 11-11: Meaning of bits in STATus:QUEStionable:LIMit register

Bit No.	Meaning
0	LIMit 1 FAIL This bit is set if limit line 1 is violated.
1	LIMit 2 FAIL This bit is set if limit line 2 is violated.
2 to 14	Not used
15	This bit is always 0.

STATus:QUEStionable:POWer Register

This register contains information about possible overload states. It can be read using the commands `STATus:QUEStionable:POWer:CONDition?` and `STATus:QUEStionable:POWer[:EVENT]?`.

Table 11-12: Meaning of bits in STATus:QUEStionable:POWer register

Bit No.	Meaning
0 to 1	Not used
2	IF_Overload This bit is set if the IF path is overloaded. 'IFOVL' is displayed.
3 to 14	Not used
15	This bit is always 0.

STATus:QUEStionable:SYNC Register

This register contains information about sync and bursts not found, and about premeasurement results exceeding or falling short of expected values.

It can be read using the commands `STATus:QUEStionable:SYNC:CONDition?` and `STATus:QUEStionable:SYNC[:EVENT]?`.

11.6.8.5 Application of the Status Reporting Systems

In order to be able to effectively use the status reporting system, the information contained there must be transmitted to the controller and further processed there. There are several methods which are represented in the following.

Service Request

Under certain circumstances, the instrument can send a service request (SRQ) to the controller. Usually this service request initiates an interrupt at the controller, to which the control program can react appropriately.

As evident from [Figure 11-7](#), an SRQ is always initiated if one or several of bits 2, 3, 4, 5 or 7 of the status byte are set and enabled in the SRE. Each of these bits combines the information of a further register, the error queue or the output buffer. The ENABLE parts of the status registers can be set so that arbitrary bits in an arbitrary status regis-

ter initiate an SRQ. In order to make use of the possibilities of the service request effectively, all bits should be set to "1" in enable registers SRE and ESE.

Example:

Use of the command *OPC to generate an SRQ at the end of a sweep

- `CALL InstrWrite(analyzer, "*ESE 1")`
'Set bit 0 in the ESE (Operation Complete)
- `CALL InstrWrite(analyzer, "*SRE 32")`
'Set bit 5 in the SRE (ESB)?

After its settings have been completed, the instrument generates an SRQ.

The SRQ is the only possibility for the instrument to become active on its own. Each controller program should set the instrument in a way that a service request is initiated in the case of malfunction. The program should react appropriately to the service request.

Serial Poll

In a serial poll, just as with command *STB, the status byte of an instrument is queried. However, the query is realized via interface messages and is thus clearly faster. The serial-poll method has already been defined in IEEE 488.1 and used to be the only standard possibility for different instruments to poll the status byte. The method also works with instruments which do not adhere to SCPI or IEEE 488.2.

The VISUAL BASIC command for executing a serial poll is IBRSP(). Serial poll is mainly used to obtain a fast overview of the state of several instruments connected to the controller.

Query by Means of Commands

Each part of any status register can be read by means of queries. The individual commands are listed in the description of the STATUS Subsystem. The returned value is always a number that represents the bit pattern of the queried register. This number is evaluated by the controller program.

Queries are usually used after an SRQ in order to obtain more detailed information on the cause of the SRQ.

Error Queue Query

Each error state in the instrument leads to an entry in the error queue. The entries of the error queue are detailed plain-text error messages that can be displayed via manual operation using the setup menu or queried via remote control using the command `SYSTem:ERRor?`. Each call of `SYSTem:ERRor?` provides one entry from the error queue. If no error messages are stored there any more, the instrument responds with 0, "No error".

The error queue should be queried after every SRQ in the controller program as the entries describe the cause of an error more precisely than the status registers. Especially in the test phase of a controller program the error queue should be queried regu-

larly since faulty commands from the controller to the instrument are recorded there as well.

11.6.8.6 Reset Values of the Status Reporting System

Table 11-13 contains the different commands and events causing the status reporting system to be reset. None of the commands, except *RST and SYSTem:PRESet, influences the functional instrument settings. In particular, DCL does not change the instrument settings.

Table 11-13: Resetting the status reporting system

Event	Switching on supply voltage	DCL, SDC				
	Power-On-Status-Clear		(Device Clear, Selected Device Clear)	*RST or SYSTem:PRESet	STAtus:PRESet	*CLS
Effect	0	1				
Clear STB, ESR	-	yes	-	-	-	yes
Clear SRE, ESE	-	yes	-	-	-	-
Clear PPE	-	yes	-	-	-	-
Clear EVENT parts of the registers	-	yes	-	-	-	yes
Clear ENABLE parts of all OPERATION and QUESTIONABLE registers; Fill ENABLE parts of all other registers with "1".	-	yes	-	-	yes	-
Fill PTRansition parts with "1"; Clear NTRansition parts	-	yes	-	-	yes	-
Clear error queue	yes	yes	-	-	-	yes
Clear output buffer	yes	yes	yes	1)	1)	1)
Clear command processing and input buffer	yes	yes	yes	-	-	-

1) Every command being the first in a program message, i.e., immediately following a <PROGRAM MESSAGE TERMINATOR> clears the output buffer.

11.6.8.7 Remote Commands of the Status Reporting System

The following commands control the status-reporting system *RST does not influence the status registers.

The OPERation status register contains information about the calibration status of the instrument.

The QUEStionable status register contains information about the status of the reference and local oscillator, possible overloads of the instrument and the status of limit checks and limit margins.

The commands are independent from the operating mode.

List of commands

- [STATus:PRESet](#) on page 245
- [STATus:QUEue\[:NEXT\]?](#) on page 245
- [STATus:OPERation\[:EVENT\]?](#) on page 245
- [STATus:OPERation:CONDition?](#) on page 245
- [STATus:OPERation:ENABLE](#) on page 245
- [STATus:OPERation:NTRansition](#) on page 246
- [STATus:OPERation:PTRansition](#) on page 246
- [STATus:QUEStionable\[:EVENT\]?](#) on page 246
- [STATus:QUEStionable:FREQuency\[:EVENT\]?](#) on page 246
- [STATus:QUEStionable:LIMit\[:EVENT\]?](#) on page 246
- [STATus:QUEStionable:POWer\[:EVENT\]?](#) on page 246
- [STATus:QUEStionable:CONDition?](#) on page 247
- [STATus:QUEStionable:FREQuency:CONDition?](#) on page 247
- [STATus:QUEStionable:LIMit:CONDition?](#) on page 247
- [STATus:QUEStionable:POWer:CONDition?](#) on page 247
- [STATus:QUEStionable:ENABLE](#) on page 247
- [STATus:QUEStionable:FREQuency:ENABLE](#) on page 247
- [STATus:QUEStionable:LIMit:ENABLE](#) on page 248
- [STATus:QUEStionable:POWer:ENABLE](#) on page 248
- [STATus:QUEStionable:NTRansition](#) on page 248
- [STATus:QUEStionable:FREQuency:NTRansition](#) on page 248
- [STATus:QUEStionable:LIMit:NTRansition](#) on page 249
- [STATus:QUEStionable:POWer:NTRansition](#) on page 249
- [STATus:QUEStionable:PTRansition](#) on page 249
- [STATus:QUEStionable:FREQuency:PTRansition](#) on page 249
- [STATus:QUEStionable:LIMit:PTRansition](#) on page 249
- [STATus:QUEStionable:POWer:PTRansition](#) on page 250

STATus:PRESet

This command resets the edge detectors and ENABLE parts of all registers to a defined value. All PTRansition parts are set to FFFFh, i.e. all transitions from 0 to 1 are detected. All NTRansition parts are set to 0, i.e. a transition from 1 to 0 in a CONDition bit is not detected. The ENABLE part of the STATus:OPERation and STATus:QUEStionable registers are set to 0, i.e. all events in these registers are not passed on.

Example: STAT:PRESet

Usage: Event

STATus:QUEue[:NEXT]?

This command returns the earliest entry to the error queue and deletes it.

Positive error numbers indicate device-specific errors, negative error numbers are error messages defined by SCPI. If the error queue is empty, the error number 0, "no error", is returned. This command is identical with the command SYSTem:ERRor.

Example: STAT:QUEue?

Usage: Query only

STATus:OPERation[:EVENT]?

This command reads out the EVENT section of the OPERation register.

The command at the same time deletes the contents of the EVENT section.

Usage: Query only

STATus:OPERation:CONDition?

This command reads out the CONDition section of the OPERation register.

The command does not delete the contents of the EVENT section.

Usage: Query only

STATus:OPERation:ENABLE <DecimalValue>

This command controls the ENABLE part of the OPERation register.

The ENABLE part allows true conditions in the EVENT part of the status register to be reported in the summary bit. If a bit is 1 in the enable register and its associated event bit transitions to true, a positive transition occurs in the summary bit reported to the next higher level.

Parameters:

<DecimalValue> Range: 0 to 65535

STATus:OPERation:NTRansition <DecimalValue>

This command controls the Negative TRansition part of the OPERation register.

Setting a bit causes a 1 to 0 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Parameters:

<DecimalValue> Range: 0 to 65535

STATus:OPERation:PTRansition <DecimalValue>

This command controls the Positive TRansition part of the OPERation register.

Setting a bit causes a 0 to 1 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Parameters:

<DecimalValue> Range: 0 to 65535

STATus:QUESTionable[:EVENT]?

This command reads out the EVENT section of the QUESTionable register.

The command at the same time deletes the contents of the EVENT section.

Usage: Query only

STATus:QUESTionable:FREQuency[:EVENT]?

This command reads out the EVENT section of the QUESTionable register.

The command at the same time deletes the contents of the EVENT section.

Usage: Query only

STATus:QUESTionable:LIMit[:EVENT]?

This command reads out the EVENT section of the QUESTionable register.

The command at the same time deletes the contents of the EVENT section.

Usage: Query only

STATus:QUESTionable:POWer[:EVENT]?

This command reads out the EVENT section of the QUESTionable register.

The command at the same time deletes the contents of the EVENT section.

Usage: Query only

STATus:QUESTionable:CONDition?

This command reads out the CONDition section of the QUESTionable register.

The command does not delete the contents of the EVENT section.

Usage: Query only

STATus:QUESTionable:FREQuency:CONDition?

This command reads out the CONDition section of the QUESTionable register.

The command does not delete the contents of the EVENT section.

Usage: Query only

STATus:QUESTionable:LIMit:CONDition?

This command reads out the CONDition section of the QUESTionable register.

The command does not delete the contents of the EVENT section.

Usage: Query only

STATus:QUESTionable:POWer:CONDition?

This command reads out the CONDition section of the QUESTionable register.

The command does not delete the contents of the EVENT section.

Usage: Query only

STATus:QUESTionable:ENABle <DecimalValue>

This command controls the ENABle part of the QUESTionable register.

The ENABle part allows true conditions in the EVENT part of the status register to be reported in the summary bit. If a bit is 1 in the enable register and its associated event bit transitions to true, a positive transition will occur in the summary bit reported to the next higher level.

Parameters:

<DecimalValue> Range: 0 to 65535

STATus:QUESTionable:FREQuency:ENABle <DecimalValue>

This command controls the ENABle part of the QUESTionable register.

The ENABle part allows true conditions in the EVENT part of the status register to be reported in the summary bit. If a bit is 1 in the enable register and its associated event bit transitions to true, a positive transition will occur in the summary bit reported to the next higher level.

Parameters:

<DecimalValue> Range: 0 to 65535

STATus:QUESTionable:LIMit:ENABLE <DecimalValue>

This command controls the ENABLE part of the QUESTionable register.

The ENABLE part allows true conditions in the EVENT part of the status register to be reported in the summary bit. If a bit is 1 in the enable register and its associated event bit transitions to true, a positive transition will occur in the summary bit reported to the next higher level.

Parameters:

<DecimalValue> Range: 0 to 65535

STATus:QUESTionable:POWer:ENABLE <DecimalValue>

This command controls the ENABLE part of the QUESTionable register.

The ENABLE part allows true conditions in the EVENT part of the status register to be reported in the summary bit. If a bit is 1 in the enable register and its associated event bit transitions to true, a positive transition occurs in the summary bit reported to the next higher level.

Parameters:

<DecimalValue> Range: 0 to 65535

STATus:QUESTionable:NTRansition <DecimalValue>

This command controls the Negative TRansition part of the QUESTionable register.

Setting a bit causes a 1 to 0 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Parameters:

<DecimalValue> Range: 0 to 65535

Example: STAT:QUES:NTR 65535

STATus:QUESTionable:FREQuency:NTRansition <DecimalValue>

This command controls the Negative TRansition part of the QUESTionable register.

Setting a bit causes a 1 to 0 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Parameters:

<DecimalValue> Range: 0 to 65535

Example: STAT:QUES:NTR 65535

STATus:QUESTionable:LIMit:NTRansition <DecimalValue>

This command controls the Negative TRansition part of the QUESTionable register.

Setting a bit causes a 1 to 0 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Parameters:

<DecimalValue> Range: 0 to 65535

Example: STAT:QUES:NTR 65535

STATus:QUESTionable:POWer:NTRansition <DecimalValue>

This command controls the Negative TRansition part of the QUESTionable register.

Setting a bit causes a 1 to 0 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Parameters:

<DecimalValue> Range: 0 to 65535

Example: STAT:QUES:NTR 65535

STATus:QUESTionable:PTRansition <DecimalValue>

This command control the Positive TRansition part of the QUESTionable register.

Setting a bit causes a 0 to 1 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Parameters:

<DecimalValue> Range: 0 to 65535

STATus:QUESTionable:FREQuency:PTRansition <DecimalValue>

This command control the Positive TRansition part of the QUESTionable register.

Setting a bit causes a 0 to 1 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Parameters:

<DecimalValue> Range: 0 to 65535

STATus:QUESTionable:LIMit:PTRansition <DecimalValue>

This command control the Positive TRansition part of the QUESTionable register.

Setting a bit causes a 0 to 1 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Parameters:

<DecimalValue> Range: 0 to 65535

STATus:QUESTionable:POWer:PTRansition <DecimalValue>

This command control the Positive TRansition part of the QUESTionable register.

Setting a bit causes a 0 to 1 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Parameters:

<DecimalValue> Range: 0 to 65535

12 Menu and Softkey Overview

This chapter shows an overview of all instrument functions in the form of softkey and menu overview.

- [General Functions](#).....251
- [Functions of the Power Meter](#).....259
- [Functions of the Wizard](#).....265
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12.1 General Functions

- [General R&S Cable Rider ZPH Setup](#).....251
- [File Management](#).....257
- [Operating Mode Selection](#).....258

12.1.1 General R&S Cable Rider ZPH Setup

The SETUP key opens the setup menu that contains functionality to set up the R&S Cable Rider ZPH in general and functionality to set up the measurement.

Softkey	Menu or Dialog items	Parameters	Parameters selection
Config Overview	Mode	DTF	SWR
			Return Loss
		Return Loss	
		SWR	
		Cable Loss	
		Phase	Unwrap
			Wrap
		Smith Chart	
	Stimulus	Start Freq	
		Stop Freq	
		Center Freq	
		Span	
		Span Mode	Auto
			Manual
	Cable	Cable Mode	Mark
			Edit
			Preview

Softkey	Menu or Dialog items	Parameters	Parameters selection
			Load
			Refresh
			Exit
		User Model	Yes
			No
		Frequency	
		Velocity Factor	
		Loss	
	Amplitude	Reference Level	
		Linear Scale	On
			Off
		Scale	50 dB
	Analysis	Trace Mode	Clear/Write
			Average
		Avg Count	
		Points	
		Distance	Start Dist
			Stop Dist
			Length Unit
			M e t e r — F e e t
	IGPS n s t r u m e n t S e	GPS	On
			Off
		Show GPS Information	On
			Off
		Coor dinat	dd° mm' ss.sss"

Softkey	Menu or Dialog items	Parameters	Parameters selection	
	t u p		e For- mat	dd° mm.mmm'
	LAN		MAC Addr ess	On, Off
			DHC P	On
				Off
				IP A d d r e s s
				S u b n e t M a s k
				G a t e w a y
	Date and Time		Set Date	
			Set Time	
			Time Zone	
	Regional		Lan- guag e	English, French, German, Spanish, Italian, Portu- guese, Japanese, Chinese, Korean, Russian, Hungar- ian, Traditional Chinese
			Date For- mat	dd/mm/yyyy,

Softkey	Menu or Dialog items	Parameters	Parameters selection	
				mm/dd/yyyy
				Length Unit
	Display		0 - 100 %	
			Dis- play Backl ight	
			Dis- play Color Sche me	Color
				Black & White

Softkey	Menu or Dialog items	Parameters	Parameters selection	
	Audio		Key Click Volume	0 - 100 %
			System Beeper Volume	0 - 100 %
			Beep on Power Overboard	On
				Off

Key Click Volume
System Beeper Volume
Beep on Power Overboard

Softkey	Menu or Dialog items	Parameters	Parameters selection	
	Power		Current Power Source	
			Battery Level	
			Battery Low Level	0 - 100 %
			Battery Low Level Beep	Repetitive
				Once
	Reset	Reset Factory Settings	Factory Reset	
User Preference	Site Name	Site Name		
		User		
		Comments		
	Preset Key	Preset Mode	User Defined	
			Default	
		Preset Dataset		
		Discard Calibration Data	On	
			Off	
	Working Directory	User working directory	On	
			Off	
		Working directory	\Public	
	Capture	Capture Screen	On	
			Off	
		Capture Dataset	On	
			Off	
		Default Filename	Measurement	
		Filename Counter Starts at	001	

Softkey	Menu or Dialog items	Parameters	Parameters selection
		Capture Screen Format	PNG
			JPG
	Dataset	Default Dataset Name	Dataset
		Use Instrument Calibration	On Off
	Cable & Antenna	Dedicated DTF Frequency	On
			Off
HW/SW info	Hardware	Instrument Model	
		Instrument Serial Number	
		Mainboard Part Number	
		Mainboard Revision	
		Mainboard Serial Number	
		Frontboard Part Number	
		Frontboard Revision	
		Frontboard Serial Number	
		Controller Version	
	Software	Software Version	
Installed Options	Option Administration	Device ID	
		Install Option	
	Installation Status		
Exit			

12.1.2 File Management

The SAVE/RECALL key opens the file manager that contains functionality to manage datasets and other files.

Softkey	Menu or Dialog items	Parameters	Parameters selection
Save	On-screen KB (see Chapter 5.2, "On-screen Keyboard" , on page 71)		
	Exit		
Recall	Preview	Prev	
		Next	

Softkey	Menu or Dialog items	Parameters	Parameters selection
		Recall	
		Exit	
	Load		
	Refresh		
	Exit		
Recall Screenshot	Preview	Prev	
		Next	
		Exit	
	Refresh		
	Exit		
File Manager	Mark		
	Edit	Rename	
		Cut	
		Copy	
		Paste	
		Delete	
	Preview	Prev	
		Next	
		Exit	
	Load		
	Refresh		
	Exit		

12.1.3 Operating Mode Selection

The MODE key opens the mode menu that contains functionality to select the operating mode of the R&S Cable Rider ZPH.

Softkey	Menu or Dialog items	Parameters	Parameters selection
Power Meter	See Chapter 8, "Power Meter" , on page 132)		
Cable & Antenna	See Chapter 12.4.1, "Cable & Antenna Measurements" , on page 268		

12.2 Functions of the Power Meter

This section contains all softkeys and menus that are available in power meter mode.

• Power Meter Measurements	259
• Frequency Parameters	262
• SCALE Parameters	262
• Sweep Configuration	263
• Limits Line Parameters	264
• Trace Parameters	264
• Marker Parameters	264

12.2.1 Power Meter Measurements

The MEAS key opens a menu that contains the functionality to configure measurements with the power meter.

Power Meter

Softkey	Menu or Dialog items	Parameters	Parameters selection
Freq ¹			
Unit	dBm		
	dBμV		
	W		
	dB Rel		
Zero			
To Ref			
Meas Time	Short		
	Normal		
	Long		

¹ If "Freq Mode" (see [Frequency Parameters](#)) is set to "Channel", the softkey displays "Channel".

Directional Power Meter with R&S FSH-Z14 & R&S FZH-Z44

Softkey	Menu or Dialog items	Parameters	Parameters selection
Fwd Pwr Display	Average		
	Peak Envelope		
Freq ¹			
Unit	Forward Power	dBm	

Softkey	Menu or Dialog items	Parameters	Parameters selection
		W	
		dB	
	Reflected Power	dBm	
		W	
		VSWR	
		dB (Return Loss)	
Zero			
To Ref			
Standard	Correction Off		
	GSM		
	EDGE		
	3GPPWCDMA ²		
	cdmaOne ²		
	cdma200 1x ²		
	DVB-T ²		
	DVB ²		
	TETRA		
	USER	4 kHz	
		200 kHz	
		600 kHz	

¹ If "Freq Mode" (see [Frequency Parameters](#)) is set to "Channel", the softkey displays "Channel".

² Only for R&S FSH-Z44

Power Meter

Softkey	Menu or Dialog items	Parameters	Parameters selection
SigGenOn			
Freq ¹			
Unit	dBm		
	W		
	dB Rel		
To Ref			

¹ If "Freq Mode" (see [Frequency Parameters](#)) is set to "Channel", the softkey displays "Channel".

Pulse Power Measurement

Table 12-1: Pulse power measurement with numeric mode

Softkey	Menu or Dialog items	Parameters	Parameters selection
Meas Mode	Average		
	Power vs Time		
Freq			
Unit	dBm		
	W		
Zero			
To Ref			
Meas Time	Short		
	Normal		
	Long		

Table 12-2: Pulse power measurement with trace mode

Softkey	Menu or Dialog items	Parameters	Parameters selection
Meas Mode	Average		
	Pwr vs Time		
Freq			
Unit	dBm		
	W		
Zero			
Algorithm	Histogram		
	Integration		
	Peak		
Ref Power Config	Low Ref Power	0 - 100 %	
	High Ref Power	0 - 100 %	
	Ref Power	0 - 100 %	
	Set to Default		
	Related to Power		
	Related to Voltage		

12.2.2 Frequency Parameters

The FREQ/DIST key opens a menu that contains the functionality to set the frequency.

Table 12-3: Power Meter, Directional Power Meter, Channel Power Meter, Pulse Power Measurement

Softkey	Menu or Dialog items	Parameters	Parameters selection
Frequency ¹			
Freq Mode	Channel ²		
	Select Downlink	Refresh	
		Load	
		Exit	
	Select Uplink	Refresh	
		Load	
		Exit	
	Set to Downlink		
	Set to Uplink		

¹ If "Freq Mode" is set to "Channel", the softkey displays "Channel".

² If "Freq Mode" is previously configured to "Channel", the menu item displays "Frequency".

12.2.3 SCALE Parameters

The SCALE key contains functionality to configure level parameters.

Table 12-4: Power Meter, Directional Power Meter, Channel Power Meter

Softkey	Menu or Dialog items	Parameters	Parameters selection
Unit	dBm		
	W		
	dB Rel		
Offset			
Transducer	Primary		
	Secondary		
	Select Primary	Load	
		Refresh	
		Exit	
	Select Secondary	Load	

Softkey	Menu or Dialog items	Parameters	Parameters selection
		Refresh	
		Exit	

Table 12-5: Pulse Power Measurement

Softkey	Menu or Dialog items	Parameters	Parameters selection
Ref Level	-70 to 30 dBm		
Range	Scale Adjust		
	100 dB (10.0dB/Div)		
	50 dB (5.0dB/Div)		
	50 dB (5.0dB/Div)		
	30 dB (3.0dB/Div)		
	20 dB (2.0dB/Div)		
	10 dB (1.0dB/Div)		
	50 dB (0.5dB/Div)		
Unit	dBm		
	W		
Offset			

12.2.4 Sweep Configuration

The SWEEP key opens a menu that contains functionality to configure the sweep.

Table 12-6: Power Meter, Directional Power Meter

Softkey	Menu or Dialog items	Parameters	Parameters selection
Meas Time	Short		
	Normal		
	Long		

Table 12-7: Pulse Power Measurement

Softkey	Menu or Dialog items	Parameters	Parameters selection
Trace Time		52 us to 1 s	
Conf Meas			
Single Meas			
Trigger	Free Run		
	Positive		
	Negative		

Softkey	Menu or Dialog items	Parameters	Parameters selection
	Trigger Level	-30 to 20 dBm	
	Trigger Delay	-51.1875us to 53 s	
	Trigger Hysteresis	0.1 to 10 dB	
	Dropout Time	0 to 10s	

12.2.5 Limits Line Parameters

The LINES key opens a menu that contains functionality to configure the limits line.

Table 12-8: Power Meter, Channel Power Meter

Softkey	Menu or Dialog items	Parameters	Parameters selection
Show Limit Lines			
Upper Limit	Set Threshold		
	Remove		
Lower Limit	Set Threshold		
	Remove		
Auto Beep			

12.2.6 Trace Parameters

The TRACE key opens a menu that contains functionality to configure the trace.

Table 12-9: Pulse Power Measurement

Softkey	Menu or Dialog items	Parameters	Parameters selection
Trace Mode	Clear/Write		
	Average		
Detector	Average		
	Max Peak		
Show	Enable Trace 2		
	Enable Memory 1		
	Enable Memory 2		
Trace>Memory			

12.2.7 Marker Parameters

The MARKER key opens a menu that contains functionality to configure the marker on the trace

Table 12-10: Pulse Power Measurement with trace mode

Softkey	Menu or Dialog items	Parameters	Parameters selection
New Marker			
Marker Type			
Delete Marker	Delete Selected		
	Delete All Delta		
	Delete All		
Select Marker			
Set Marker	Search Range		
	Set To Peak		
	Set To Next Peak		
	Set To Minimum		
	All Marker To Peak		
	Center=Marker Freq		
	Ref Level=Marker Level		

12.3 Functions of the Wizard

This section contains all softkeys and menus that are available in the measurement WIZARD.

- [Measurement Wizard](#)..... 265

12.3.1 Measurement Wizard

The WIZARD key opens a menu that contains the functionality to perform wizard measurement.

Softkey	Menu or Dialog items	Parameters	Parameters selection
Load Meas Set	Edit	Rename	
		Cut	
		Copy	
		Paste	
		Delete	
	Refresh		
	Load		
	Exit		

Softkey	Menu or Dialog items	Parameters	Parameters selection
Start Meas	Continue	Next Meas	Continue
			Interrupt
			Skip
			Finish Wizard
			Cancel
		Repeat Meas	
		Interrupt	Leave Menu ¹
			Resume Sequence
			Cancel
		Finish Wizard	
		Cancel	
	Interrupt	Leave Menu ¹	
		Resume Sequence	
		Cancel	Yes
			No
	Skip	Continue	Next Meas
			Repeat Meas
			Interrupt
			Finish Wizard
			Cancel
		Interrupt	Leave Menu ¹
			Resume Sequence
			Cancel
		Skip	Continue
			Interrupt
			Skip
			Finish Wizard
			Cancel
		Finish Wizard	
		Cancel	Yes
			No
	Finish Wizard		
	Cancel	Yes	Save Result

Softkey	Menu or Dialog items	Parameters	Parameters selection
			Discard Result
		No	
Meas Setting	General	Measurement Definition	
		User	
		Number of Steps	
		Description	
	Site	Site Number	
		Comments	
		GPS Position	
	Cable Definition	Use Wizard Cable Settings	On
			Off
		Cable Model	Load
			Refresh
			Exit
		Clear Cable Model	Clear
		Cable length	
	Cable Settings	Default Calibration	
		Use Stored Calibrations	On
			Off
Meas Spec			
Meas Results	Mark		
	Edit	Rename	
		Cut	
		Copy	
		Paste	
		Delete	
	Preview	Prev	
		Next	
		Exit	
	Refresh		
	Exit		
Exit			

¹Press WIZARD key to resume back the wizard measurement.

12.4 Functions of the Cable & Antenna

This section contains all softkeys and menus that are available in the measurement Cable & Antenna.

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12.4.1 Cable & Antenna Measurements

This section contains all softkeys and menus that are available in the measurement WIZARD.

The MEAS key opens a menu that contains the functionality to configure the cable & antenna measurements.

Softkey	Menu or Dialog items	Parameters	Parameters selection
DTF	Split Screen		
	Return Loss		
	SWR		
Return Loss			
SWR			
Cable Loss	Normal		
	(Open + Short) / 2	Continue	Continue
			Cancel
		Cancel	
Smith			
Phase	Group Delay		
	Ref1 Coeff		
	Others		

Softkey	Menu or Dialog items	Parameters	Parameters selection
	Unwrap		
	Wrap		

12.4.2 FREQ/DIST Parameters

The FREQ/DIST key opens a menu that contains the functionality to set the frequency and cable distance.

Table 12-11: DTF

Softkey	Menu or Dialog items	Parameters	Parameters selection
Start Dist			
Stop Dist			
DTF Center Freq			
DTF Span	Coupled		
	Auto		
	Manual		
DTF Start Freq			
DTF Stop Freq			

Table 12-12: Return Loss, SWR, Cable Loss, Smith, Phase

Softkey	Menu or Dialog items	Parameters	Parameters selection
Start			
Stop			
Center			
Span			
Signal Standard	Select Downlink	Mark	
		Edit	
		Preview	
		Load	
		Refresh	
		Exit	
	Select Uplink	Mark	
		Edit	
		Preview	
		Load	
		Refresh	

Softkey	Menu or Dialog items	Parameters	Parameters selection
		Exit	
	Set to Downlink		
	Set to Uplink		
	Set to Uplink + Downlink		

12.4.3 SCALE Parameters

The SCALE key opens a menu that contains the functionality to set the vertical axis of the measurement diagram.

Table 12-13: DTF (Return Loss), Return Loss, SWR, Cable Loss

Softkey	Menu or Dialog items	Parameters	Parameters selection
Ref	Clear/Write		
	Average		
Range	Range		
	Ref Position		
Auto Scale			
Full Scale (50 dB)			

Table 12-14: DTF (SWR), SWR

Softkey	Menu or Dialog items	Parameters	Parameters selection
Range	SWR Range		
	Scale Max		
	Scale Min		
Auto Scale			

Table 12-15: Phase

Softkey	Menu or Dialog items	Parameters	Parameters selection
Ref			
Range	SWR Range		
	Scale Max		
	Scale Min		
Auto Scale			

12.4.4 DTF CONFIG Parameters

The DTF CONFIG key opens a menu that contains the functionality to set the DTF config.

Table 12-16: DTF

Softkey	Menu or Dialog items	Parameters	Parameters selection
Cable Config	Cable Model	Mark	
		Edit	
		Preview	
		Load	
		Refresh	
		Exit	
	User Model		
	User Setting	Frequency	
		Velocity Factor	
		Loss	
	Clear Model		
DTF Meas Overview	Exit		
DTF List	Cable Config	Cable Model	Mark
			Edit
			Preview
			Load
			Refresh
			Exit
		User Model	
		User Setting	Frequency
			Velocity Factor
			Loss
		Clear Model	
	DTF Meas Overview	Exit	
	DTF List		
	DTF List Threshold		
	Exit		
DTF List Threshold			
Exit			

Table 12-17: Return Loss, SWR, Cable Loss, Smith, Phase

Softkey	Menu or Dialog items	Parameters	Parameters selection
Cable Config	Cable Model	Mark	
		Edit	
		Preview	
		Load	
		Refresh	
		Exit	
	User Model		
	User Setting	Frequency	
		Velocity Factor	
		Loss	
	Clear Model		
DTF Meas Overview	Exit		

12.4.5 SWEEP Parameters

The SWEEP key opens a menu that contains the functionality to set the sweep.

Table 12-18: DTF, Return Loss, SWR, Cable Loss, Smith, Phase

Softkey	Menu or Dialog items	Parameters	Parameters selection
Number of Points			
Hold			
Single Sweep			
Continuous Sweep			

12.4.6 TRACE Parameters

The TRACE key opens a menu that contains the functionality to set the trace.

Table 12-19: DTF, Return Loss, SWR, Cable Loss, Phase

Softkey	Menu or Dialog items	Parameters	Parameters selection
Trace Mode	Clear/Write		
	Average		
Show Memory			

Softkey	Menu or Dialog items	Parameters	Parameters selection
Trace►Memory			
Select Trace			
Trace Math	Off		
	Trace - Memory		
	Memory - Trace		

Table 12-20: Smith

Softkey	Menu or Dialog items	Parameters	Parameters selection
Trace Mode	Clear/Write		
	Average		
Show Memory			
Trace►Memory			

12.4.7 MARKER Parameters

The MARKER key opens a menu that contains the functionality to set the marker.

Table 12-21: DTF, Return Loss, SWR, Cable Loss, Phase

Softkey	Menu or Dialog items	Parameters	Parameters selection
New Marker	Clear/Write		
	Average		
Marker Type			
Delete Marker	Delete Selected		
	Delete All Data		
	Delete All		
Select Marker			
View List			
Set Marker	Search Range	Search Range 1	Lower Limit
			Upper Limit
		Search Range 2	Lower Limit
			Upper Limit
		Selected Marker	Search Range Off

Softkey	Menu or Dialog items	Parameters	Parameters selection
			Search Range 1
			Search Range 2
		All Markers	Search Range Off
			Search Range 1
			Search Range 2
		Select Marker	
		Exit	
	Set To Peak		
	Set To Next Peak		
	Set To Minimum		
	All Marker To Peak		

Table 12-22: Smith

Softkey	Menu or Dialog items	Parameters	Parameters selection
New Marker	Clear/Write		
	Average		
Marker Type			
Delete Marker	Delete Selected		
	Delete All Data		
	Delete All		
Select Marker			
Marker Mode	Normal		
	dB Magn + Phase		
	Lin Magn + Phase (Rho)		
	Real + Img (Rho)		
	R + jX		
	G + jB		
	(R + jX) / Z0		
	(G + jB) / Y0		
	Ref Impedance		
Set Marker	Search Range	Search Range 1	Lower Limit
			Upper Limit
	Search Range	Search Range 2	Lower Limit
			Upper Limit

Softkey	Menu or Dialog items	Parameters	Parameters selection
		Selected Marker	Search Range Off
			Search Range 1
			Search Range 2
		All Markers	Search Range Off
			Search Range 1
			Search Range 2
		Select Marker	
		Exit	
	Set To Peak		
	Set To Next Peak		
	Set To Minimum		
	All Marker To Peak		

12.4.8 CAL Parameters

The CAL key opens a menu that contains the functionality to calibrate the instrument.

Table 12-23: DTF, Return Loss, SWR, Cable Loss, Smith, Phase

Softkey	Menu or Dialog items	Parameters	Parameters selection
Full 1-Port	Continue	Continue	Continue
			Cancel
	Cancel	Cancel	
Easy 1-Port	Continue		
	Cancel		

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