Manual

Average Power Sensor

R&S® NRP-Z11

10 MHz to 8 GHz / 200 pW to 200 mW

1138.3004.02

R&S® NRP-Z21

10 MHz to 18 GHz / 200 pW to 200 mW

1137.6000.02

Operation of Power Sensor R&S NRP-Z11
from R&S NRP base unit

The power sensor shipped with this manual has firmware revision *02.00* or higher. For operation from an R&S NRP base unit, all software components within the base unit must also be of revision *02.00* or higher.

Revision numbers for the software components installed in the base unit can be displayed under menu item 'System Info', lines 'Main Program', 'Bootloader' and 'Keybd. Ctrl.'. The 'System Info' can be found in the 'File' menu for revision numbers lower than 02.00 and in the 'System' menu otherwise.

Tabbed Divider Overview

Data Sheet

Safety Instructions
Certificate of Quality
EU Certificate of Conformity
List of R&S Representatives

Tabbed Divider

Safety Instructions

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

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

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

The product is used for its designated purpose if it is used in accordance with its operating manual and within its performance limits (see data sheet, documentation, the following safety instructions). Using the products requires technical skills and knowledge of English. It is therefore essential that the products be used exclusively by skilled and specialized staff or thoroughly trained personnel with the required skills. If personal safety gear is required for using Rohde & Schwarz products, this will be indicated at the appropriate place in the product documentation.

Symbols and safety labels

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

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

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

Tags and their meaning

DANGER — This tag indicates a safety hazard with a high potential of risk for the user that can result in death or serious injuries.

WARNING — This tag indicates a safety hazard with a medium potential of risk for the user that can result in death or serious injuries.

CAUTION — This tag indicates a safety hazard with a low potential of risk for the user that can result in slight or minor injuries.

ATTENTION — This tag indicates the possibility of incorrect use that can cause damage to the product.

NOTE — This tag indicates a situation where the user should pay special attention to operating the product but which does not lead to damage.

Basic safety instructions

1. The product may be operated only under the operating conditions and in the positions specified by the manufacturer. Its ventilation must not be obstructed during operation. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products: IP protection 2X, pollution severity 2, overvoltage category 2, use only in enclosed spaces, max. operation altitude max. 2000 m.

2. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed. The product may be opened only by authorized, specially trained personnel. Prior to performing any work on the product or opening the product, the instrument must be disconnected from the supply network. Any adjustments, replacements of parts, maintenance or repair must be carried out only by technical personnel authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced

(visual inspection, PE conductor test, insulation resistance measurement, leakage current measurement, functional test).

3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as aluminum cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties), consult a physician immediately to determine the cause.

4. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn life requires increased protection, pregnant women should be protected by appropriate measures. Persons with pacemakers may also be endangered by electromagnetic radiation. The employer is required to assess workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the danger.

5. Operating the products requires special training and intense concentration. Disabled persons should not use the products unless it is made certain that their disability has no adverse effects while they are operating the products.

6. Prior to switching on the product, it must be ensured that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.

7. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with earthing contact and protective earth connection.

8. Intentionally breaking the protective earth connection either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.

9. If the product has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases, it must be ensured that the power plug is easily reachable and accessible at all times (length of connecting cable approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply. If products without power switches are integrated in racks or systems, a disconnecting device must be provided at the system level.

10. Never use the product if the power cable is damaged. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by e.g. tripping over the cable or suffering an electric shock.

11. The product may be operated only from TN/TT supply networks fused with max. 16 A.

12. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise this can result in sparks, fire and/or injuries.

13. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.

14. For measurements in circuits with voltages V_{rms} > 30 V, suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.

15. Ensure that the connections with information technology equipment comply with IEC950/EN60950.

16. Never remove the cover or part of the housing while you are operating the product. This will expose circuits and components and can lead to injuries, fire or damage to the product.

17. If a product is to be permanently installed, the connection between the PE terminal on site and the product's PE conductor must be made first before any other connection is made. The product may be installed and connected only by a skilled electrician.

18. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused in such a way that suitable protection is provided for users and products.

19. Do not insert any objects into the openings in the housing that are not designed for this purpose. Never pour any liquids onto or into the housing. This can cause short circuits inside the product and/or electric shocks, fire or injuries.

20. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a thunderstorm) can reach the product. Otherwise the operating personnel will be endangered by electric shocks.

21. Rohde & Schwarz products are not protected against penetration of water, unless otherwise specified (see also safety instruction 1.). If this is not taken into account, there exists the danger of electric shock or damage to the product, which can also lead to personal injury.

22. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product was moved from a cold to a warm environment.

23. Do not close any slots or openings on the product, since they are necessary for ventilation and prevent the product from overheating. Do not place the product on soft surfaces such as sofas or rugs or inside a closed housing, unless this is well ventilated.

24. Do not place the product on heat-generating devices such as radiators or fan heaters. The temperature of the environment must not exceed the maximum temperature specified in the data sheet.

25. Batteries and storage batteries must not be exposed to high temperatures or fire. Keep batteries and storage batteries away from children. If batteries or storage batteries are improperly replaced, this can cause an explosion (warning: lithium cells). Replace the battery or storage battery only with the matching Rohde & Schwarz type (see spare parts list). Batteries and storage batteries are hazardous waste. Dispose of them only in specially marked containers. Observe local regulations regarding waste disposal. Do not short-circuit batteries or storage batteries.

26. Please be aware that in the event of a fire, toxic gases that may be hazardous to your health may escape from the product.

27. Please be aware of the weight of the product. Be careful when moving it; otherwise you may injure your back or other parts of your body.

28. 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).

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

30. If a laser product (e.g. a CD/DVD drive) is integrated in a Rohde & Schwarz product, do not use any other settings or functions than those described in the documentation. Otherwise this may be hazardous to your health, since the laser beam can cause irreversible damage to your eyes. Never try to take such products apart, and never look into the laser beam.

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

Informaciones de seguridad

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

Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto solamente fue elaborado para ser utilizado en la indústria y el laboratorio o para fines de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda ser dañada. El uso del producto fuera de sus fines definidos o despreciando las informaciones de seguridad del fabricante queda en la responsabilidad del usuario. El fabricante no se hace en ninguna forma responsable de consecuencias a causa del maluso del producto.

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

Símbolos y definiciones de seguridad

Ver manual de instrucciones del uso	Informaciones para maquinaria con uns peso de > 18kg	Peligro de golpe de corriente	¡Cuidado! Superficie caliente	Conexión a conductor protector	Conexión a tierra	Conexión a masa conductora	¡Cuidado! Elementos de construción con peligro de carga electroestática

potencia EN MARCHA/PARADA	Indicación Stand-by	Corriente continua DC	Corriente alterna AC	Corriente continua/alterna DC/AC	El aparato está protegido en su totalidad por un aislamiento de doble refuerzo

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

Palabras de señal y su significado

PELIGRO	Indica un punto de peligro con gran potencial de riesgo para el ususario.Punto de peligro que puede llevar hasta la muerte o graves heridas.
ADVERTENCIA	Indica un punto de peligro con un protencial de riesgo mediano para el usuario. Punto de peligro que puede llevar hasta la muerte o graves heridas .
CUIDADO	Indica un punto de peligro con un protencial de riesgo pequeño para el usuario. Punto de peligro que puede llevar hasta heridas leves o pequeñas
ATENCIÓN	Indica la posibilidad de utilizar mal el producto y a consecuencia dañarlo.
INFORMACIÓN	Indica una situación en la que deberían seguirse las instrucciones en el uso del producto, pero que no consecuentemente deben de llevar a un daño del mismo.

Informaciones de seguridad elementales

1. El producto solamente debe ser utilizado según lo indicado por el fabricante referente a la situación y posición de funcionamiento sin que se obstruya la ventilación. Si no se convino de otra manera, es para los productos R&S válido lo que sigue:
modo de protección IP 2X, grado de suciedad 2, categoría de sobrecarga eléctrica 2, utilizar solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar.

2. En todos los trabajos deberán ser tenidas en cuenta las normas locales de seguridad de trabajo y de prevención de accidentes. El producto solamente debe de ser abierto por personal périto autorizado. Antes de efectuar trabajos en el producto o abrirlo deberá este ser desconectado de la corriente. El ajuste, el cambio de partes, la manutención y la reparación deberán ser solamente efectuadas por electricistas autorizados por R&S.Si se reponen partes con importancia para los aspectos de seguridad (por ejemplo el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales.Despues de cada recambio de partes elementales para la seguridad deberá ser efectuado un control de seguridad (control a primera vista, control de conductor protector, medición de resistencia de aislamiento, medición de medición de la corriente conductora, control de funcionamiento).

3. Como en todo producto de fabricación industrial no puede ser excluido en general de que se produzcan al usarlo elementos que puedan generar alergias, los llamados elementos alergénicos (por ejemplo el aluminio). Si se produceran en el trato con productos R&S reacciones alérgicas, como por ejemplo urticaria, estornudos frecuentes, irritación de la conjuntiva o dificultades al respirar, se deberá consultar inmediatamente a un médico para averigurar los motivos de estas reacciones.

4. Ciertos productos, como por ejemplo las instalaciones de radiación HF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. En vista a la protección de la vida en desarrollo deberían ser protegidas personas embarazadas debidamente. También las personas con un bypass pueden correr peligro a causa de la radiación electromagnética. El empresario está comprometido a valorar y señalar areas de trabajo en las que se corra un riesgo de exposición a radiaciones aumentadas de riesgo aumentado para evitar riesgos.

5. La utilización de los productos requiere instrucciones especiales y una alta concentracion en el manejo. Personas minusválidas solamente deberán utilizar estos productos si está por seguro de que a causa de su handicap no podrá surgir ninguna restricción en el manejo del producto.

6. Antes de la puesta en marcha del producto se deberá tener por seguro de que la tensión preseleccionada en el producto equivalga a la del la red de distribución. Si es necesario cambiar la preselección de la tensión también se deberán en caso dabo cambiar los fusibles correspondientes del prodcuto.

7. Productos de la clase de seguridad I con alimentación móvil y enchufe individual de producto solamente deberán ser conectados para el funcionamiento a tomas de corriente de contacto de seguridad y con conductor protector conectado.

8. Queda prohibida toda clase de interrupción intencionada del conductor protector, tanto en la toma de corriente como en el mismo producto ya que puede tener como consecuencia el peligro de golpe de corriente por el producto. Si se utilizaran cables o enchufes de extensión se deberá poner al seguro, que es controlado su estado técnico de seguridad.

9. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de distribución como interruptor. En estos casos deberá asegurar de que el enchufe sea de fácil acceso y nabejo (medida del cable de distribución aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para la el corte de la red eléctrica. Si los productos sin interruptor están integrados en construciones o instalaciones, se deberá instalar el interruptor al nivel de la instalación.

10. No utilice nunca el producto si está dañado el cable eléctrico. Asegure a través de las medidas de protección y de instalación adecuadas de que el cable de eléctrico no pueda ser dañado o de que nadie pueda ser dañado por él, por ejemplo al tropezar o por un golpe de corriente.

11. Solamente está permitido el funcionamiento en redes de distribución TN/TT aseguradas con fusibles de como máximo 16 A.

12. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. Si no tiene en consideración estas indicaciones se arriesga a que se originen chispas, fuego y/o heridas.

13. No sobrecargue las tomas de corriente, los cables de extensión o los enchufes de extensión ya que esto pudiera causar fuego o golpes de corriente.

14. En las mediciones en circuitos de corriente con una tensión de entrada de Ueff > 30 V se deberá tomar las precauciones debidas para impedir cualquier peligro (por ejemplo medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).

15. En caso de conexión con aparatos de la técnica informática se deberá tener en cuenta que estos cumplan los requisitos de la EC950/EN60950.

16. Nunca abra la tapa o parte de ella si el producto está en funcionamiento. Esto pone a descubierto los cables y componentes eléctricos y puede causar heridas, fuego o daños en el producto.

17. Si un producto es instalado fijamente en un lugar, se deberá primero conectar el conductor protector fijo con el conductor protector del aparato antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.

18. En caso de que los productos que son instalados fijamente en un lugar sean sin protector implementado, autointerruptor o similares objetos de protección, deberá la toma de corriente estar protegida de manera que los productos o los usuarios estén suficientemente protegidos.

19. Por favor, no introduzca ningún objeto que no esté destinado a ello en los orificios de la caja del aparato. No vierta nunca ninguna clase de líquidos sobre o en la caja. Esto puede producir corto circuitos en el producto y/o puede causar golpes de corriente, fuego heridas.

20. Asegúrese con la protección adecuada de que no pueda originarse en el producto una sobrecarga por ejemplo a causa de una tormenta. Si no se verá el personal que lo utilice expuesto al peligro de un golpe de corriente.

21. Los productos R&S no están protegidos contra el agua si no es que exista otra indicación, ver también punto 1. Si no se tiene en cuenta esto se arriesga el peligro de golpe de corriente o de daños en el producto lo cual también puede llevar al peligro de personas.

22. No utilice el producto bajo condiciones en las que pueda producirse y se hayan producido líquidos de condensación en o dentro del producto como por ejemplo cuando se desplaza el producto de un lugar frío a un lugar caliente.

23. Por favor no cierre ninguna ranura u orificio del producto, ya que estas son necesarias para la ventilación e impiden que el producto se caliente demasiado. No pongan el producto encima de materiales blandos como por ejemplo sofás o alfombras o dentro de una caja cerrada, si esta no está suficientemente ventilada.

24. No ponga el producto sobre aparatos que produzcan calor, como por ejemplo radiadores o calentadores. La temperatura ambiental no debe superar la temperatura máxima especificada en la hoja de datos.

25. Baterías y acumuladores no deben de ser expuestos a temperaturas altas o al fuego. Guardar baterías y acumuladores fuera del alcance de los niños. Si las baterías o los acumuladores no son cambiados con la debida atención existirá peligro de explosión (atención células de Litio). Cambiar las baterías o los acumuladores solamente por los del tipo R&S correspondiente (ver lista de piezas de recambio). Baterías y acumuladores son deshechos problemáticos. Por favor tirenlos en los recipientes especiales para este fín. Por favor tengan en cuenta las prescripciones nacionales de cada país referente al tratamiento de deshechos. Nunca sometan a las baterías o acumuladores a un corto circuito.

26. Tengan en consideración de que en caso de un incendio pueden escaparse gases tóxicos del producto, que pueden causar daños a la salud.

27. Por favor tengan en cuenta el peso del producto. Muevanlo cuidadosamente ya que el peso puede causar lesiones de la espalda u otros daños físicos.

28. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptas para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (por ejemplo paredes y estantes).

29. Si llega a utilizar el producto dentro de un vehículo, queda en la responsabilidad absoluta del conductor que conducir el vehículo de manera segura. Asegure el producto dentro del vehículo debidamente para evitar en caso de un accidente las lesiones u otra clase de daños. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Siempre queda en la responsabilidad absoluta del conductor la seguridad del vehículo y el fabricante no asumirá ninguna clase de responsabilidad por accidentes o colisiones.

30. Dado el caso de que esté integrado und producto de laser en un producto R&S (por ejemplo CD/DVD-ROM) no utilice otras instalaciones o funciones que las descritas en la documentación. De otra manera pondrá en peligro su salud, ya que el rayo laser puede dañar irreversiblemente sus ojos. Nunca trate de descomponer estos productos. Nunca mire dentro del rayo laser.

Certified Quality System

DIN EN ISO   9001 : 2000
DIN EN   9100 : 2003
DIN EN ISO 14001 : 1996

DQS REG. NO 001954 QM/ST UM

QUALITÄTSZERTIFIKAT

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

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:1996

CERTIFICATE OF QUALITY

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

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:1996

CERTIFICAT DE QUALITÉ

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

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:1996

ROHDE&SCHWARZ

ROHDE&SCHWARZ
EC Certificate of Conformity

C €

Certificate No.: 2002-36

This is to certify that:

Equipment type	Stock No.	Designation
NRP	1143.8500.02	Power Meter
NRP-B1	1146.9008.02	Sensor Check Source
NRP-B2	1146.8801.02	Second Sensor Input
NRP-B5	1146.9608.02	3rd und 4th Sensor
NRP-B6	1146.9908.02	Rear-Panel Sensor
NRP-Z3	1146.7005.02	USB Adapter
NRP-Z4	1146.8001.02	USB Adapter
NRP-Z11	1138.3004.02	Average Power Sensor
NRP-Z21	1137.6000.02	Average Power Sensor

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

- relating to electrical equipment for use within defined voltage limits
  (73/23/EEC revised by 93/68/EEC)

- relating to electromagnetic compatibility
  (89/336/EEC revised by 91/263/EEC, 92/31/EEC, 93/68/EEC)

Conformity is proven by compliance with the following standards:

EN61010-1 : 1993 + A2 : 1995
EN55011 : 1998 + A1 : 1999
EN61326 : 1997 + A1 : 1998 + A2 : 2001

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

Affixing the EC conformity mark as from 2002

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

Munich, 2002-06-27

Central Quality Management FS-QZ / Becker

Customer Support

Technical support – where and when you need it

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

Up-to-date information and upgrades

To keep your Rohde & Schwarz equipment always up-to-date,
please subscribe to an electronic newsletter at
http://www.rohde-schwarz.com/www/response.nsf/newsletterpreselection

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

Feedback

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

USA & Canada

Monday to Friday (except US-state holidays)
8:00 AM – 8:00 PM Eastern Standard Time (EST)

USA: 888-test-rsa (888-837-8772) (opt 2)
From outside USA: +1 410 910 7800 (opt 2)
Fax: 410 910 7801

E-Mail: Customer.Support@rsa.rohde-schwarz.com

Rest of World

Monday to Friday (except German-state holidays)
08:00 – 17:00 Central European Time (CET)

Europe:+49 (0) 180 512 42 42
From outside Europe: +49 89 4129 13776
Fax: +49 (0) 89 41 29 637 78

E-Mail: CustomerSupport@rohde-schwarz.com

ROHDE&SCHWARZ

FIRMENSITZ/HEADQUARTERS
(Tel) Phone
(Fax) Fax
E-mail

Rohde & Schwarz GmbH & Co. KG
Mühldorfstraße 15 · D-81671 München
Postfach 80 14 69 · D-81614 München
(Tel) +49 (89) 41 29-0
(Fax) +49 89 4129-121 64
info@rohde-schwarz.com

WERKE/PLANTS

Rohde & Schwarz Messgerätebau GmbH
Riedbachstraße 58 · D-87700 Memmingen
Postfach 1652 · D-87686 Memmingen
(Tel) +49 (8331) 108-0
(Fax) +49 (8331) 108-11 24
info.rsdmb@rohde-schwarz.com

Rohde & Schwarz GmbH & Co. KG
Werk Teisnach
Kaikenrieder Straße 27 · D-94244 Teisnach
Postfach 1149 · D-94240 Teisnach
(Tel) +49 (9923) 857-0
(Fax) +49 (9923) 857-11 74
info.rsdts@rohde-schwarz.com

Rohde & Schwarz GmbH & Co. KG
Dienstleistungszentrum Köln
Graf-Zeppelin-Straße 18 · D-51147 Köln
Postfach 98 02 60 · D-51130 Köln
(Tel) +49 (2203) 49-0
(Fax) +49 (2203) 49 51-229
info.rsdc@rohde-
schwarz.com·service.rsdc@rohde-
schwarz.com

TOCHTERUNTERNEHMEN/SUBSIDIARIES

Rohde & Schwarz Vertriebs-GmbH
Mühldorfstraße 15 · D-81671 München
Postfach 80 14 69 · D-81614 München
(Tel) +49 (89) 41 29-137 74
(Fax) +49 (89) 41 29-137 77
customersupport@rohde-
schwarz.com

Rohde & Schwarz International GmbH
Mühldorfstraße 15 · D-81671 München
Postfach 80 14 60 · D-81614 München
(Tel) +49 (89) 41 29-129 84
(Fax) +49 (89) 41 29-120 50
info.rusis@rohde-schwarz.com

Rohde & Schwarz Engineering and Sales
GmbH
Mühldorfstraße 15 · D-81671 München
Postfach 80 14 29 · D-81614 München
(Tel) +49 (89) 41 29-137 11
(Fax) +49 (89) 41 29-137 23
info.rse@rohde-schwarz.com

R&S BICK Mobilfunk GmbH
Fritz-Hahne-Str. 7 · D-31848 Bad Münder
Postfach 2062 · D-31844 Bad Münder
(Tel) +49 (5042) 998-0
(Fax) +49 (5042) 998-105
info.rsbick@rohde-schwarz.com

Rohde & Schwarz FTK GmbH
Wendenschlossstraße 168, Haus 28
D-12557 Berlin
(Tel) +49 (30) 658 91-122
(Fax) +49 (30) 655 50-221
info.ftk@rohde-schwarz.com

Rohde & Schwarz SIT GmbH
Agastraße 3
D-12489 Berlin
(Tel) +49 (30) 658 84-0
(Fax) +49 (30) 658 84-183
info.sit@rohde-schwarz.com

R&S Systems GmbH
Graf-Zeppelin-Straße 18 D-51147 Köln
Postfach 98 02 60 D-51130 Köln
(Tel) +49 (2203) 49-5 23 25
(Fax) +49 (2203) 49-5 23 36
info.rssys@rohde-schwarz.com

ADRESSEN WELTWEIT/ADDRESSES WORLDWIDE

Albania
siehe/see Austria

Algeria
Rohde & Schwarz
Bureau d'Alger
5B Place de Laperrine
16035 Hydra-Alger
(Tel) +213 (21) 48 20 18
(Fax) +213 (21) 69 46 08

Antilles (Neth.)
siehe / see Mexico

Argentina
Precision Electronica S.R.L.
Av. Pde Julio A. Roca 710 - 6° Piso
1067 Buenos Aires
(Tel) +541 (14) 331 10 67
(Fax) +541 (14) 334 51 11
alberto.lombardi@prec-elec.com.ar

Australia
Rohde & Schwarz (Australia) Pty. Ltd.
Sales Support
Unit 6
2-8 South Street
Rydalmere, N.S.W. 2116
(Tel) +61 (2) 88 45 41 00
(Fax) +61 (2) 96 38 39 88
sales@rsaus.rohde-schwarz.com

Austria
Rohde & Schwarz-Österreich Ges.m.b.H.
Am Europlatz 3
Gebäude B
1120 Wien
(Tel) +43 (1) 602 61 41-0
(Fax) +43 (1) 602 61 41-14
rs-austria@rsoe.rohde-schwarz.com

Azerbaijan
Rohde & Schwarz Azerbaijan
Liaison Office Baku
ISR Plaza, 5th floor
340 Nizami Str.
370000 Baku
(Tel) +994 (12) 93 31 38
(Fax) +994 (12) 93 03 14
rs-azerbaijan@rsd.rohde-
schwarz.com

Bangladesh
BIL Consortium Ltd.
Corporate Office
House-33, Road-4, Block-F
Banani, Dhaka-1213
(Tel) +880 (2) 881 06 53
(Fax) +880 (2) 882 82 91

Barbados
siehe / see Mexico

Belarus
siehe/see Ukraine

Belgium
Rohde & Schwarz Belgium N.V.
Excelsiorlaan 31 Bus 1
1930 Zaventem
(Tel) +32 (2) 721 50 02
(Fax) +32 (2) 725 09 36
info@rsb.rohde-schwarz.com

Belize
siehe / see Mexico

Bermuda
siehe/see Mexico

Bosnia-Herzegovina
siehe/see Slovenia

Brazil
Rohde & Schwarz Do Brasil Ltda.
Av. Alfredo Egidio de Souza Aranha n° 670
1° andar - Santo Amaro
04726-170 Sao Paulo - SP
(Tel) +55 (11) 56 44 86 11
(Tel) +55 (11) 56 44 86 25 (sales)
(Fax) +55 (11) 56 44 86 36
sales-brazil@rsdb.rohde-
schwarz.com

Brunei
George Keen Lee Equipment Pte Ltd.
#11-01 BP Tower
396 Alexandra Road
Singapore 119954
(Tel) +656 276 06 26
(Fax) +656 276 06 29
gkleqpt@singnet.com.sg

Bulgaria
Rohde & Schwarz
Representation Office Bulgaria
39, Fridtjof Nansen Blvd.
1000 Sofia
(Tel) +359 (2) 96 343 34
(Fax) +359 (2) 963 21 97
rs-bulgaria@rsbg.rohde-schwarz

Canada
Rohde & Schwarz Canada Inc.
555 March Rd.
Kanata, Ontario K2K 2M5
(Tel) +1 (613) 592 80 00
(Fax) +1 (613) 592 80 09
sales@rscanada.ca

Chile
Dymeq Ltda.
Av. Larrain 6666
Santiago
(Tel) +56 (2) 339 20 00
(Fax) +56 (2) 339 20 10
dymeq@dymeq.com

China
Rohde & Schwarz China Ltd.
Representative Office Beijing
6F, Parkview Center
2 Jiangtai Road
Chao Yang District
Beijing 100016
(Tel) +86 (10) 64 31 28 28
(Fax) +86 (10) 64 37 98 88
info.rschina@rsbp.rohde-
schwarz.com

Rohde & Schwarz China Ltd.
Representative Office Shanghai
Room 807-809, Central Plaza
227 Huangpi North Road
Shanghai 200003
(Tel) +86 (21) 63 75 00 18
(Fax) +86 (21) 63 75 91 70
May.Zhu@rsbp.rohde-schwarz.com

Rohde & Schwarz China Ltd.
Representative Office Guangzhou
Room 2903, Metro Plaza
183 Tian He North Road
Guangzhou 510075
(Tel) +86 (20) 87 55 47 58
(Fax) +86 (20) 87 55 47 59
Winnie.Lin@rsbp.rohde-
schwarz.com

China	Rohde & Schwarz China Ltd. Representative Office Chengdu Unit G, 28/F, First City Plaza 308 Shuncheng Avenue Chengdu 610017	(Tel) +86 (28) 86 52 76 06 (Fax) +86 (28) 86 52 76 10 sophia.chen@rsbp.rohde- schwarz.com
	Rohde & Schwarz China Ltd. Representative Office Xian Room 603, Jin Xin International No. 99 Heping Road Xian 710001	(Tel) +86 (29) 87 41 53 77 (Fax) +86 (29) 87 20 65 00 sherry.yu@rsbp.rohde-schwarz.com
	Rohde & Schwarz China Ltd. Representative Office Shenzhen Room 1901, Central Business Building No. 88 Fuhua Yilu Futian District Shenzhen 518026	(Tel) +86 (755) 82 03 11 98 (Fax) +86 (755) 82 03 30 70 jessica.lia@rsbp.rohde-schwarz.com
Costa Rica	siehe / see Mexico	
Croatia	siehe/see Slovenia	
Cuba	siehe / see Mexico	
Cyprus	Hinis Telecast Ltd. Agiou Thoma 18 Kiti Larnaca 7550	(Tel) +357 (24) 42 51 78 (Fax) +357 (24) 42 46 21 hinis@logos.cy.net
Czech Republic	Rohde & Schwarz Praha, s.r.o. Hadovka Office Park Evropská 2590/33c 16000 Praha 6	(Tel) +420 (2) 24 31 12 32 (Fax) +420 (2) 24 31 70 43 office@rscz.rohde-schwarz.com
Denmark	Rohde & Schwarz Danmark A/S Ejby Industrivej 40 2600 Glostrup	(Tel) +45 (43) 43 66 99 (Fax) +45 (43) 43 77 44 rsdk@rsdk.rohde-schwarz.com
Egypt	U.A.S. Universal Advanced Systems 31 Manshiet El-Bakry Street Heliopolis 11341 Cairo	(Tel) +20 (2) 455 67 44 (Fax) +20 (2) 256 17 40 an_uas@link.net
El Salvador	siehe/see Mexico	
Estonia	Rohde & Schwarz Danmark A/S Estonian Branch Office Narva mnt. 13 10151 Tallinn	(Tel) +372 (6) 14 31 23 (Fax) +372 (6) 14 31 21 estonia@rsdk.rohde-schwarz.com
Finland	Rohde & Schwarz Finland Oy Taivaltie 5 01610 Vantaa	(Tel) +358 (207) 60 04 00 (Fax) +358 (207) 60 04 17 info@rsfin.rohde-schwarz.com
France	Rohde & Schwarz France Immeuble "Le Newton" 9-11, rue Jeanne Braconnier 92366 Meudon La Forêt Cédex	(Tel) +33 (0) 141 36 10 00 (Fax) +33 (0) 141 36 11 11 contact@rsf.rohde-schwarz.com
	Niederlassung/Subsidiary Rennes 37 Rue du Bignon Bâtiment A 35510 Cesson Sévigné	(Tel) +33 (2) 99 51 97 00 (Fax) +33 (2) 99 51 98 77
Germany	Zweigniederlassungen der Rohde & Schwarz Vertriebs-GmbH/Branch offices of Rohde & Schwarz Vertriebs-GmbH	
	Zweigniederlassung Nord, Geschäftsstelle Berlin Ernst-Reuter-Platz 10 · D-10587 Berlin Postfach 100620 · D-10566 Berlin	(Tel) +49 (30) 34 79 48-0 (Fax) +49 (30) 34 79 48 48 info.rsv@rohde-schwarz.com
Germany	Zweigniederlassung Büro Bonn Josef-Wirmer-Straße 1-3 · D-53123 Bonn Postfach 140264 · D-53057 Bonn	(Tel) +49 (228) 918 90-0 (Fax) +49 (228) 25 50 87 info.rsv@rohde-schwarz.com
	Zweigniederlassung Nord, Geschäftsstelle Hamburg Vierenkamp 6 D-22423 Hamburg	(Tel) +49 (40) 38 61 83 - 00 (Fax) +49 (40) 38 61 83 - 20 info.rsv@rohde-schwarz.com
	Zweigniederlassung Mitte, Geschäftsstelle Köln Niederkasseler Straße 33 · D-51147 Köln Postfach 900 149 · D-51111 Köln	(Tel) +49 (2203) 807-0 (Fax) +49 (2203) 807-650 info.rsv@rohde-schwarz.com
	Zweigniederlassung Süd, Geschäftsstelle München Mühldorfstraße 15 · D-81671 München Postfach 80 14 69 · D-81614 München	(Tel) +49 (89) 41 86 95-0 (Fax) +49 (89) 40 47 64 info.rsv@rohde-schwarz.com
	Zweigniederlassung Süd, Geschäftsstelle Nürnberg Donaustraße 36 D-90451 Nürnberg	(Tel) +49 (911) 642 03-0 (Fax) +49 (911) 642 03-33 info.rsv@rohde-schwarz.com
	Zweigniederlassung Mitte, Geschäftsstelle Neu-Isenburg Siemensstraße 20 D-63263 Neu-Isenburg Postfach 16 51 D-63236 Neu-isenburg	(Tel) +49 (6102) 20 07-0 (Fax) +49 (6102) 20 07 12 info.rsv@rohde-schwarz.com
Ghana	Kop Engineering Ltd. P.O. Box 11012 3rd Floor Akai House, Osu Accra North	(Tel) +233 (21) 77 89 13 (Fax) +233 (21) 701 06 20 joblink@ghana.com
Greece	Mercury S.A. 6, Loukianou Str. 10675 Athens	(Tel) +302 (10) 722 92 13 (Fax) +302 (10) 721 51 98 mercury@hol.gr
Guatemala	siehe/see Mexico	
Guiana	siehe / see Mexico	
Haiti	siehe / see Mexico	
Honduras	siehe/see Mexico	
Hong Kong	Electronic Scientific Engineering 9/F North Somerset House Taikoo Place 979 King's Road, Quarry Bay Hong Kong	(Tel) +852 (25) 07 03 33 (Fax) +852 (25) 07 09 25 stephenchau@ese.com.hk
Hungary	Rohde & Schwarz Budapesti Iroda Váci út 169 1138 Budapest	(Tel) +36 (1) 412 44 60 (Fax) +36 (1) 412 44 61 rs-hungary@rshu.rohde- schwarz.com
Iceland	siehe/see Denmark	
India	Rohde & Schwarz India Pvt. Ltd. 244, Okhla Industrial Estate Phase - III New Delhi 110 020	(Tel) +91 (11) 26 32 63 81 (Fax) +91 (11) 26 32 63 73 sales@rsindia.rohde-schwarz.com
	Rohde & Schwarz India Pvt. Ltd. Bangalore Office No. 24, Service Road, Domlur 2nd Stage Extension Bangalore - 560 071	(Tel) +91 (80) 535 23 62 (Fax) +91 (80) 535 03 61 rsindiab@rsnl.net
	Rohde & Schwarz India Pvt. Ltd. Hyderabad Office 302 & 303, Millennium Centre 6-3-1099/1100, Somajiguda Hyderabad - 500 016	(Tel) +91 (40) 23 32 24 16 (Fax) +91 (40) 23 32 27 32 rsindiah@nd2.dot.net.in

Adressen/Addresses

India	Rohde & Schwarz India Pvt. Ltd. Mumbai Office B-603, Remi Bizcourt, Shah Industrial Estate, Off Veera Desai Road Andheri West Mumbai - 400 058	(Tel) +91 (22) 26 30 18 10 (Fax) +91 (22) 26 73 20 81 rsindiam@rsnl.net
Indonesia	PT Rohde & Schwarz Indonesia Graha Paramita 5th Floor Jln. Denpasar Raya Blok D-2 Jakarta 12940	(Tel) +62 (21) 252 36 08 (Fax) +62 (21) 252 36 07 sales@rsbj.rohde- schwarz.com-services@rsbj.rohde- schwarz.com
Iran	Rohde & Schwarz Iran Liaison Office Tehran Groundfloor No. 1, 14th Street Khaled Eslamboli (Vozara) Ave. 15117 Tehran	(Tel) +98 (21) 872 42 96 (Fax) +98 (21) 871 90 12 alfred.korff@rsd.rohde-schwarz.com
Ireland	siehe/see United Kingdom	
Israel	Eastronics Ltd. Measurement Products 11 Rozanis St. P.O.Box 39300 Tel Aviv 61392	(Tel) +972 (3) 645 87 77 (Fax) +972 (3) 645 86 66 david_hasky@easx.co.il
	J.M. Moss (Engineering) Ltd. Communications Products 9 Oded Street P.O.Box 967 52109 Ramat Gan	(Tel) +972 (3) 631 20 57 (Fax) +972 (3) 631 40 58 jmmoss@zahav.net.il
Italy	Rohde & Schwarz Italia S.p.a. Centro Direzionale Lombardo Via Roma 108 20060 Cassina de Pecchi (MI)	(Tel) +39 (02) 95 70 41 (Fax) +39 (02) 95 30 27 72 rsi.info@rsi.rohde-schwarz.com
	Rohde & Schwarz Italia S.p.a. Via Tiburtina 1182 00156 Roma	(Tel) +39 (06) 41 59 81 (Fax) +39 (06) 41 59 82 70 rsi.info@rsi.rohde-schwarz.com
Jamaica	siehe / see Mexico	
Japan	Rohde & Schwarz Japan K.K. Tokyo Office 711 Bldg., Room 501 (5th floor) 7-11-18 Nishi-Shinjuku Shinjuku-ku Tokyo 160-00023	(Tel) +81 (3) 59 25 12 88 (Fax) +81 (3) 59 25 12 90 scj.support@rsjp.rohde-schwarz.com
	Rohde & Schwarz Japan K.K. Shin-Yokohama Office KM Daiichi Bldg., 8F 2-13-13 Kouhoku-ku Yokohama-shi Kanagawa 222-0033	(Tel) +81 (4) 54 77 35 70
	Rohde & Schwarz Japan K.K. Osaka Office TEK Dai 2 Bldg., 8F 1-13-20 Esaka-shi Suita-shi Osaka-fu 564-0063	(Tel) +81 (6) 63 10 96 51
Jordan	Jordan Crown Engineering & Trading Co. Jabal Amman, Second Circle Youssef Ezzideen Street P.O.Box 830414 Amman, 11183	(Tel) +962 (6) 462 17 29 (Fax) +962 (6) 465 96 72 jocrown@go.com.jo
Kazakhstan	Rohde & Schwarz Kazakhstan Representative Office Almaty Pl. Respubliki 15 480013 Almaty	(Tel) +7 (32) 72 67 23 54 (Fax) +7 (32) 72 67 23 46 rs-kazakhstan@rsd-rohde- schwarz.com
Kenya	Excel Enterprises Ltd Dunga Road P.O.Box 42 788 Nairobi	(Tel) +254 (2) 55 80 88 (Fax) +254 (2) 54 46 79
Korea	Rohde & Schwarz Korea Ltd. 83-29 Nonhyun-Dong, Kangnam-Ku Seoul 135-010	(Tel) +82 (2) 34 85 19 00 (Fax) +82 (2) 547 43 00 sales@rskor.rohde- schwarz.com-service@rskor.rohde- schwarz.com
Kuwait	Group Five Trading & Contracting Co. Mezzanine Floor Al-Bana Towers Ahmad Al Jaber Street Sharq	(Tel) +965 (244) 91 72/73/74 (Fax) +965 (244) 95 28 jk_agarwal@yahoo.com
Latvia	Rohde & Schwarz Danmark A/S Latvian Branch Office Merkela iela 21-301 1050 Riga	(Tel) +371 (7) 50 23 55 (Fax) +371 (7) 50 23 60 latvia@rsdk.rohde-schwarz.com
Lebanon	Rohde & Schwarz Liaison Office Riyadh P.O.Box 361 Riyadh 11411	(Tel) +966 (1) 465 64 28 Ext. 303 (Fax) +966 (1) 465 64 28 Ext. 229 chris.porzky@rsd.rohde-schwarz.com
	Netcom P.O.Box 55199 Op. Ex-Presidential Palace Horch Tabet Beirut	(Tel) +961 (1) 48 69 99 (Fax) +961 (1) 49 05 11 tohme.sayar@netcomm.tv
Liechtenstein	siehe/see Switzerland	
Lithuania	Rohde & Schwarz Danmark A/S Lithuanian Branch Office Lukiskiu 5-228 2600 Vilnius	(Tel) +370 (5) 239 50 10 (Fax) +370 (5) 239 50 11 lithuania@rsdk.rohde-schwarz.com
Luxembourg	siehe/see Belgium	
Macedonia	NETRA Sarski odred 7 1000 Skopje	(Tel) +389 (2) 329 82 30 (Fax) +389 (2) 317 74 88 netra@netra.com.sk
Malaysia	Rohde & Schwarz Malaysia Sdn Bhd Suite 10.04, Level 10, Wisma E&C No. 2 Lorong Dungun Kiri Damansara Heights 50490 Kuala-Lumpur	(Tel) +60 (3) 20 94 00 33 (Fax) +60 (3) 20 94 24 33 sales.malaysia@rohde-schwarz.com
Malta	Tektraco International Technology Ltd. 121, B'Kara Road San Gwann SGN 08	(Tel) +356 (21) 37 43 00 or 37 80 88 (Fax) +356 (21) 37 66 67 sales@tektraco.com
Mexico	Rohde & Schwarz de Mexico S. de R.L. de C.V. German Centre Oficina 4-2-2 Av. Santa Fé 170 Col. Lomas de Santa Fé 01210 Mexico D.F.	(Tel) +52 (55) 85 03 99 13 (Fax) +52 (55) 85 03 99 16 latinoamerica@rsd.rohde- schwarz.com
Moldava	siehe/see Austria	
Nepal	ICTC Pvt. Ltd. Hattisar, Post Box No. 660 Kathmandu	(Tel) +977 (1) 443 48 95 (Fax) +977 (1) 443 49 37 ictc@mos.com.np

Netherlands	Rohde & Schwarz Nederland B.V. Perkinsbaan 1 3439 ND Nieuwegein	(Tel) +31 (30) 600 17 00 (Fax) +31 (30) 600 17 99 info@rsn.rohde-schwarz.com
New Zealand	Nichecom 1 Lincoln Ave. Tawa, Wellington	(Tel) +64 (4) 232 32 33 (Fax) +64 (4) 232 32 30 rob@nichecom.co.nz
Nicaragua	siehe/see Mexico	
Nigeria	Ferrostaal Abuja Plot 3323, Barada Close P.O.Box 8513, Wuse Off Amazon Street Maitama, Abuja	(Tel) +234 (9) 413 52 51 (Fax) +234 (9) 413 52 50 fsabuja@rosecom.net
Norway	Rohde & Schwarz Norge AS Enebakkveien 302 B 1188 Oslo	(Tel) +47 (23) 38 66 00 (Fax) +47 (23) 38 66 01 firmapost@rsnor.rohde-schwarz.com
Oman	Mustafa Sultan Science & Industry Co.LLC. Test & Measurement Products Way No. 3503 Building No. 241 Postal Code 112 Al Khuwair, Muscat	(Tel) +968 63 60 00 (Fax) +968 60 70 66 m-aziz@mustafasultan.com
Pakistan	Siemens Pakistan 23, West Jinnah Avenue Islamabad	(Tel) +92 (51) 227 22 00 (Fax) +92 (51) 227 54 98 reza.bokhary@siemens.com.pk
Panama	siehe/see Mexico	
Papua New Guinea	siehe/see Australia	
Paraguay	siehe/see Argentina	
Philippines	Rohde & Schwarz (Philippines) Inc. Unit 2301, PBCom Tower 6795, Ayala Ave. cor. Herrera St. Makati City	(Tel) +63 (2) 753 14 44 (Fax) +63 (2) 753 14 56
Poland	Rohde & Schwarz SP.z o.o. Przedstawicielstwo w Polsce ul. Stawki 2, Pietro 28 00-193 Warszawa	(Tel) +48 (22) 860 64 94 (Fax) +48 (22) 860 64 99 rs-poland@rspl.rohde-schwarz.com
Portugal	Rohde & Schwarz Portugal, Lda. Alameda Antonio Sergio 7-R/C - Sala A 2795-023 Linda-a-Velha	(Tel) +351 (21) 415 57 00 (Fax) +351 (21) 415 57 10 info@rspt.rohde-schwarz.com
Republic Dominican	siehe/see Mexico	
Romania	Rohde & Schwarz Representation Office Bucharest 89 Eroii Sanitari Bldv., sector 5 050472 Bucuresti	(Tel) +40 (21) 411 20 13 (Fax) +40 (21) 410 68 46 rs-romania@rsro.rohde-schwarz.com
Russian Federation	Rohde & Schwarz International GmbH 119180, Yakimanskaya nab., 2 Moscow	(Tel) +7 (095) 745 88 50 to 53 (Fax) +7 (095) 745 88 54 rs-russia@rsru.rohde-schwarz.com
Saudi Arabia	Rohde & Schwarz International GmbH - Liaison Office Riyadh c/o Haji Abdullah Alireza Co. Ltd. P.O.Box 361 Riyadh 11411	(Tel) +966 (1) 293 2035 (Fax) +966 (1) 466 1657 chris.porzky@rsd.rohde-schwarz.com
Saudi Arabia	Gentec Haji Abdullah Alireza & Co. Ltd. P.O.Box 43054 Riyadh	(Tel) +966 (1) 293 20 35 (Fax) +966 (1) 466 16 57 akanbar@gentec.com.sa
Serbia-Montenegro	Rohde & Schwarz Representative Office Belgrade Tose Jovanovica 7 11030 Beograd	(Tel) +381 (11) 305 50 25 (Fax) +381 (11) 305 50 24 rs-scg@rscs.rohde-schwarz.com
Singapore	Rohde & Schwarz Regional Headquarters Singapore Pte. Ltd. 1 Kaki Bukit View #05-01/02 Techview Singapore 415 941	(Tel) +65 68 46 18 72 (Fax) +65 68 46 12 52
	Rohde & Schwarz Systems & Communications Asia Pte Ltd Service 1 Kaki Bukit View #04-01/07 Techview Singapore 415 941	(Tel) +65 68 46 37 10 (Fax) +65 68 46 00 29 info@rssg.rohde-schwarz.com
Slovak Republic	Specialne systemy a software, a.s. Svrcia ul. 3 841 04 Bratislava 4	(Tel) +421 (2) 65 42 24 88 (Fax) +421 (2) 65 42 07 68 3s@special.sk
Slovenia	Rohde & Schwarz Representative Office Ljubljana Tbilisijska 89 1000 Ljubljana	(Tel) +386 (1) 423 46 51 (Fax) +386 (1) 423 46 11 rs-slovenia@rssi.rohde-schwarz.com
South Africa	Protea Data Systems (Pty.) Ltd. Communications and Measurement Division Private Bag X19 Bramley 2018	(Tel) +27 (11) 719 57 00 (Fax) +27 (11) 786 58 91 unicm@protea.co.za
	Protea Data Systems (Pty.) Ltd. Cape Town Branch Unit G9, Centurion Business Park Bosmandam Road Milnerton Cape Town, 7441	(Tel) +27 (21) 555 36 32 (Fax) +27 (21) 555 42 67 unicm@protea.co.za
Spain	Rohde & Schwarz Espana S.A. Salcedo, 11 28034 Madrid	(Tel) +34 (91) 334 10 70 (Fax) +34 (91) 729 05 06 rses@rses.rohde-schwarz.com
	Rohde & Schwarz Espana S.A. Av. Princep d'Astúries, 66 08012 Barcelona	(Tel) +34 (93) 415 15 68 (Fax) +34 (93) 237 49 95 bcn@rses.rohde-schwarz.com
Sri Lanka	Dynatel Communications (PTE) Ltd. 451/A Kandy Road Kelaniya	(Tel) +94 (112) 90 80 01 (Fax) +94 (112) 91 04 69 69 dynatel@dynanet.lk
Sudan	SolarMan Co. Ltd. P.O.Box 11 545 North of Fraouq Cementry 6/7/9 Bldg. 16 Karthoum	(Tel) +249 (183) 47 31 08 (Fax) +249 (183) 47 31 38 solarman29@hotmail.com
Sweden	Rohde & Schwarz Sverige AB Flygfältsgatan 15 128 30 Skarpnäck	(Tel) +46 (8) 605 19 00 (Fax) +46 (8) 605 19 80 info@rss.rohde-schwarz.com
Switzerland	Roschi Rohde & Schwarz AG Mühlestr. 7 3063 Ittigen	(Tel) +41 (31) 922 15 22 (Fax) +41 (31) 921 81 01 support@roschi.rohde-schwarz.com
Syria	Electro Scientific Office Baghdad Street Dawara Clinical Lab. Bldg P.O.Box 8162 Damascus	(Tel) +963 (11) 231 59 74 (Fax) +963 (11) 231 88 75 memo@hamshointl.com

Taiwan	Rohde & Schwarz Taiwan (Pvt.) Ltd. Floor 14, No. 13, Sec. 2, Pei-Tou Road Taipei 112	(Tel) +886 (2) 28 93 10 88 (Fax) +886 (2) 28 91 72 60 celine.tu@rstw.rohde-schwarz.com
Tanzania	SSTL Group P.O. Box 7512 Dunga Street Plot 343/345 Dar Es Salaam	(Tel) +255 (22) 276 00 37 (Fax) +255 (22) 276 02 93 sstl@ud.co.tz
Thailand	Rohde & Schwarz International Thailand 2nd floor Gems Tower Bangrak, Suriyawong Bangkok 10600	(Tel) +66 (2) 200 07 29 (Fax) +66 (2) 267 00 79
	Schmidt Electronics (Thailand) Ltd. Messtechnik 202 Le Concorede Tower, 23rd Fl. Ratchadaphisek Rd. Huay kwang Bangkok 10320	(Tel) +66 (2) 69 41 47 05 (Fax) +66 (2) 69 41 476 salestm@schmidtelectronics.com
	TPP Operation Co. Ltd. Kommunikationstechnik 41/5 Mooban Tarinee Boromrajchonnee Road Talingchan Bangkok 10170	(Tel) +66 (2) 880 93 47 (Fax) +66 (2) 880 93 47
Trinidad &Tobago	siehe/see Mexico	(Tel) (Fax)
Tunisia	Teletek 71, Rue Alain Savary Residence Alain Savary (C64) Cité el Khadra 1003 Tunis	(Tel) +216 (71) 77 33 88 (Fax) +216 (71) 77 05 53 teletek@gnet.tn
Turkey	Rohde & Schwarz International GmbH Liaison Office Istanbul Bagdat Cad. 191/3, Arda Apt. B-Blok 81030 Selamicesme-Istanbul	(Tel) +90 (216) 385 19 17 (Fax) +90 (216) 385 19 18 nadir.guerelman@rsd.rohde- schwarz.com
Ukraine	Rohde & Schwarz Representative Office Kiev 4, Patris Loumoumba ul. 01042 Kiev	(Tel) +38 (044) 268 60 55 (Fax) +38 (044) 268 83 64 rsbkiev@public.ua.net
United Arab Emirates	Rohde & Schwarz International GmbH Liaison Office Middle East Vertrieb P.O. Box 31156 Abu Dhabi	(Tel) +971 (2) 6335 670 (Fax) +971 (2) 6335 671 Dario Barisoni@rsd.rohde- schwarz.com
	Rohde & Schwarz Bick Mobile Communication P.O.Box 17466 JAFZ, PPU ZG-07 Dubai	(Tel) +971 (4) 883 71 35 (Fax) +971 (4) 883 71 36
	Rohde & Schwarz Emirates L.L.C. ESNAAD Premisses at Mussafah, P.O.Box 31156 Abu Dhabi	(Tel) +971 (2) 55 49 411 (Fax) +971 (2) 55 49 433 rsuaeam@emirates.net.ae
United Kingdom	Rohde & Schwarz UK Ltd. Ancells Business Park Fleet Hampshire GU51 2UZ	(Tel) +44 (1252) 81 88 88 (sales) +44 (1252) 81 88 18 (service) (Fax) +44 (1252) 81 14 47 sales@rsuk.rohde-schwarz.com
United Kingdom	Rohde & Schwarz UK Ltd. 3000 Manchester Business Park Aviator Way Manchester M22 5TG	(Tel) +44 (870) 735 16 42 (Fax) +44 (1252) 81 14 77 sales@rsuk.rohde-schwarz.com
Uruguay	Aeromarine S.A. Cerro Largo 1497 11200 Montevideo	(Tel) +598 (2) 400 39 62 (Fax) +598 (2) 401 85 97 cs@aeromarine.com.uy
USA	Rohde & Schwarz, Inc. Eastern Regional Office (US Headquarters) 8661A Robert Fulton Drive Columbia, MD 21046-2265	(Tel) +1 (410) 910 78 00 (Fax) +1 (410) 910 78 01 info@rsa.rohde-schwarz.com
	Rohde & Schwarz, Inc. Central Regional Office / Systems & EMI Products 8080 Tristar Drive Suite 120 Irving, TX 75063	(Tel) +1 (469) 713 53 00 (Fax) +1 (469) 713 53 01 info@rsa.rohde-schwarz.com
	Rohde & Schwarz, Inc. R&D and Application Support 8905 SW Nimbus Ave Suite 240 Beaverton, OR 97008	(Tel) +1 (503) 403 47 00 (Fax) +1 (503) 403 47 01 info@rsa.rohde-schwarz.com
	Rohde & Schwarz, Inc. Western Regional Office 7700 Irvine Center Drive Suite 100 Irvine, CA 92618	(Tel) +1 (949) 885 70 00 (Fax) +1 (949) 885 70 01 info@rsa.rohde-schwarz.com
	Rohde & Schwarz, Inc. Service & Calibration Center 8661A Robert Fulton Drive Columbia, MD 21046-2265	(Tel) +1 (410) 910 50 02 (Fax) +1 (410) 910 79 31 service.rsa@rsa.rohde-schwarz.com
Vietnam	Rohde & Schwarz Representative Office Vietnam Unit 807, 8/F, Schmidt Tower 239 Xuan Thuy Road Cau Giay District Hanoi	(Tel) +84 (4) 834 20 46
West Indies	siehe/see Mexico	

Table of Contents

Figs.

1 Putting into Operation

Follow the instructions below precisely to prevent damage to the sensor – particularly when you are putting it into operation for the first time.

Unpacking the sensor

Remove the sensor from its packing and check that nothing is missing. Inspect all items for damage. If you discover any damage, inform the carrier responsible immediately and keep the packing to support any claims for compensation.

It is also best to use the original packing if the sensor is to be shipped or transported at a later date..

The sensor contains components which can be destroyed by electrostatic discharges. To prevent this happening, never touch the inner conductor of the RF connector and never open the sensor.

Connecting the sensor

To prevent EMI, the sensor must never be operated with its enclosure wholly or partially removed. Only use shielded cables that meet the relevant EMC standards.

Never exceed the maximum RF power limit. Even brief overloads can destroy the sensor.

In many cases, the RF connector only requires manual tightening. However, for maximal measurement accuracy, the RF connector must be tightened using a torque wrench with a nominal torque of 1.36 Nm (12" lbs.).

Operation with the R&S NRP basic unit

Connecting the sensor to the R&S NRP basic unit

The sensor can be connected to the R&S NRP basic unit when it is in operation. The interface connector must be inserted, red marking upwards, into one of the R&S NRP basic unit's sensor connectors. When the sensor is connected, it is detected by the R&S NRP basic unit and initialized.

Connecting the sensor to the DUT

The Sensor R&S NRP-Z11/-Z21 has a male N connector and so can be connected to any standard female N connector. Using light pressure, and keeping the male N connector perpendicular, insert it into the female N connector and tighten the N connector locking nut (right-hand thread).

PC control

Hardware and software requirements

The following requirements must be met if the sensor is to be controlled by a PC via an interface adapter:

- The PC must have a USB port.
- The PC's operating system must support the USB port. This is the case with Windows™ 98, Windows™ ME, Windows™ 2000, Windows™ XP and more recent versions of the Windows™ operating system.
- The USB device drivers in the supplied *NRP Toolkit* software package must be installed.

If these requirements are met, the sensor can be controlled using a suitable application program such as the NrpFlashup program contained in the NRP Toolkit (includes the modules Power Viewer, USB Terminal, Firmware Update and Update S-Parameters).

When you insert the CD-ROM supplied with the R&S NRP, the NRP Toolkit is automatically installed on your PC. The rest of the procedure is self-explanatory.

The sensor can be powered in two ways:

- *Self-powered* from a separate power supply via the Active USB Adapter R&S NRP-Z3.
- *Bus-powered* from the PC or a USB hub with its own power supply (*self-powered hub*) via the Active USB Adapter R&S NRP-Z3 or via the Passive USB Adapter R&S NRP-Z4.

As the sensor is a *high-power device*, there is no guarantee that it can be powered from all types of laptop or notebook in the *bus-powered* mode. To be sure, you should determine the current at the USB connectors beforehand:

- *In the Windows™ start menu, select Settings – Control Panel*

- *Select the System icon*

- *Select the Hardware tab*

- *By clicking on the button with that name, start the Device Manager*

- *Open USB Controller (all USB controllers, hubs and USB devices are listed here)*

- *Double-click on USB Root Hub or select Properties in the context menu (use the right-hand mouse button)*

- *Select the Power tab (Fig. 1-1). If the hub is self-powered and the total power available is, as indicated by Hub Information, 500 mA per port, high-power devices can be connected.*
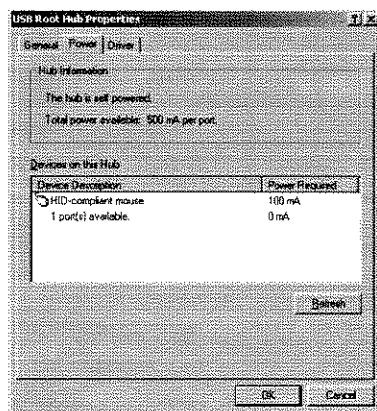
Fig. 1-1   Displaying the total available power of a USB port

If you have any doubts, ask the manufacturer if the USB port on your laptop or notebook can handle *high-power devices.*

Operation via the Active USB Adapter R&S NRP-Z3

Figure 1-2 shows the configuration with the Active USB Adapter R&S NRP-Z3, which also makes it possible to feed in a trigger signal for the *Timeslot* and *Scope* modes. The order in which the cables are connected is not critical.
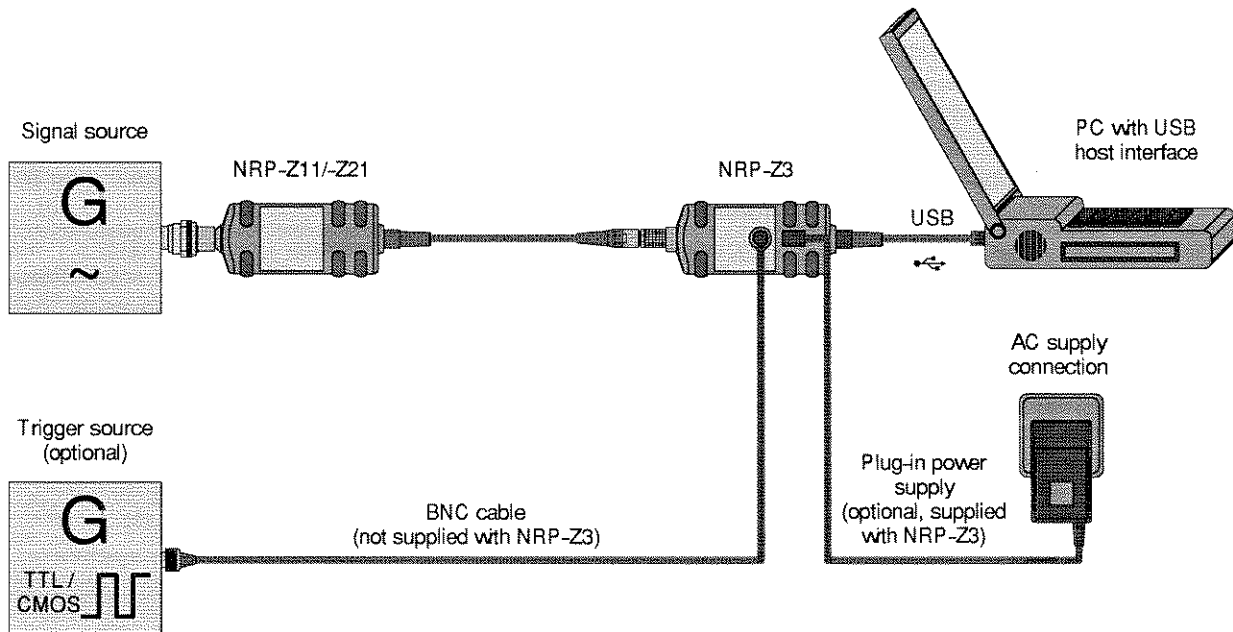
Fig. 1-2   Configuration with Active USB Adapter R&S NRP-Z3

The plug-in power supply for the R&S NRP-Z3 can be powered from a single-phase AC source with a nominal voltage range of 100 V to 240 V and a nominal frequency between 50 Hz and 60 Hz. The plug-in power supply autosets to the applied AC voltage. No manual voltage selection is required.

The plug-in power supply comes with four primary adapters for Europe, the UK, the USA and Australia. No tools of any kind are required to change the primary adapter. The adapter is pulled out manually and another adapter inserted until it locks (Fig. 1-3).
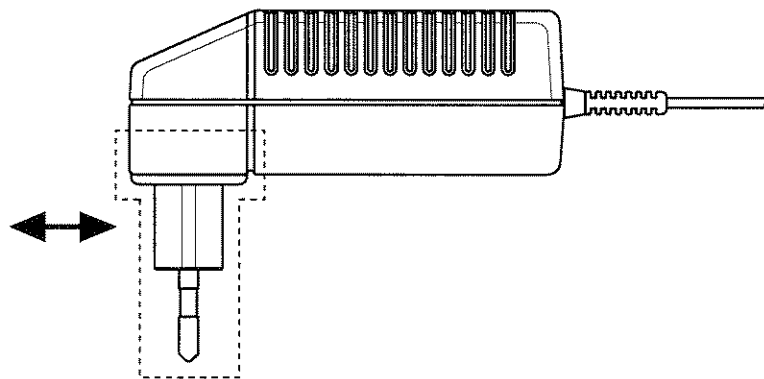
Fig. 1-3   Changing the primary adapter

The plug-in power supply is short-circuit-proof and has an internal fuse. It is not possible to replace this fuse or open the plug-in power supply.

⚠️ *The plug-in power supply is not intended for outdoor use.*

Keep within the temperature range of 0°C to 50°C.

If there is any condensation on the plug-in power supply, dry it off before connecting it to the AC supply.

Operation via the Passive USB Adapter R&S NRP-Z4

Fig. 1-4 is a schematic of the measurement setup. The order in which the cables are connected is not critical.
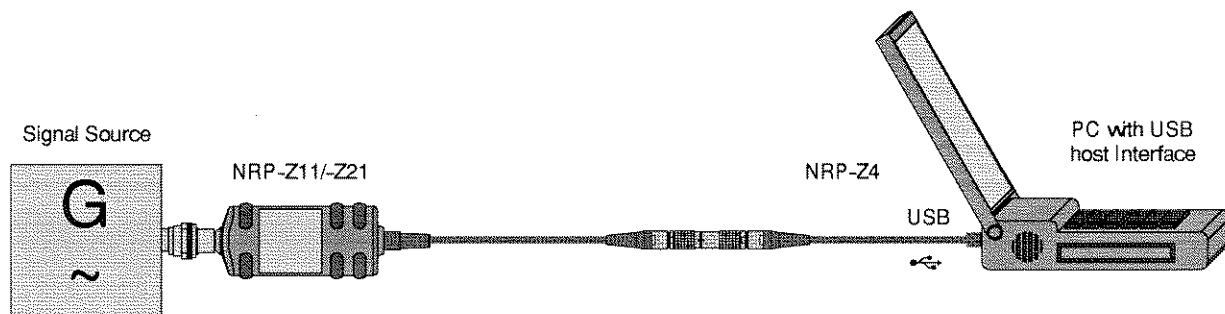
Fig. 1-4   Configuration with Passive USB Adapter R&S NRP-Z4

Connecting the sensor to the DUT

See the section "Operation with the R&S NRP basic unit" for information on how to connect the sensor to the DUT.

Table of Contents

Figs.

Tables

2 Virtual Power Meter

You will find the **NrpFlashup** program for controlling sensors with a PC under Windows™ on the CD-ROM that accompanies the sensor. The program comprises several modules which can be started centrally via the Windows™ start-menu entry **NRP Toolkit**.

This section describes the **Power Viewer** program module. This is a virtual power meter which only uses a cut-down set of the sensor's functions. This means that after an extremely brief familiarization period, the user can measure the average power of modulated signals.

The other modules in **NrpFlashup** are described in Chapter 3 of the operating manual (**Terminal** and **Update S-Parameters** modules) or in the service manual (**Firmware Update** module).

Overview

Start the virtual power meter using the **NRP Toolkit – Power Viewer** start-menu entry. The **Power Viewer** program window is displayed (Fig. 2-1).
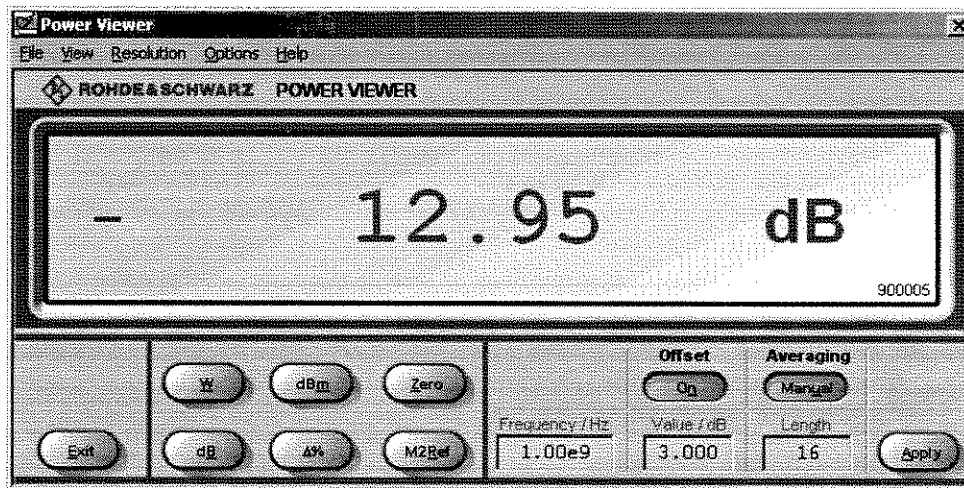
Fig. 2-1   **Power Viewer** – virtual power meter

The result display occupies most of the program window. The result, unit and additional sensor status information are displayed. The serial number of the sensor is displayed in the bottom right. The program window also contains animated buttons and entry fields (see Table 2-1 and Table 2-2).

Table 2-1   Virtual power meter keys

Button	Function	Key combination
Exit	Terminates the program. The current settings are saved and recalled the next time the program is started.	Alt + E
W	Selects Watt as the display unit.	Alt + W
dBm	Selects dBm as the display unit.	Alt + M
Zero	Zeroes the sensor.	Alt + Z
dB	Selects dB as the display unit. This is the log of the ratio of the measured value to the reference value.	Alt + B
Δ%	Selects % as the display unit. The difference between the measured value and the reference value is expressed as a percentage.	Alt + %
M2Ref	Makes the current measured value the reference value for the relative display units dB and %.	Alt + R
Offset On/Off	Turns the offset correction for the sensor on or off. If the offset correction is Off, the **Offset/dB** entry field has a grey background.	Alt + N
Averaging Man/Auto	Turns auto-averaging on or off. When auto-averaging is on, the **Length** entry field has a grey background; the current averaging factor is displayed.	Alt + T
Apply	Accepts edited numerical values in the **Frequency/Hz**, **Value/dB** and **Length** entry fields and transfers them to the sensor.	Alt + A or Enter key

Table 2-2   Virtual power meter entry fields

Entry field	Function
Frequency/Hz	Frequency of the RF carrier in Hertz.
Value/dB	Attenuation in dB of the twoport connected to the sensor. The valid range is –100 to 100. The offset correction must be activated beforehand with the **Offset On/Off** button if this entry field is to be edited.
Length	Length of the averaging filter (= averaging factor). The valid range is 1 to 65536. Averaging must be set to manual with the **Averaging Man/Auto** button if this entry field is to be edited.

Scientific notation can also be used for the entry fields. If an invalid entry is made, an error message is output. An edited numerical value will not be transferred to the sensor unless you use the **Apply** button or the Enter key to terminate the entry.

Menus

The menu bar can be used to call less frequently used functions.

| File | **Start Log ...** | Opens a file-selection dialog to specify the path and name of the log file. Clicking the **Save** button starts the recording. All displayed values are written line-by-line to the log file with the date (format: YY/MM/DD) and time (format: hh:mm:ss.ms). Example: `-22.51 dBm (03/02/25 15:37:25.310)` |

Stop Log — Ends the log-file recording.

View — **Display Refresh Rate** — Opens a dialog box to adjust the display refresh rate. The time in milliseconds between two refresh operations is entered. The default setting is 200 ms.
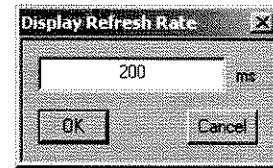
Colours — Opens a dialog box to select the background colour for

    Result   • the result,

    Unit   • the unit,

    Edit   • the text in the number fields or

    Button   • the key labelling.

Resolution — For setting the result resolution. If auto-averaging has been selected, a higher resolution leads to a greater averaging factor, which means a longer result settling time.
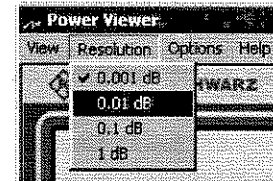
Options — **Read Sensor Status ...** — Reads the current sensor status. A parameter list is output.
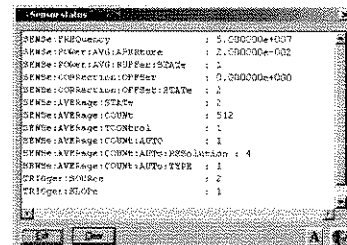
Read Error Queue ... — Reads the error queue. All the error messages that have been issued since the last call are read line-by-line. A tick before this menu entry indicates that an error has occurred.
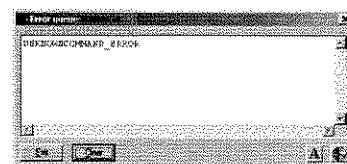
Simulation ...	For trying out the functions of the virtual power meter without actually connecting a sensor. The display alternates between **Measurement Value 1** & **Measurement Value 2** with a period given by **Interval**. Simulation can be activated immediately with the **Activate** check box.	

Measurement Simulation	☒
Measurement Value 1:	2.0	W
Measurement Value 2:	3.0	W
Jitter:	0.1	W
Interval:	200	ms
	☐ Jitter ☐ In dBm
Apply	☑ Activate
Exit	☐ Open on Startup
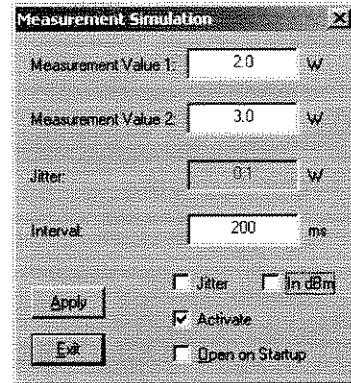
	Reset Sensor	Initializes the sensor. Any previous zeroing remains valid.
Help	**Contents**	Opens the table of contents for the online-help facility.
	About	Displays information about the program version used, etc.

Table of Contents

Figs.

Tables

3 Manual Operation

The previous section describes the Power Viewer program module supplied with the instrument. This module simplifies the most frequently used function of a power meter – measuring the average power of an RF signal of almost any modulation. Other program modules are also part of the supplied equipment and can be selected in the Start menu:

- **Power Viewer**: A detailed description of this virtual power meter module is provided in section 2.

- **Terminal**: Program module for sending commands and command sequences to the sensor and for displaying measurement results, status information and other data from the sensor

- **Firmware Update**: Program module for updating the sensor firmware

- **Update S-Parameters**: Program module for loading an s-parameter table into the sensor

Program module "Terminal"

Main control elements

With the USB terminal, commands and command sequences can be sent to the sensor in two different ways:

- Commands are entered in the **Input** field (Fig. 3-1). Consecutive commands can be entered as separate lines, one below the other. The buttons associated with the **Input** field are described in Table 3-1.

- Commands or command sequences are stored in *command files*. Command files are created with a text editor, for instance, and then stored. They can be called as often as required (Fig. 3-2). The buttons of the **Command File** field are described in Table 3-2.
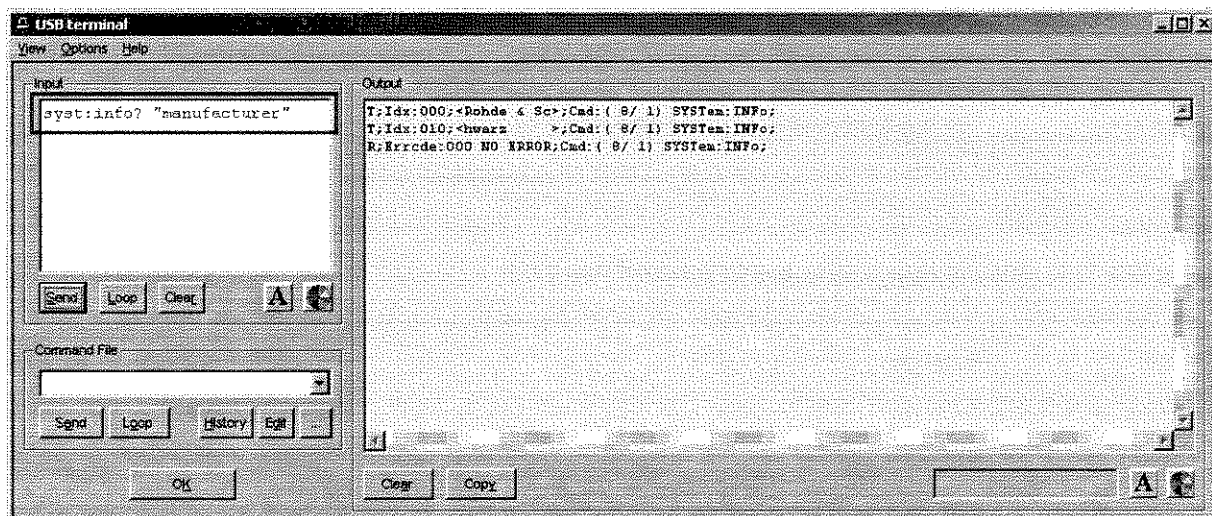

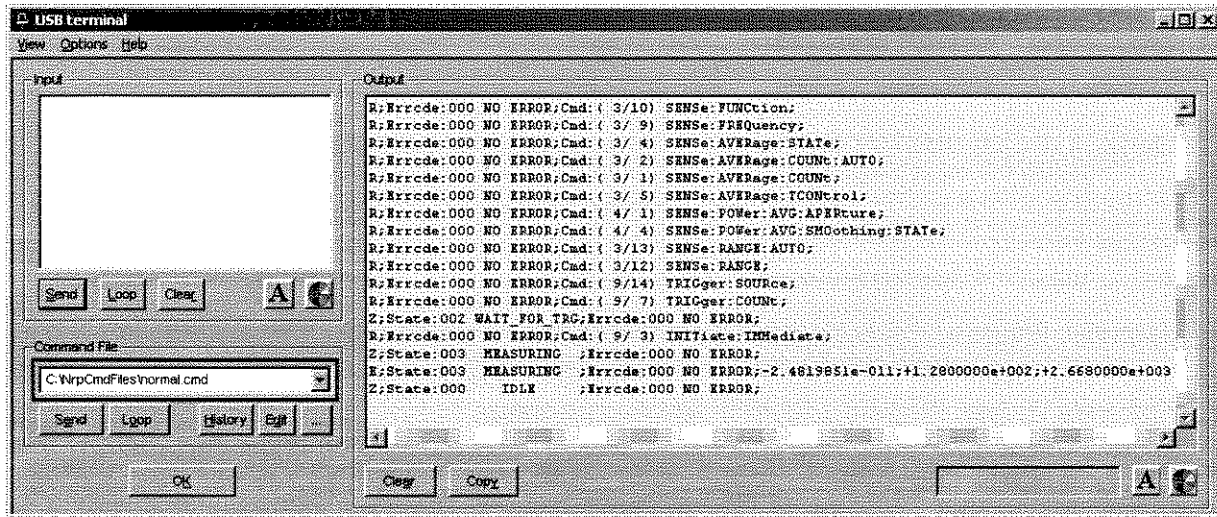Fig. 3-1   Sending commands using the **Input** field

Fig. 3-2   Sending commands using command files

Table 3-1   Buttons assigned to the **Input** field

Button	Function	Key combination
Send	Sends the content of the **Input** entry field to the sensor.	Alt + S
Loop	With **Loop** the command or command sequence is cyclically sent. Pressing the button again terminates the cyclic transmission. The repetition rate is set in a dialog window that can be opened with **View - Loop...**	Alt + L
Clear	Clears the content of the **Input** field.	Alt + R
Font key	Opens a dialog window where the font for the **Input** field can be selected.	
Colour key	Opens a dialog window where the background colour of the **Input** field can be selected.	

Table 3-2   Buttons assigned to the **Command File** field

Button	Function	Key combination
Send	Sends the content of the command file to the sensor.	Alt + E
Loop	With **Loop** the command or command sequence is cyclically sent. Pressing the button again terminates the cyclic transmission. The repetition rate is set in a dialog window that can be opened with **View - Loop...**	Alt + O
History	Opens a window for editing the command file name in the **Command File** field.	Alt + H
Edit	Opens the selected command file in the Windows™ text editor.	Alt + D
...	Opens a file opening dialog for selecting the command file.	

A command line starting with a tab, a blank or a special character is considered a comment and not forwarded to the sensor.

Measurement results, parameters and status information returned by the sensor are displayed in the **Output** field.

Table 3-3   Buttons assigned to the **Output** field

Button	Function	Key combination
Clear	Clears the content of the **Output** field	Alt + A
Copy	Copies the content of the **Output** field to the clipboard. (Another possiblity: mark the desired information in the output window with the mouse cursor, press the right mouse key or Ctrl+C and then copy the selected text to the clipboard using the menu item **Copy** in the opened context menu.)	Alt + Y
Font button	Opens a dialog window where the font for the **Output** field can be selected.	
Colour button	Opens a dialog window where the background colour of the **Output** field can be selected.	

Close the USB terminal with OK.

Menus

View   **Post Filter ...**   Opens the **Output Postfilter** dialog window where the lines stored in the input buffer can be filtered according to different criteria.
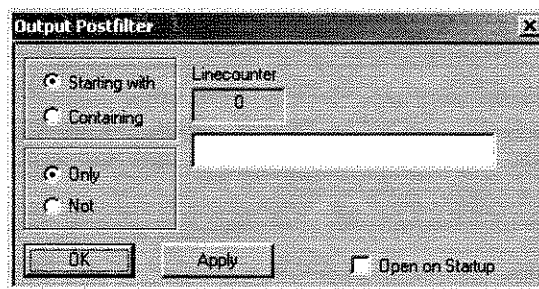
Filter criteria:

Only + Starting with: Only lines starting with the entered character string are displayed.

Not + Starting with: Only lines not starting with the entered character string are displayed.

**Only + Containing**: Only lines containing the entered character string are displayed.

Not + Containing: Only lines not containing the entered character string are displayed.

Lines not matching the specific filter criterion are blanked but not cleared.

Filtering is started with **Apply**. The number of lines matching the filter criterion is displayed in the **Linecounter** field. If **Open on startup** is active, the **Output Postfilter** dialog is automatically opened when the terminal is started. The dialog window is closed with **OK**.

Response Time ...

Opens the **Response time** dialog window where the response time of the sensor can be set.
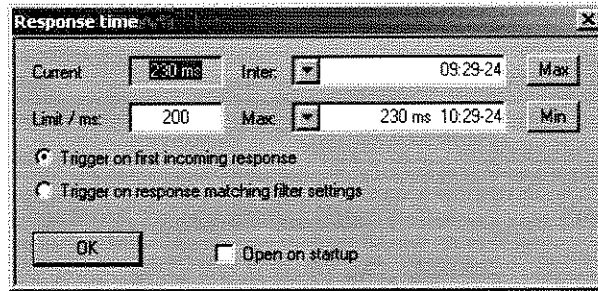
Current indicates the time elapsed between dispatch of the last command and receipt of an acknowledgement from the sensor. When the **Max** button is clicked, the response times exceeding the value in the **limit / ms** field are recorded. When the **Min** button is clicked, the response times within the value in the **limit / ms** field are recorded.

If **Trigger on first incoming response** is active, the time measurement is terminated as soon as the first response arrives after a command is sent. If **Trigger on response matching filter settings** is active, the time measurement is terminated as soon as the first response matching the filter criterion in the **Output Postfilter** dialog window is received.

If **Open on startup** is active, the **Response Time** dialog is automatically displayed when the Terminal module is started. The dialog window is closed with **OK**.

Loop ...

Opens the **Loop controls** dialog window where the cyclic transfer of commands and command sequences can be controlled.


In the **Delay / ms** field, the time interval for the cyclic transfer is specified in milliseconds.

The number of completed transfer cycles is displayed in the **Counter** field. If **Open on startup** is active, the **Response time** dialog is automatically opened when the Terminal module is started. The dialog window is closed with **OK**.
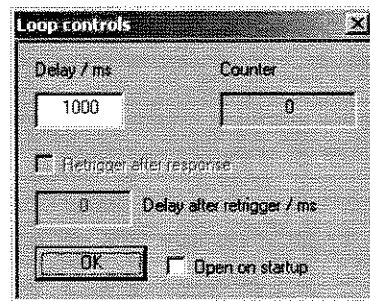
Options   **Protocol Mode**   In this mode, a time stamp is added to each response block.

           Hex Mode   In this mode, the response blocks from the sensor are displayed in hexadecimal format.

           Auto Delete   With this option active, the **Output** field is automatically cleared when the **Send** button is pressed.

           Auto Scroll   With this option active, older items in the **Output** field are automatically shifted upward and off the display if space is required for new values.

           LF at EOT   With this option active, a line feed is appended to each response block from the sensor.

           Delete on Start   With this option active, the **Output** field is automatically cleared when the Terminal module is started.

           Send as Hex   With this option active, the text in the **Input** field is interpreted as a hexadecimal character sequence.

           Advanced ...   Opens a dialog window where the buffer size for the **Output** field can be set.
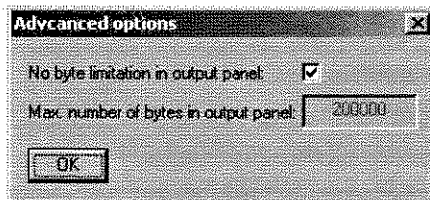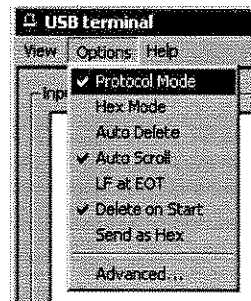
Help   **Contents**   Opens the table of contents for the online help.

           About   Displays information about the program version, etc.

Program module "Firmware Update"

A detailed description of the program module for firmware updates is provided in the Service Manual.

Program module "Update S-Parameters"

Fundamentals

With the Sensor R&S NRP-Z11/-Z21 the influence of any twoport connected to the input on the measurement result can be corrected by way of calculation. A precondition is that a complete set of s-parameters of the twoport is available in the frequency range in question. The set of calibration data in the R&S NRP-Z11/-Z21 therefore includes an s-parameter table with up to 1000 measurement frequencies. The real and the imaginary part of each frequency as well as the uncertainty of s-parameters s_{11}, s_{12}, s_{21} and s_{22} can be stored. Since the measurement frequencies in the s-parameter table are independent of the calibration frequencies, they can be set so that the twoport frequency range of interest is optimally covered. The real and the imaginary parts between these measurement frequencies are linearly interpolated, while the more substantial measurement uncertainty at the two neighbouring frequency points is used for calculating the uncertainty of the measurement result. Below the first and above the last measurement frequency, the values of the first and the last measurement frequency are used, respectively.

The NrpFlashup program (menu item **Update S-Parameters**) is used for loading an s-parameter table. To ensure compatibility with a great number of network analyzers, NrpFlashup can process measurement data files in S2P format. All standard frequency units (Hz, kHz, MHz, GHz) and display formats (real and imaginary part, linear magnitude and phase, magnitude in dB and phase) are supported. The only restriction is that a reference impedance of 50 Ω must be used for the s-parameters. Other noise parameters in the measurement data file are not evaluated.

Structure of the S2P measurement data file:

1. The *option line* has the following format:
   # [<frequency unit>] [<parameter>] [<format>] [<R n>]
   # identifies the *option line*.
   The <frequency unit> may be Hz, kHz, MHz or GHz. If a frequency unit is not specified, GHz is implicitly assumed.
   If a parameter is specified, S must be used in <parameter> for s-parameter files. If a parameter is not specified, S is implicitly assumed.
   The <format> may be MA (linear magnitude and phase in degree), DB (magnitude in dB, phase in degree) or RI (real and imaginary part). If a format is not specified, MA is implicitly assumed.
   R is optional and followed by the reference impedance in Ω. If an entry is made for R, R50 must be specified. If no entry is made, R50 is implicitly assumed.
   The *option line* should therefore read:
   # [HZ | KHZ | MHZ | GHZ] [S] [MA | DB | RI] [R 50]

2. The measurement frequencies in ascending order are specified as follows:
   $$f_i \quad s_{11}(f_i) \quad s_{21}(f_i) \quad s_{12}(f_i) \quad s_{22}(f_i),$$

   where $s_{jk}(f_i)$ is the specified display format for the *option line*.

   $|s_{jk}(f_i)| \quad \arg s_{jk}(f_i)$ (display format for linear magnitude and phase in degree) or

   $20 \cdot \lg |s_{jk}(f_i)| \quad \arg s_{jk}(f_i)$ (display format for magnitude in dB and phase in degree)

   $\mathrm{Re}\,|s_{jk}(f_i)| \quad \mathrm{Im}\,|s_{jk}(f_i)|$ (display format for real and imaginary part)

3. Comments: Any line starting with an exclamation mark (!) is interpreted as a comment line.

To characterize the measurement uncertainty of the s-parameter test system, another data file can optionally be created. Without this file, the measurement uncertainty cannot be correctly calculated in the sensor. The syntax of the uncertainty data file is similar to that of the S2P data file but U is specified as <Parameter> in the *option line* so that the *option line* reads # Hz U for frequencies in Hz.
The measurement frequencies must not be identical to those of the S2P measurement data files. In most cases a few entries will be sufficient to characterize the measurement uncertainty of the s-parameter test system. An s-parameter uncertainty as high as that of the neighbouring measurement frequencies of the uncertainty data file is then selected. If different values are available, the higher one is chosen. This is illustrated in the example below:

Table 3-4   Uncertainties of the s-parameter test system (example)

f in GHz	unc [$s_{ik}(f)$]
0.1	0.01
1.0	0.01
1.1	0.005
10.0	0.005
10.1	0.01
40.0	0.01

Table 3-5   Interpolated uncertainties of measurement frequencies for s-parameters (example)

f in GHz	unc [$s_{ik}(f)$]
0.9	0.01
0.95	0.01
1.0	0.01
1.05	0.01
1.1	0.005
1.15	0.005
1.2	0.005

At 1.05 GHz, the higher uncertainty of the two adjacent 1.0 GHz and 1.1 GHz measurement frequencies is entered in the s-parameter table. If an uncertainty of 0.005 is desired for all frequencies above 1.0 GHz, the first measurement frequency in the uncertainty data file must above 1.0 GHz, e.g. 1.000001 GHz.

Structure of the uncertainty data file:

1. The *option line* has the following format:

> \# [<frequency unit>] <parameter> [<format>] [<R n>]
> \# identifies the *option line*.
> The <frequency unit> may be Hz, kHz, MHz or GHz. If a frequency unit is not specified, GHz is implicitly assumed.
> U must be specified for <parameter> in uncertainty data files. If a parameter is not specified, S is implicitly assumed and as a result an error message is triggered.
> <format> is ignored in uncertainty measurement files; the entry is therefore irrelevant.
> R is optional and followed by the reference impedance in Ω. If an entry is made for R, R50 must be specified. If no entry is made, R50 is implicitly assumed.
> The *option line* should therefore read:
> \# [HZ | KHZ | MHZ | GHZ] U [MA | DB | RI] [R 50]

2. Measurement frequencies in ascending order are specified in the following form:

$$f_i \quad \mathrm{unc}\left[s_{11}(f_i)\right] \quad \mathrm{unc}\left[s_{21}(f_i)\right] \quad \mathrm{unc}\left[s_{12}(f_i)\right] \quad \mathrm{unc}\left[s_{22}(f_i)\right].$$

The s-parameters uncertainties are forwarded as follows:

- as extended absolute uncertainties ($k=2$) for the magnitude of reflection parameters s_{11} and s_{22}, for instance 0.015,
- as extended uncertainties ($k=2$) in dB for the magnitude of transmission parameters s_{21} and s_{12}, for instance 0.015.

3. Comments: Any line starting with an exclamation mark (!) is interpreted as a comment line.

Two additional values must be specified when the s-parameters are loaded: the lower and the upper nominal measurement limit of the sensor-twoport combination. If s-parameter correction is active, these values are transferred by the sensor in response to SYSTem:INFO? The values cannot always be derived from the lower or upper measurement limit of the sensor alone and from the loss or gain of the preconnected twoport. The upper measurement limit of the sensor-twoport combination may also be limited by the twoport's maximum power-handling capacity. Furthermore, the lower measurement limit may be raised not only by the loss but also by the inherent noise of the twoport. For this reason, NrpFlashup allows these values to be entered.

> ⚠ *The upper nominal measurement limit of the sensor-twoport combination entered when loading the s-parameters should be carefully specified, as automatic test systems may evaluate it and an incorrect value may cause the sensor and/or the twoport to be overloaded.*

Procedure

To load an s-parameter table into the calibration set of the sensor, proceed as follows:
1. Connect the sensor to the USB port of the PC and start NrpFlashup.

2. Activate **Update S-Parameters** in the menu. The corresponding dialog window is opened (Fig. 3-3).

3. Under **S-Parameter File** enter the search path and the name of the S2P file containing the parameters. Press the **Browse...** button to open a file-opening dialog where the S2P measurement data file can be easily selected.

4. Under **Uncertainty File** enter the search path and the name of the measurement uncertainty file containing the measurement uncertainty of the s-parameter test system. Press the **Browse...** button to open a file-opening dialog where the measurement uncertainty file can be easily selected.

5. Enter the upper and lower nominal measurement limit of the sensor-twoport combination in the **Lower Power Limit** and **Upper Power Limit** fields.

6. Enter a name for the loaded s-parameter set in the **S-Parameter Device Mnemonic** field. This name can later be queried with *SYSTem:INFO? "SPD Mnemonic"* and is displayed on the NRP basic unit when s-parameter correction is switched on.

7. Activate **S-Parameter Correction on by Default** if the *SENSe:CORRection:TRANsmission* switch should be automatically set to *ON* when the sensor is put into operation.

8. Press **Start** for loading. (The dialog is closed with **OK** and the set parameters are retained. When the dialog is exited with **Cancel**, all parameter modifications are ignored.)
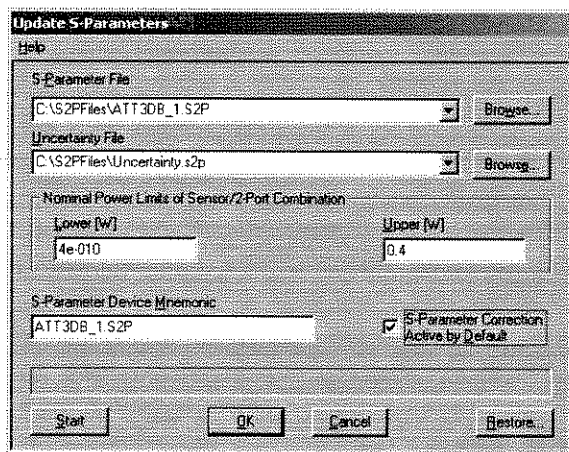

Fig. 3-3   Dialog window for loading an s-parameter table

During loading, the current calibration data set of the sensor is overwritten. To be on the safe side, a backup copy of the current calibration data set is therefore automatically stored before s-parameters are loaded. The names of the backup files have the structure <batch number>_<date><time>.bak, where <batch number> is the batch number of the sensor, <date> the date of the s-parameter update in yymmdd format and <time> the time of the s-parameter update in the format hhmmss.

> *Store the automatically created backup files on a separate data medium (e.g. diskette, CD-ROM or network drive) and, if required, assign an meaningful name to them to simplify reloading. With the aid of these files, a previously used calibration data set of the sensor can be restored.*

To reload the backup file of a calibration data set into the sensor, proceed as follows:

- Press the **Restore...** button. The **Restore S-Parameters** window is opened (Fig. 3-4).
- Enter the search path and the name of the backup file in the **Backup File** field. Press the **Browse...** button to open a dialog where the backup file can be easily selected.
- Press **OK** to start the restore procedure. (With **Cancel** the dialog window is exited without data being restored).
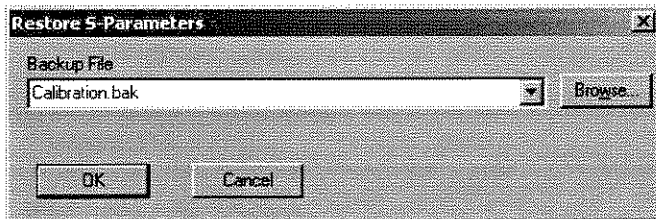

Fig. 3-4   Dialog window for loading the backup file of a calibration data set

Table of Contents

E-3

5 Remote Control – Fundamentals

Rohde & Schwarz recommends to utilize the VXI Plug & Play Driver for the remote control of R&S NRP power sensors. This driver can be found on the CD-ROM supplied with the sensor or downloaded in its most recent version via the internet (http://rohde-schwarz.com/).

The old remote control interface provided by the *Dynamic Link Library NrpControl.dll* is not developed further, but remains on the CD-ROM and can be downloaded via the internet.

Table of Contents

Figs.

Tables

6 Remote Control – Commands

Notation

In the following sections, all commands implemented in the sensor are first listed in a table according to command systems and are then described in detail. The notation is largely in line with the SCPI standard.

Command tables For a quick overview of available commands, the commands are listed in a table before they are described. These tables contain the following four columns:

Command: Commands and their tree structure.
Parameters: Possible parameters.
Unit: The basic unit of the physical parameters (must not be sent with parameters).
Remarks: Identification of all commands
              • that have no query form
              • that are available as query only

Indentations The various levels of the SCPI command hierarchy are shown in the table by indentations to the right. The lower the level, the greater the indentation to the right. It should be noted that the complete notation of the command includes the higher levels too.

Example:
SENSe:AVERage:COUNt is represented in the table as follows:
SENSe   first level
   :AVERage   second level
     :COUNt   third level

In the individual description, the command is shown in full length. An example of the command is given at the end of the description.

[?]
?   A question mark in square brackets at the end of a command indicates that this command can either be used as a setting command (without question mark) or as a query (with question mark). If the question mark is not in square brackets, the command is a query only.

Example:
SENSe:POWer:AVG:APERture[?]
SENSe:POWer:AVG:APERture 1e-3 sets the length of the sampling window to 1 ms.

SENSe:POWer:AVG:APERture? Returns the currently set length as a response.
*IDN? Queries the sensor identification string that of course cannot be changed. For this reason, this command is only available as a query.

Special characters | for parameters   A vertical bar between parameters is used to separate alternative options (OR link).

Example:
NITiate:CONTinuous OFF | ON
The parameter *OFF* or *ON* can be entered.

{numeric expression}   A numeric expression in braces means that it has been rounded to the nearest integral value.

<parameter>
<variable>   A parameter or a variable in triangular brackets expresses its current value.

Commands as per IEEE 488.2

The sensor supports a subset of the possible setting commands and queries *(Common Commands and Queries)* in line with IEEE 488.2.

*IDN? – IDentification Query

IDN? returns a string with information on the sensor's identity (device identification code). In addition, the version number of the installed firmware is indicated. The string for a sensor of type R&S NRP-Z21 has the following structure:

ROHDE&SCHWARZ,NRP-Z21,<serial number>,<firmware version>

<serial number>: Serial number in ASCII
<firmware version>: Firmware version number in ASCII

*RST – Reset

RST sets the sensor to the default state, i.e. the default settings for all test parameters are loaded.

*TRG – Trigger

TRG triggers a measurement. For this purpose, the sensor is in the *WAIT_FOR_TRIGGER* state and the source for the trigger event is set to *BUS (TRIGger:SOURce BUS)*.

*TST? – Self Test Query

TST? starts a selftest and returns 0 (no error found) or 1 (an error has occurred). The selftest comprises the following functions:

- RAM test
- Operating voltages
- Temperature measurement
- Calibration data set
- Noise
- Zero-point offsets.

SCPI Commands

The sensors R&S NRP-Z11/-Z21 are controlled via the groups of commands

- CALibration (zeroing)
- SENSe (measurement configurations)
- SYSTem
- TRIGger
- SERVice.

CALibration

Table 6-1   Commands of the *CALibration* system

Command	Parameter	Unit	Remarks
CALibration			
:DATA[?]	<calibration data set as definite length block>		
:LENGth?		Bytes	Query only
:ZERO			
:AUTO[?]	OFF	ON	ONCE		

CALibration:DATA[?]   <calibration data set as *definite length block*>

CALibration:DATA is used for writing a calibration data set in the flash memory of the sensor.

The query yields the calibration data set currently stored in the flash memory as a *definite length block*.

CALibration:DATA:LENGth?

CALibration:DATA:LENGth? yields the length in bytes of the calibration data set currently stored in the flash memory. Programs that read out the calibration data set can use this information to determine the capacity of the buffer memory required.

CALibration:ZERO:AUTO[?]   OFF | ON | ONCE

The commands *CALibration:ZERO:AUTO ON* and *CALibration:ZERO:AUTO ONCE* zeroes the three measurement paths of the sensor. For this purpose, the test signal must be deactivated or the sensor disconnected from the signal source. The sensor automatically detects the presence of any significant power to be measured. This causes zeroing to be aborted and error message *NRPERROR_CALZERO* to be output. The *CALibration:ZERO:AUTO OFF* is ignored. Zeroing takes four seconds at a minimum, but at least as long as the selected averaging filter needs for settling (only fixed-filter mode).

Repeat zeroing

- *during warm-up after switching on or connecting the instrument*

- *after a substantial variation of the ambient temperature*

- *after fastening the sensor to an RF connector at high temperature*

- *after several hours of operation*

- *when very low-power signals are to be measured, e.g. less than 10 dB above the lower measurement limit.*

For zeroing switch off the test signal and do not remove the sensor from the signal source. Apart from keeping the thermal balance, this has the advantage that the noise superimposed on the test signal (e.g. from a broadband amplifier) can be detected on zeroing and does not impair the measurement result.

The query always yields *1* (= *OFF*).

Default setting

After a power-on reset, the zero offsets determined during the last calibration are used until the first zeroing. Therefore, very slight zero offsets are to be expected with a warmed up sensor. Initialization by means of **RST* or *SYSTem:INITialize* has no influence on the current zero offsets.

SENSe (Sensor Configuration)

The sensor is configured by means of the commands of the groups *SENSe* and *TRIGger*.

Table 6-2   Commands of the *SENSe* system

Command	Parameter	Unit	Remarks
SENSe			
:AVERage			
:RESet			No query
:STATe[?]	OFF | ON		
:TCONtrol[?]	MOVing | REPeat		
:COUNt[?]	1 to 65536		
:AUTO[?]	OFF | ON | ONCE		
:TYPE[?]	RESolution | NSRatio		
:MTIMe[?]	1.0 to 999.99	s	
:NSRatio[?]	0.0001 to 1.0	dB	
:RESolution[?]	1 to 4		
:SLOT[?]	1 to <SENSe:POWer:TSLot:AVG:COUNt>		
:CORRection			
:OFFSet[?]	-200.0 to 200.0	dB	
:STATe[?]	OFF to ON		
:DCYCle[?]	0.001 to 99.999	%	
:STATe[?]	OFF to ON		
:SPDevice:STATe[?]	OFF to ON		
:FREQuency[?]	10.0e6 to 8.0e9 (NRP-Z11) or 18.0e9 (NRP-Z21)	Hz	
:FUNCtion[?]	"POWer:AVG" | "POWer:TSLot:AVG" | "POWer:BURSt:AVG" | "XTIME:POWer"		
:POWer			
:AVG			
:APERture[?]	1.0e-6 to 0.3	s	
:BUFFer			
:STATe[?]	OFF | ON		
:SIZE[?]	1 to 1024		

Command	Parameter	Unit	Remarks
:SMOothing:STATe[?]	OFF | ON		
:BURSt:DTOLerance[?]	0.0 to 3.0e-3	s	
:TSLot:AVG			
:COUNt[?]	1 to 128		
:WIDTh[?]	10e-6 to 100e-3	s	
:RANGe [?]	0 to 2		
:AUTO[?]	OFF | ON		
:CLEVel[?]	0.0 to 20.0	dB	
:SAMPling[?]	FREQ1 | FREQ2		
:SGAMma			
:CORRection:STATe[?]	OFF | ON		
:MAGNitude[?]	0.0 to 1.0		
:PHASe[?]	-360.0 to 360.0	degree	
:TRACe			
:AVERage			
:STATe[?]	OFF | ON		
:TCONtrol[?]	MOVing | REPeat		
:COUNt[?]	1 to 65536		
:AUTO[?]	OFF | ON | ONCE		
TYPE[?]	RESolution | NSRatio		
:MTIMe[?]	1.0 to 999.99	s	
:NSRatio[?]	0.0001 to 1.0	dB	
:RESolution[?]	1 to 4		
:POINt[?]	1 to <SENSe:TRACe:POINts>		
:MPWidth?		s	Query only
:OFFSet:TIME[?]	− (<TRIGger:DELay> + 0.005) to 100.0	s	
:POINts[?]	1 to 1024		
:REALtime[?]	OFF | ON		

Command	Parameter	Unit	Remarks
:TIME[?]	0.0001 to 0.3		
:TIMing			
:EXCLude			
:STARt[?]	0.0 to 3.0e-3	s	
:STOP[?]	0.0 to 3.0e-3	s	

SENSe:AVERage:COUNt[?]   1 to 65536

SENSe:AVERage:COUNt sets the number of measured values that have to be averaged for forming the measurement result in the modes *Continuous Average*, *Burst Average* and *Timeslot*. The higher this averaging factor, the less the measured values fluctuate and the longer the measurement time lasts. The parameter is rounded off to the nearest power-of-two number.

The query yields the averaging factor used in the modes *Continuous Average*, *Burst Average* and *Timeslot*.

The averaging function must be activated with SENSe:AVERage:STATe ON *so that the set averaging factor becomes effective.*

Default setting: *4*

SENSe:AVERage:COUNt:AUTO[?]   OFF | ON | ONCE

SENSe:AVERage:COUNt:AUTO activates (auto-averaging) or deactivates (fixed-filter mode) automatic determination of the averaging factor in the modes *Continuous Average*, *Burst Average* and *Timeslot*. If auto-averaging is activated, the averaging factor is continuously determined and set depending on the level of power and other parameters.

SENSe:AVERage:COUNt:AUTO ON activates auto-averaging and *SENSe:AVERage:COUNt :AUTO OFF* deactivates it. On deactivation, the previous, automatically determined averaging factor is used in the fixed-filter mode. The *SENSe:AVERage:COUNt:AUTO ONCE* command ensures that a new averaging factor is determined by the filter automatic function under the current measurement conditions and used in the fixed-filter mode.

The query yields
- *1* for *OFF,*
- *2* for *ON.*

Default setting: *OFF*

SENSe:AVERage:COUNt:AUTO:MTIMe[?]   1.0 to 999.99

SENSe:AVERage:COUNt:AUTO:MTIMe sets the settling time upper limit of the averaging filter in the auto-averaging mode for the *Continuous Average, Burst Average* and *Timeslot* modes and limits the length of the filter.

The query yields the current settling time upper limit of the averaging filter in the auto-averaging mode for the *Continuous Average, Burst Average* and *Timeslot* modes.

Default setting: *30.0 [s]*

SENSe:AVERage:COUNt:AUTO:NSRatio[?]   0.0001 to 1.0

SENSe:AVERage:COUNt:AUTO:NSRatio determines the relative noise component in the measurement result for the *Continuous Average, Burst Average* and *Timeslot* modes if auto-averaging is operated in the corresponding mode (*SENSe:AVERage:COUNt:AUTO:TYPE NSRatio*). The noise component is defined as the magnitude of the level variation in dB caused by the inherent noise of the sensor (two standard deviations).

The query yields the relative noise component in the result for the *Continuous Average, Burst Average* or *Timeslot* modes.

Default setting: *0.01 [dB]*

SENSe:AVERage:COUNt:AUTO:RESolution[?]   1 to 4

SENSe:AVERage:COUNt:AUTO:RESolution sets the resolution index for the automatic averaging filter in the *Continuous Average, Burst Average* and *Timeslot* modes if it is operated in the *RESolution* mode. The resolution index equals the number of decimal places that have to be taken into account for the further processing of the measurement result in dBm, dBµV or dB. The normal mode is designed in a similar manner as for the predecessors R&S NRVS and R&S NRVD or other commercial power meters. The higher the selected index, the better the measurement result is filtered without the last significant place (0.01 dB with an index of 3) actually being set. The NSRatio setting is recommended instead.

The query yields the resolution index for the *Continuous Average, Burst Average* and *Timeslot* modes.

Default setting: *3*

SENSe:AVERage:COUNt:AUTO:SLOT[?]   1 to <SENSe:POWer:TSLot:AVG:COUNt>

SENSe:AVERage:COUNt:AUTO:SLOT defines the timeslot, whose power is referenced by auto-averaging in the *Timeslot* mode. The timeslot is addressed via its number, the counting beginning with 1. The timeslot number must not exceed the number of the currently set timeslots. If a valid timeslot number is initially set and then the number of timeslots reduced to a value that is smaller than the initial timeslot number, the initial value is automatically set to the new timeslot number, i.e. auto-averaging references the most recent timeslot.

The query yields the number of the current timeslot, whose power is referenced by auto-averaging in the *Timeslot* mode.

Default setting: *1*

SENSe:AVERage:COUNt:AUTO:TYPE[?]   RESolution | NSRatio

SENSe:AVERage:COUNt:AUTO:TYPE defines the automatic averaging filter mode in the *Continuous Average, Burst Average* and *Timeslot* modes. The *RESolution* parameter sets the mode usual for power meters; *NSRatio* predefines the compliance to an exactly defined noise component.

The query yields
*   *1* for *RESolution,*
*   *2* for *NSRatio.*

Default setting: *RESolution*

SENSe:AVERage:RESet

SENSe:AVERage:RESet initializes the averaging filter for the *Continuous Average, Burst Average* or *Timeslot* modes. This is useful if a high averaging factor is set in the *SENSe:AVERage :TCONtrol MOVing* filter mode and if the power to be measured has significantly decreased since the previous measurement, e.g. by several powers of ten. In this case, previous measurement results still contained in the averaging filter strongly affect the settling of the display; as a result, the advantage of the *SENSe:AVERage:TCONtrol MOVing* filter mode, i.e. the ability to detect trends in the measurement result while the measurement is still in progress, is lost. The *SENSe:AVERage:RESet* command solves this problem by deleting all previous measurement results that the averaging filter contains. After initialization, the filter length gradually increases from 1 to its nominal value *SENSe:AVERage:COUNt,* so that trends in the measurement result become quickly apparent. However, this procedure does not shorten the measurement time required in order for the averaging filter to settle completely.

SENSe:AVERage:STATe[?]   OFF | ON

SENSe:AVERage:STATe switches on or off the averaging filter for the *Continuous Average, Burst Average* and *Timeslot* modes.

The query yields
*   *1* for *OFF,*
*   *2* for *ON.*

Default setting: *ON*

SENSe:AVERage:TCONtrol[?]   MOVing | REPeat

SENSe:AVERage:TCONtrol (terminal control) defines the behaviour of the averaging filter in the *Continuous Average, Burst Average* and *Timeslot* modes. As soon as a new measured value is shifted to the FIR filter, a new average value is available at the filter output, which is obtained from the new measured value and the other values stored in the filter.

The *MOVing* parameter defines that each new average value is output as a measurement result. This allows tendencies in the result to be recognized during the measurement procedure.

The *REPeat* parameter defines that a new result is output after the FIR filter has been filled with new measured values. This ensures that no redundant information is output.

The query yields
*   *1* for *MOVing,*
*   *2* for *REPeat.*

Default setting: *MOVing*

SENSe:CORRection:DCYCle[?]   0.001 to 99.999

SENSe:CORRection:DCYCle sets the duty cycle to a percent value for the correction of pulse-modulated signals. With the correction activated, the sensor calculates the signal pulse power from this value and the mean power. Since the duty cycle is only useful in the Continuous Average mode and the normal mode, it is evaluated only there.

The query yields the current duty cycle in percent.

Default setting: *1.0 [%]*

SENSe:CORRection:DCYCle:STATe[?]   OFF | ON

SENSe:CORRection:DCYCle:STATe ON activates the duty cycle correction and thus the pulse-power measurement whereas *SENSe:CORRection:DCYCle:STATe OFF* deactivates it.

The query yields
*   *1* for *OFF,*
*   *2* for *ON.*

Default setting: *OFF*

SENSe:CORRection:OFFSet[?]   –200.0 to 200.0

SENSe:CORRection:OFFSet defines a fixed offset in dB, which is used to correct the measured value. (When a log scale is used, the offset is added to the measured value; this is the reason why the command has this name.)

The attenuation of an attenuator located ahead of the sensor or the coupling attenuation of a directional coupler is taken into account with a positive offset, i.e. the sensor calculates the power at the input of the attenuator or directional coupler. A negative offset can be used to correct the influence of a gain connected ahead.

The query yields the set offset in dB.

Default setting: *0.0 [dB]*

SENSe:CORRection:OFFSet:STATe[?]   OFF | ON

SENSe:CORRection:OFFSet:STATe ON activates the offset correction and
SENSe:CORRection:OFFSet:STATe OFF deactivates it.

The query yields
*   *1* for *OFF,*
*   *2* for *ON.*

Default setting: *OFF*

SENSe:CORRection:SPDev:STATe[?] OFF | ON

SENSe:CORRection:SPDevice:STATe ON activates the s-parameter data set for a component (attenuator, directional coupler) connected ahead of the sensor. Parameter *OFF* deactivates it.

The use of s-parameters instead of a fixed offset
(see group of commands *SENSe:CORRection:OFFSet*)
allows more precise measurements, since the interactions between the sensor, the source and components connected between them can be taken into account. (For detailed information on loading s-parameter data sets, refer to section 3.) The sensor has no factory-set s-parameter data set. In this state, the *SENSe:CORRection:SPDevice:STATe ON* command generates an error message.

The query yields
* *1* for *OFF,*
* *2* for *ON.*

Default setting:
The factory-set default setting of the sensor is *OFF*. On loading an s-parameter table, the default setting can be redefined (see section 3).

SENSe:FREQuency[?]   10.0e6 to 8.0e9 (NRP-Z11) or 18.0e9 (NRP-Z21)

SENSe:FREQuency transfers the carrier frequency of the RF signal to be measured; this frequency is used for the frequency-response correction of the measurement result. The center frequency is set for broadband signals (*spread-spectrum* signals, multicarrier signals).

The query yields the set carrier frequency in Hz.

Default setting: *50.0e6 [Hz]*

SENSe:FUNCtion[?]   <sensor_function>

SENSe:FUNCtion <sensor_function> sets the sensor to one of the following measurement modes:

Table 6-3   Measurement modes

<sensor_function>	Description of the measurement mode
"POWer:AVG"	**Continuous Average** After occurrence of the trigger event, the mean power is measured in a time interval (sampling window) whose width is defined with SENSe:POWer:AVG:APERture. The single measurements are performed in pairs to obtain a more accurate measurement result by differentiation. With the averaging function activated, this operation is repeated the number of times specified by the averaging factor. With the averaging function activated, the actual measurement time is thus 2 × <SENSe:AVERage:COUNt> × <SENSe:POWer:AVG:APERture> and with deactivated averaging function 2 × <SENSe:POWer:AVG:APERture>. Trigger events start one or several measurements in the Continuous Average mode (depending on the TRIGger:COUNt parameter).
"POWer:TSLot:AVG"	**Timeslot** The power is measured in a defined number of consecutive timeslots. Up to 128 timeslots have the same width, which is defined by SENSe:POWer:TSLot :WIDTh. Their quantity is defined by SENSe:POWer:TSLot:COUNt. The measurement result is an array, which contains as many elements as timeslots. Each element represents the average power in one of the timeslots. After each occurrence of the trigger event, a measurement is performed in all timeslots. The single measurements are also performed in pairs in this mode to obtain a more accurate measurement result by differentiation. With the averaging function activated, this operation is repeated the number of times specified by the averaging factor. With the averaging function activated, the actual measurement time is thus 2 × <SENSe:AVERage:COUNt> × <SENSe:POWer:TSLot:AVG:WIDTh> and with deactivated averaging function 2 × <SENSe:POWer:TSLot:AVG:WIDTh>. Note that a corresponding number of trigger events must be available.
"POWer:BURSt:AVG"	**Burst Average** This mode is used for the measurement of the average power of repetitive single bursts, for example. The time interval (integration time) in which the average power is measured is not predefined. Instead, a special algorithm detects the beginning and end of the burst and ensures the synchronization of the sampling window. However, the user must define the dropout tolerance, a time criterion for detecting the pulse or burst end, using SENSe:POWer:BURSt:DTOLerance. In the Burst Average mode, external trigger events (irrespective of the setting of the TRIGger:SOURce parameter) and the TRIGger:DELay parameter are ignored.
"XTIMe:POWer"	**Scope** The Scope mode is similar to the Timeslot mode. Since, however, up to 1024 consecutive timeslots (called "points" here) are possible, the maximum averaging factor is limited to 8192 due to the storage capacity. In the Scope mode, other limits than in the Timeslot mode apply to the timeslot width. SENSe:TRACe:REALtime ON optimizes the time resolution. The differentiation and averaging filter are ignored.

Time intervals that are excluded from the measurement can be set at the beginning and the end of the sampling window or timeslot in the measurement modes *Burst Average* and *Timeslot.* (*SENSe:TIMing:EXCLude:STARt* and -*:STOP*).

The query yields
- *1* for *"POWer:AVG"*,
- *2* for *"POWer:TSLot:AVG"*,
- *4* for *"POWer:BURSt:AVG"*,
- *8* for *"XTIMe:POWer"*.

Default setting: *"POWer:AVG"*

SENSe:POWer:AVG:APERture[?]   0.0001 to 0.3

SENSe:POWer:AVG:APERture defines the time interval (sampling window) for the *Continuous Average* mode; measured values are continuously recorded in this interval. In manual operation, the default setting of 20 ms in conjunction with the activated smoothing (see *SENSe:POWer:AVG:SMOothing:STATe*) is sufficient in most cases. Another value, which is normally higher, is required when the measurement result shows variations due to modulation. Especially with low-frequency modulation, it is useful to adapt the size of the sampling window exactly to the modulation period, which yields an optimum stable display.

Table 6-4   Optimum selection of the sampling window size (N = 1, 2, 3, ...)

Smoothing	Optimum sampling window size
OFF	N × modulation period / 2
ON	N × modulation period × 2

The theoretically shortest measurement time can then be obtained only with smoothing deactivated. As the number of modulation periods that fit into a sampling window increases, the issue of whether N is an integer becomes more critical. With smoothing activated, approx. 5 periods are sufficient to reduce variations due to modulation to an acceptable extent; variations are no longer perceptible with more than 9 periods. With smoothing deactivated, the situation is significantly unfavourable. In this case, 5 instead of 300 periods are required and the variations completely disappear as of 3000 periods.

The query yields the currently set width of the sampling window in seconds.

Default setting: *0.02 [s]*

SENSe:POWer:AVG:BUFFer:SIZE[?]   1 to 1024

SENSe:POWer:AVG:BUFFer:SIZE sets the buffer size for the buffered *Continuous Average* mode.

The query yields the current buffer size for the buffered *Continuous Average* mode.

Default setting: *1*

SENSe:POWer:AVG:BUFFer:STATe[?] OFF | ON

The buffered *Continuous Average* mode is activated with *ON* and deactivated with *OFF*. In this mode, the results generated by trigger events are collected in the sensor until the buffer is filled. All results are then transferred as block data. The measurement rate obtained is thus higher than in the non-buffered *Continuous Average* mode. The maximum measurement rate is obtained by combining the buffered mode with multiple triggering (see parameter *TRIGger:COUNt*). The size of the result buffer is set with the *SENSe:POWer:AVG:BUFFer:SIZe* command.

The query yields
* *1* for *OFF*,
* *2* for *ON*.

Default setting: *OFF*

SENSe:POWer:AVG:SMOothing:STATe[?] OFF | ON

The *ON* parameter activates a smoothing filter for modulated signals in the *Continuous Average* mode and *OFF* deactivates it. The smoothing filter is a steep-edge digital lowpass filter used to suppress variations of results caused by low-frequency modulation. This parameter should be activated to reduce variations in results due to modulation when the size of the sampling window cannot or should not be exactly adapted to the modulation period. If the selected sampling window is 5 to 9 times larger than a modulation period, the variations in display are normally sufficiently reduced. With smoothing deactivated, 300 to 3000 periods are required to obtain the same effect.

With smoothing deactivated, the sampling values are considered equivalent and averaged in a sampling window, which yields an integrating behaviour of the measuring instrument. As described above, optimum suppression of variations in the result is thus obtained when the size of the sampling window is exactly adapted to the modulation period. Otherwise, the modulation can have a considerable influence, even if the sampling window is much larger than the modulation period. The behaviour can be considerably improved by subjecting sampling values to weighting (raised-von-Hann window), which corresponds to video filtering. This is exactly what happens with activated smoothing.

Since the smoothing filter increases the inherent noise of the sensor by approx. 20%, it should remain deactivated if it is not required.

The query yields
* *1* for *OFF*,
* *2* for *ON*.

Default setting: *ON*

SENSe:POWer:BURSt:DTOLerance[?] 0.0 to 0.003

SENSe:POWer:BURSt:DTOLerance defines the dropout tolerance, a parameter for reliably detecting the burst end in the *Burst Average* mode with modulated signals (e. g. with digital standards NADC, PDC, PHS, etc.). The dropout tolerance should be selected larger than the longest amplitude drop and smaller than the gap between two consecutive bursts. The default value is sufficient for all usual digital communication standards.

The query yields the dropout tolerance for the *Burst Average* mode.

Default setting: *0.0001 [s]*
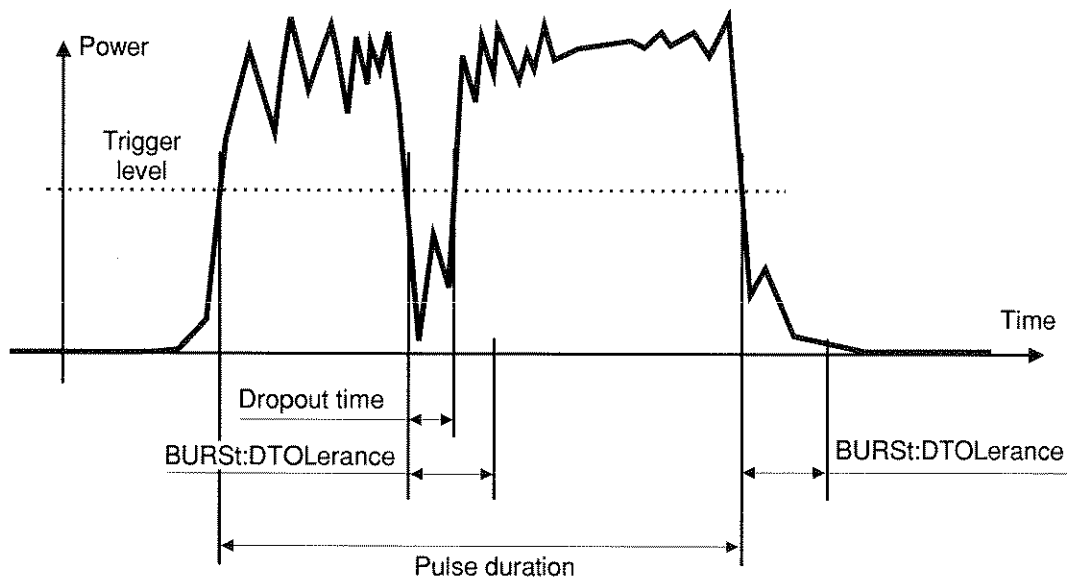
Fig. 6-1   Effect of SENSe:POWer:BURSt:DTOLerance

SENSe:POWer:TSLot:AVG:COUNt[?]   1 to 128

For the Timeslot mode, *SENSe:POWer:TSLot:AVG:COUNt* sets the number of consecutive timeslots that are to be processed after each trigger event.

The query yields the number of consecutive timeslots.

Default setting: *1*

SENSe:POWer:TSLot:AVG:WIDTh[?]   0.0001 to 0.1

SENSe:POWer:TSLot:AVG:WIDTh sets the length of a timeslot in seconds for the Timeslot mode.

The query yields the length of a timeslot in seconds for the Timeslot mode.

Default setting: *0.001 [s]*

SENSe:RANGe[?]   0 to 2

SENSe:RANGe selects the measurement path of the sensor. The sensor has three separate measurement paths. Path 1 is the most sensitive, path 2 medium and path 3 the least sensitive. *SENSe:RANGe 0* selects path 1, *SENSe:RANGe 1* path 2 and *SENSe:RANGe 2* path 3.
The dynamic ranges of these measurement paths depend on temperature and are model-specific. Reference values are 40 µW(−14 dBm) for the most sensitive measurement path, 4 mW (6 dBm) for the medium one and 400 mW (26 dBm) for the least sensitive.

The query yields
* *0* for path 1,
* *1* for path 2,
* *2* for path 3.

If the measurement path is selected manually (*SENSe:RANGe:AUTO OFF*), the currently selected measurement path is output. With automatic selection, the last path that was set manually is output. It is therefore immediately reset after deactivating the automatic function.

Default setting: *2* (least sensitive path)

SENSe:RANGe:AUTO[?]   OFF | ON

SENSe:RANGe:AUTO ON activates the automatic selection of the measurement path and *SENSe:RANGe:AUTO OFF* deactivates it.

The query yields
- *1* for *OFF*,
- *2* for *ON*.

Default setting: *ON*

SENSe:RANGe:AUTO:CLEVel[?]   –20.0 to 0.0

SENSe:RANGe:AUTO:CLEVel is used to reduce the transition range between measurement paths 1 and 2 or 2 and 3 by the indicated value (in dB). This can improve the measurement accuracy for signals with a high *peak-to-average* ratio, since the headroom for modulation peaks becomes larger. The disadvantage is that the S/N ratio is reduced at the lower limits of the transition ranges.

The query yields the offset of transition ranges between measurement channels 1 and 2 or 2 and 3.

Default setting: *0.0 [dB]*

SENSe:SAMPling[?]   FREQ1 | FREQ2

SENSe:SAMPling is used to vary the sampling frequency of the analog-digital converter in the sensor. With parameter specification *FREQ1* the sampling frequency is 133.400 kHz, and 119.467 kHz with parameter *FREQ2*. This is provided to suppress interfering low-frequency mixture products from signal components and the sampling frequency.

The query yields
- *1* for *FREQ1*,
- *2* for *FREQ2*.

Default setting: *FREQ1*

SENSe:SGAMma:CORRection:STATe[?]   OFF | ON

SENSe:SGAMma:CORRection:STATe ON initiates the use of the complex reflection coefficient of the source defined with *SENSe:SGAMma:MAGNitude* and *SENSe:SGAMma:PHASe* for the correction of interactions between the sensor, the source and the components connected between them (*see SENSe:CORRection:SPDevice:STATe*). This compensates for the source mismatch, which often largely contributes to measurement uncertainty.

The query yields
- *1* for *OFF*,
- *2* for *ON*.

Default setting: *OFF*

SENSe:SGAMma:MAGNitude[?] 0.0 to 1.0

SENSe:SGAMma:MAGNitude defines the magnitude of the complex reflection coefficient of the source. A value of *0.0* corresponds to an ideal matched source and a value of 1.0 to total reflection.

The query yields the set magnitude.

Default setting: *0.0*

SENSe:SGAMma:PHASe[?] −360.0 to 360.0

SENSe:SGAMma:MAGNitude defines the phase angle (in degrees) of the complex reflection coefficient of the source.

The query yields the set phase angle.

Default setting: *0.0 [°]*

SENSe:TRACe:AVERage:COUNt[?] 1 to 65536

SENSe:TRACe:AVERage:COUNt is used to set the number of measured values to be averaged in the *Scope* mode for the formation of the measurement result. The higher this averaging factor, the lesser the fluctuation the measured values and the longer the measurement time. The parameter is rounded off to the next power-of-two number.

The query yields the averaging factor used in the *Scope* mode.

> *The averaging function must be activated with SENSe:TRACe:AVERage:STATe ON so that the set averaging factor becomes effective.*

Default setting: *4*

SENSe:TRACe:AVERage:COUNt:AUTO[?] OFF | ON | ONCE

SENSe:SWep:AVERage:COUNt:AUTO activates (auto-averaging) or deactivates (fixed-filter mode) the automatic determination of the averaging factor in the *Scope* mode. If auto-averaging is activated, the averaging factor is continuously determined and set depending on the level of power and other parameters.

SENSe:TRACe:AVERage:COUNt:AUTO ON activates auto-averaging and *SENSe:TRACe :AVERage:COUNt:AUTO OFF* deactivates it. When deactivation occurs, the previous, automatically determined averaging factor is used in the fixed-filter mode. The *SENSe:TRACe:AVERage :COUNt:AUTO ONCE* command ensures that a new averaging factor is determined by the filter automatic function under the current measurement conditions and that this factor is used in the fixed-filter mode.

The query yields
- *1* for *OFF,*
- *2* for *ON.*

Default setting: *OFF*

SENSe:TRACe:AVERage:COUNt:AUTO:MTIMe[?]   1.0 to 999.99

SENSe:TRACe:AVERage:COUNt:AUTO:MTIMe sets the settling time upper limit of the averaging filter in the auto-averaging mode for the *Scope* mode and limits the length of the filter.

The query yields the current settling time upper limit of the averaging filter in the auto-averaging mode for the *Scope* mode.

Default setting: *30.0 [s]*

SENSe:TRACe:AVERage:COUNt:AUTO:NSRatio[?]   0.0001 to 1.0

SENSe:TRACe:AVERage:COUNt:AUTO:NSRatio determines the relative noise component in the measurement result for the *Scope* mode if auto-averaging is operated in the corresponding mode (*SENSe:TRACe:AVERage:COUNt:AUTO:TYPE NSRatio*). The noise component is defined as the magnitude of the level variation in dB caused by the inherent noise of the sensor (two standard deviations).

The query yields the relative noise component in the measurement result in the *Scope* mode.

Default setting: *0.01 [dB]*

SENSe:TRACe:AVERage:COUNt:AUTO:RESolution[?]   1 to 4

SENSe:TRACe:AVERage:COUNt:AUTO:RESolution sets the resolution index for the automatic averaging filter in the *Scope* mode when it is operated in the *RESolution* mode. The resolution index is equal to the number of decimal places that have to be taken into account for the further processing of the measurement result in dBm, dBμV or dB. Thus, the design of the normal mode is similar to that for the predecessors R&S NRVS and R&S NRVD or other commercial power meters. The higher the selected index, the better the measurement result is filtered without the last significant place (0.01 dB with an index of 3) being actually set. The NSRatio setting is recommended instead.

The query yields the resolution index for the *Scope* mode.

Default setting: *3*

SENSe:TRACe:AVERage:COUNt:AUTO:POINt[?]   1 to <SENSe:TRACe:POINts>

SENSe:TRACe:AVERage:COUNt:AUTO:SLOT defines the "point" whose power is referenced by auto-averaging in the *Scope* mode. The "point" is addressed via its number, the counting beginning with 1. The "point" number must not exceed the number of the currently set "points". If a valid "point" number is initially set and then the number of "points" reduced to a value that is smaller than the initial "point" number, the initial value is automatically set to the new "point" number, i.e. auto-averaging references the most recent "point".

The query yields the number of the current "point" whose power is referenced by auto-averaging in the *Scope* mode.

Default setting: *1*

SENSe:TRACe:AVERage:COUNt:AUTO:TYPE[?]   RESolution | NSRatio

SENSe:TRACe:AVERage:COUNt:AUTO:TYPE defines the mode of the automatic averaging filter in the *Scope* mode. The *RESolution* parameter sets the mode usual for power meters; *NSRatio* predefines the compliance to an exactly defined noise component.

The query yields
- 1 for *RESolution*,
- 2 for *NSRatio*.

Default setting: *RESolution*

SENSe:TRACe:AVERage:STATe[?]   OFF | ON

SENSe:TRACe:AVERage:STATe switches the averaging filter on or off for the *Scope* mode.

The query yields
- *1* for *OFF*,
- *2* for *ON*.

Default setting: *ON*

SENSe:TRACe:AVERage:TCONtrol[?]   MOVing | REPeat

SENSe:TRACe:AVERage:TCONtrol (terminal control) defines the behaviour of the averaging filter in the *Scope* mode. As soon as a new measured value is shifted to the FIR filter, a new mean is available at the filter output, which is obtained from the new measured value and the other values stored in the filter.

The *MOVing* parameter defines that each new average value is output as a measurement result. This allows trends in the result to be recognized during the measurement procedure.

The *REPeat* parameter defines that a new result is output after the FIR filter has been filled with new measured values. This ensures that no redundant information is output.

The query yields
- *1* for *MOVing*,
- *2* for *REPeat*.

Default setting: *MOVing*

SENSe:TRACe:MPWidth?

SENSe:TRACe:MPWidth? provides the *minimum point width* for the *Scope* mode, i.e. time resolution in seconds is determined as a function of the *TRIGger:SOURce* parameter while taking into consideration how the sensor operates. The display may be incorrect if

$$<SENSe:TRACe:POINts> \times <SENSe:TRACe:MPWidth> < SENSe:TRACE:TIME>$$

One way to prevent this is to decrease the number of points of the *Scope* measurement sequence.

SENSe:TRACe:OFFSet:TIME[?]　– (<TRIGger:DELay> + 0.005) to 100.0

This command is used to shift the timeslot for measured-data acquisition along the time axis in the *Scope* mode without modifying the value of *TRIGger:DELay*. Positive values yield an additional delay and negative values a correspondingly earlier measured-data acquisition.

The query yields the set time in seconds.

Default setting: *0.0 [s]*

SENSe:TRACe:POINts[?]　1 to 1024

This command defines the time resolution of the measurement result. Each "point" represents a time interval whose duration is obtained from the length of the timeslot (command *SENSe:TRACe:TIME*) divided by the number of "points". The measurement result for a "point" equals the average power over the associated time interval.

The query yields the number of set "points".

Default setting: *100*

SENSe:TRACe:REALtime[?]　OFF | ON

SENSe:TRACe:REALtime ON suppresses the measured-value acquisition in pairs so that single operations can be recorded in this setting.　Since the averaging filter of the sensor is not used, *SENSe:AVERage:STATe* is ignored, but is not affected.

The query yields
- *1* for *OFF*,
- *2* for *ON*.

Default setting: *OFF*

SENSe:TRACe:TIME[?]　0.0001 to 0.3

SENSe:TRACe:TIME sets the duration of the timeslot in the *Scope* mode. This timeslot is divided into a number of equal intervals, in which the average power is determined. The number of intervals equals the number of test points, which is set with the command *SENSe:TRACe:POINts*.

The query yields the duration of the timeslot in the *Scope* mode (in s).

Default setting: *0.01 [s]*

SENSe:TIMing:EXCLude:STARt[?]　0.0 to 0.1

SENSe:TIMing:EXClude:STARt defines the exclusion time at the beginning of the measurement window in the *Burst Average* (Fig. 6-2) and *Timeslot* (Fig. 6-3) modes.

The query yields the exclusion time at the beginning of the measurement window.

Default setting: *0.0 [s]*

SENSe:TIMing:EXCLude:STOP[?]   0.0 to 0.003

SENSe:TIMing:EXClude:STOP defines the exclusion time at the end of the measurement window in the *Burst Average* (Fig. 6-2) and *Timeslot* (Fig. 6-3) modes.

The query yields the exclusion time at the end of the measurement window.
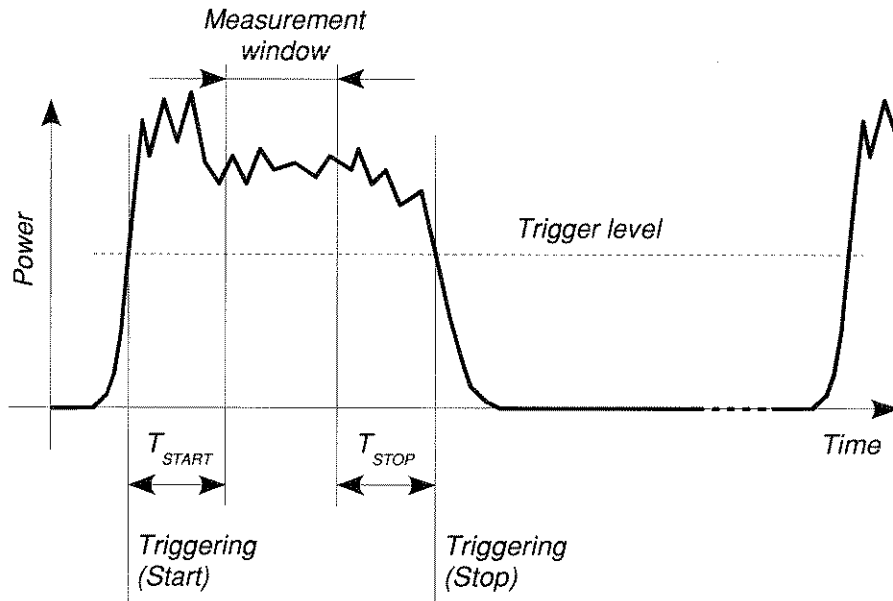
Default setting: *0.0 [s]*

Fig. 6-2   Effect of *SENSe:TIMing:EXCLude:STARt* and *:END* in the *Burst Average* mode
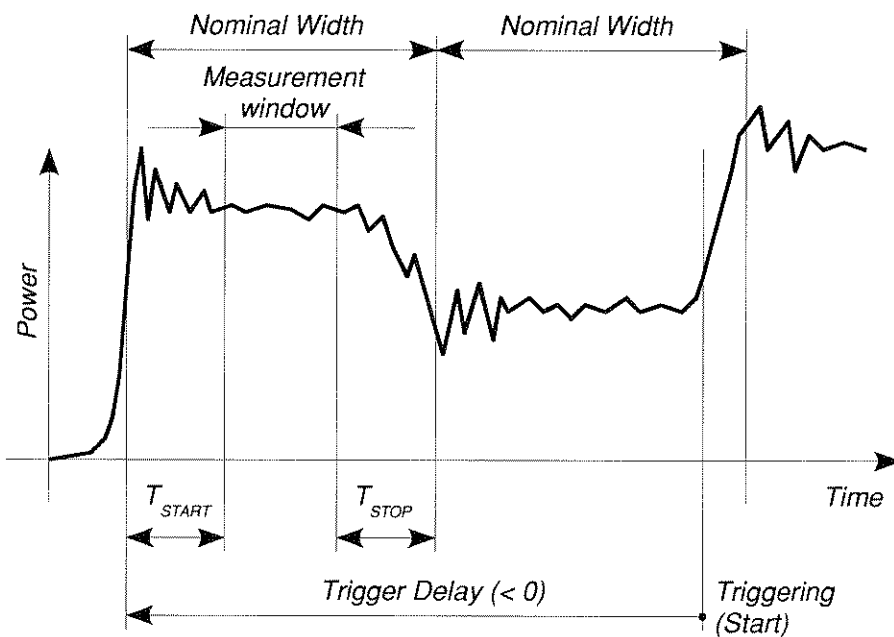
Fig. 6-3   Effect of *SENSe:TIMing:EXCLude:STARt* and *:END* in the *Timeslot* mode

SYSTem

With the aid of the SYSTem system, administrative device settings can be defined and queried. This includes detailed information on the sensor and its initialization and the transfer of available commands and their parameter limits.

Table 6-5   Commands of the *SYSTem* system

Command	Parameter	Unit	Remarks
SYSTem			
:INFO? [Item]			Query only
:INITialize			No query
MINPower?		W	Query only
:TRANsaction			
:BEGIN:			No query
:END			No query

SYSTem:INFO? [Item]

SYSTem:INFO? yields a string containing information that is more detailed than the identification string delivered by the sensor as a response to **IDN?*. If no *Item* is specified, the response string is a sequence of entries in the form *Item:Information-String* separated by *CR* and *LF* (in C notation: \r\n). With the *Item* optionally appended to the command, the entry for the required *Item* can be queried. The response string is zero-terminated, i.e. its end identification is a zero byte (in C notation: \0).

Table 6-6   Meaning of *Item* in the *SYSTem:INFO?* command

Item	Information string	Remarks
"MANUFACTURER"	"Rohde & Schwarz GmbH & Co. KG"	Manufacturer
"TYPE"	"NRP-Z11" or "NRP-Z21"	Type designation
"STOCK NUMBER"	"1138.3004.02" or "1137.6000.02"	Material number
"SERIAL"	"<serial number>"	6-digit serial number
"HWVERSION"	"000000000"	Hardware version (standard)
"HWVARIANT"	"000000000"	Hardware model (standard)
"SW BUILD"	"<build number>"	Version number of sensor firmware
"TECHNOLOGY"	"3 Path Diode"	Detector technology used
"FUNCTION"	"Power Terminating"	The R&S NRP-Z11/-Z21 is a termination power sensor.

Item	Information string	Remarks
"MINPOWER"	"<nominal lower test limit in W>"	The nominal lower test limit of the R&S NRP-Z11/-Z21 is 200 pW, i.e. with s-parameter correction deactivated, the sensor returns the information string "2e-10" as a response to *"SYSTem:INFo? "MINPOWER"*. With s-parameter correction activated, the information string depends on the nominal lower limit of the sensor/twoport combination.
"MAXPOWER"	"<nominal upper test limit in W>"	The nominal upper test limit of the R&S NRP-Z11/-Z21 is 200 mW, i.e. with s-parameter correction deactivated, the sensor returns the information string "0.2" as a response to *"SYSTem:INFo? "MAXPOWER"*. With s-parameter correction activated, the information string depends on the nominal upper limit of the sensor/twoport combination.
"MINFREQ"	"1e+07"	The minimum measuring frequency of the R&S NRP-Z11/-Z21 is 10 MHz.
"MAXFREQ"	"8e+09" or "1.8e+10"	The maximum measuring frequency is 8 GHz for the R&S NRP-Z11 and 18 GHz for the R&S NRP-Z21.
"RESOLUTION"	"2.5µs Ext, 10µs Int"	The maximum time resolution that can be reached in the Scope mode is 2.5 µs for internal triggering and 10 µs for external triggering.
"IMPEDANCE"	"50"	The R&S NRP-Z11/-Z21 RF input has a nominal input impedance of 50 Ω.
"COUPLING"	"AC/DC"	The RF input of the R&S NRP-Z11/-Z21 is DC-coupled, but DC voltages superimposed on the RF signal are suppressed by the measurement amplifier.
"CAL. ABS."	"<date>"	Date of absolute calibration in the format YYYY-MM-DD. "Invalid Calibration Date" is returned with an invalid date entry.
"CAL. REFL."	"<date>"	Date of reflection-coefficient calibration in the format YYYY-MM-DD. "Invalid Calibration Date" is returned with an invalid date entry.
"CAL. S PARA."	"<date>"	Date of s-parameter calibration in the format YYYY-MM-DD. If no S parameter set is loaded, the sensor returns the string "not applicable". "Invalid Calibration Date" is returned with an invalid date entry.
"CAL. MISC."	"<date>"	Date of the calibration of other parameters in the format YYYY-MM-DD. "Invalid Calibration Date" is returned with an invalid date entry.
"SPD MNEMONIC"	"<mnemonic string>"	Clear-text designation of the components connected ahead of the sensor.

SYSTem:INITialize

SYSTem:INITialize sets the sensor to the standard state, i.e. the default settings for all test parameters are loaded in the same way as with **RST*. The sensor then outputs a complete list of all supported commands and parameters. With the command, the remote-control software can automatically adapt to the features of different types of sensors with different functionality.

SYSTem:MINPower?

SYSTem:MINPower? yields the lower test limit of the sensor or the combination comprising the sensor and components connected ahead of it, if the *SENSe:CORRection:SPDevice* parameter has the *ON* value. This query can be used to determine a useful resolution for the result display near the lower test limit.

SYSTem:TRANsaction:BEGin

SYSTEM:TRANsaction:BEGin marks the beginning of a sequence of setting commands between which the parameter limits must not be checked. This prevents the display of error messages when a setting command causes a conflict that is resolved by a subsequent setting command. See *SYSTEM:TRANsaction:END.*

SYSTem:TRANsaction:END

SYSTEM:TRANsaction:END marks the end of a sequence of setting commands between which the parameter limits must not be checked. After this command, the parameter limits are checked.

TEST

Table 6-7   Commands of the *TEST* system

Command	Parameter	Unit	Remarks
TEST:SENSor?			Query only

TEST:SENSor?

TEST:SENSor? triggers a selftest of the sensor. In contrast to *TST*, this command yields detailed information, which is useful for troubleshooting.

TRIGger

Table 6-8   Commands of the *TRIGger* system

Command	Parameter	Unit	Remarks
ABORt			No query
INITiate			
:CONTinuous[?]	OFF | ON		
:IMMediate			No query
TRIGger			
:ATRigger:STATe[?]	OFF | ON		
:COUNt[?]	1 to 2×10^9		
:DELay[?]	x to 100.0	s	
:AUTO[?]	OFF | ON		
:HOLDoff[?]	0.0 to 10.0	s	
:HYSTeresis[?]	0.0 to 3.0	dB	
:IMMediate			No query
:LEVel[?]	x to y	W	
:SLOPe[?]	POSitive | NEGative		
:SOURce[?]	BUS | EXTernal | HOLD | IMMediate | INTernal		

ABORt

ABORt interrupts the current measurement and sets the sensor to the *IDLE* state (normal case). However, if the sensor is in the continuous measurement mode (setting *INITiate:CONTinuous ON*), the *IDLE* state is immediately exited and the sensor enters the *WAIT_FOR_TRIGGER* state.

INITiate:CONTinuous[?]   OFF | ON

INITiate:CONTinuous ON activates the continuous measurement mode. In this mode, a new measurement is automatically started when a measurement is terminated. The sensor first enters the *WAIT_FOR_TRIGGER* state and begins with the measurement as soon as the trigger condition is fulfilled. Once the measurement is completed, the sensor again enters the *WAIT_FOR_TRIGGER* state. The sensor will measure continuously assuming continuous trigger events.

In contrast, each measurement cycle must be explicitly started with the *INITiate:IMMediate* command after the *INITiate:CONTinuous OFF* command has been sent. After triggering and completion of the measurement, the sensor enters the *IDLE* status and remains in this status until a new measurement is started with the *INITiate:IMMediate* command.

The query yields
- *1* for *OFF,*
- *2* for *ON.*

Default setting: *OFF*

INITiate:IMMediate

INITiate:IMMediate starts a single measurement cycle. The sensor first changes from the *IDLE* state to the *WAIT_FOR_TRIGGER* state and begins with the measurement as soon as the trigger condition is fulfilled. Once the measurement is completed, the sensor again enters the *IDLE* state. Since the command is ignored during measurement, it normally has no effect in the continuous mode (setting *INITiate:CONTinuous ON*).

TRIGger:ATRigger:STATe[?]   OFF | ON

TRIGger:ATRigger:STATe ON causes an artificial trigger event to be triggered if no trigger is recorded more than 10 s after the measurement has been started (only in the *Scope* mode). *TRIGger:ATRigger:STATe OFF* deactivates the trigger automatic function.

The query yields
- *1* for *OFF,*
- *2* for *ON.*

Default setting: *OFF*

TRIGger:COUNt[?]   1 to 2×10^9

This setting is designed for applications in which several consecutive measurements have to be performed by sending the *INITiate:IMMediate* command only once, e.g. to obtain a higher measurement speed. The gap between a single measurement and the continuous measurement mode is thus closed. The number of measurements is defined with the parameter associated with the *TRIGger:COUNt* command. This number equals the number of results yielded by the sensor at the end of the measurement.

> *The* TRIGger:COUNt *command does not define the number of trigger events required for performing the entire measurement task. The number may vary depending on the measurement mode.*
>
> *A further increase in the measurement speed can be obtained by combining the mode used with the buffered mode. The results are not made available immediately but as a block at the end of the measurement sequence (see group commands* SENSe:POWer:AVG:BUFFer).

The query yields the number of measurements performed with the *INIT:IMMediate* command after a measurement start.

Default setting: *1*

TRIGger:DELay[?] x to 100.0

TRIGger:DELay defines the delay (in seconds) between the occurrence of the trigger event and the beginning of the measurement itself for the *Timeslot* and *Scope* modes. This parameter is ignored in the *Burst Average* mode. Pretriggering is obtained by means of negative values; with bus-triggered measurements (see *TRIGger:SOURce*), the parameter must be set to positive values or zero to avoid measurement errors.

The query yields the set trigger delay for the *Timeslot* and *Scope* modes (in seconds).

Lower limit x of the parameter
Modes *Continuous Average*, *Burst Average* and *Timeslot*: x = –0.005
Mode *Scope*: x = – (*<SENSe:TRACe:OFFSet:TIME>* + 0.005)

Default setting: *0.0 [s]*

TRIGger:DELay:AUTO[?] OFF | ON

TRIGger:DELay:AUTO ON ensures by means of an automatically determined delay that a measurement is only started after the sensor has settled. This is important when thermal sensors are used. The automatically determined delay is ignored if a longer period was set with *TRIGger:DELay*. This does not overwrite the value of *TRIGger:DELay*. *TRIGger:DELay:AUTO OFF* deactivates this function.

The query yields
- *1* for *OFF*,
- *2* for *ON*.

Default setting: *ON*

TRIGger:HOLDoff[?] 0.0 to 10.0

TRIGger:HOLDoff suppresses trigger events within the set holdoff time (in s), starting from the time of the last successful triggering.

The query yields the set holdoff time (in s).

Default setting: *0.0 [s]*

TRIGger:HYSTeresis[?] 0.0 to 10.0

TRIGger:HYSTeresis sets the hysteresis of the internal trigger threshold (parameter *TRIGger:LEVel*). Hysteresis is the magnitude (in dB) by which the trigger signal level falls below the trigger threshold (with positive trigger edge) to enable triggering again. The case is exactly the opposite with a negative trigger edge. The trigger hysteresis setting is only relevant to the *INTernal* trigger source.

The query yields the trigger hysteresis in dB.

Default setting: *0.0 [dB]*

TRIGger:IMMediate

TRIGger:IMMediate triggers a generic trigger event that causes the sensor to exit immediately the *WAIT_FOR_TRIGGER* state irrespective of the trigger source and the trigger delay and begin with the measurement. The command is the only means of starting a measurement when the trigger source is set to *HOLD*.

TRIGger:LEVel[?]   x to y

TRIGger:LEVel sets the trigger threshold for internal triggering derived from the test signal (in W). This setting is irrelevant to all other trigger sources.

The query yields the trigger threshold in W.
Lower limit x and upper limit y of parameter
SENSe:CORRection:OFFSet:STATe OFF: x = 500 × <lower test limit>
                                         y = <upper test limit >

SENSe:CORRection:OFFSet:STATe ON: x = 500 × < lower test limit > ×
                                              10^(<*SENSe:CORRection:OFFSet*> / 10)
                                         y = < upper test limit > ×
                                              10^(<*SENSe:CORRection:OFFSet*> / 10)

< lower test limit >:   200.0e-12 (with *SENSe:CORRection:SPDevice:STATe OFF*) or
                         entered lower test limit of sensor/twoport combination
                         (with *SENSe:CORRection:SPDevice:STATe ON*)

< upper test limit >:   0.2 (with *SENSe:CORRection:SPDevice:STATe OFF*) or entered
                         upper test limit of sensor/twoport combination
                         (with *SENSe:CORRection:SPDevice:STATe ON*)

Default setting: 10 × x

TRIGger:SLOPe[?]   POSitive | NEGative

TRIGger:SLOPe defines the edge of the trigger event with internal and external triggering in the *Timeslot* and *Scope* modes. In this connection, positive means increasing envelope power (with internal triggering) or increasing voltage (with external triggering). As in the *Burst Average* mode, this command has no effect in conjunction with trigger sources *BUS*, *HOLD* and *IMMediate*.

The query yields
- *1* for *POSitive*,
- *2* for *NEGative*.

Default setting: *POSitive*

TRIGger:SOURce[?]   BUS | EXTernal | HOLD | IMMediate | INTernal

TRIGger:SOURce sets the trigger source.

- *BUS:*   Triggering with command **TRG* or *TRIGger:IMMediate*.
- *EXTernal:*   Triggering via USB Adapter R&S NRP-Z3. Relevant trigger parameters: *TRIGger:DELay* and *TRIGger:SLOPe*.
- *HOLD:*   Triggering only with command *TRIGger:IMMediate*.
- *IMMediate:* Automatic triggering without explicit event.
- *INTernal:*   Triggering by the measurement signal. Relevant trigger parameters: *TRIGger:LEVel, TRIGger:DELay* and *TRIGger:SLOPe* (not in the *Burst Average* mode).

The query yields
- *1* for *BUS,*
- *2* for *EXTernal,*
- *4* for *HOLD,*
- *8* for *IMMediate,*
- *16* for *INTernal.*

Default setting: *IMMediate*

List of Remote-Control Commands

The remote-control commands of the R&S NRP-Z11/-Z21 have a syntax based on standard SCPI 1999.0, but they comply with it only to a limited extent.

Table 6-9   List of remote-control commands

Command	Parameter	Unit	Default setting	Page
* Commands				
*IDN?				6.2
*RST				6.2
*TRG				6.2
*TST?				6.2
CALibration Commands				
CALibration:DATA[?]	\<calibration data set as definite length block>			6.3
CALibration:DATA:LENGth?		Bytes		6.3
CALibration:ZERO:AUTO[?]	OFF | ON | ONCE		OFF (fixed)	6.4
SENSe Commands				
SENSe:AVERage:COUNt[?]	1 to 65536		4	6.7
SENSe:AVERage:COUNt:AUTO[?]	OFF | ON | ONCE		ON	6.7
SENSe:AVERage:COUNt:AUTO:MTIMe[?]	1.0 to 999.99	s	30.0	6.8
SENSe:AVERage:COUNt:AUTO:NSRatio[?]	0.0001 to 1.0	dB	0.01	6.8
SENSe:AVERage:COUNt:AUTO:RESolution[?]	1 to 4		3	6.8
SENSe:AVERage:COUNt:AUTO:SLOT[?]	1 to \<SENSe:POWer:TSLot:AVG :COUNt>		1	6.8
SENSe:AVERage:COUNt:AUTO:TYPE[?]	RESolution | NSRatio		RESolution	6.9
SENSe:AVERage:RESet				6.9
SENSe:AVERage:STATe[?]	OFF | ON		ON	6.9
SENSe:AVERage:TCONtrol[?]	MOVing | REPeat		REPeat	6.9
SENSe:CORRection:DCYCle[?]	0.001 to 99.999	%	1.0	6.10
SENSe:CORRection:DCYCle:STATe[?]	OFF | ON		OFF	6.10
SENSe:CORRection:OFFSet[?]	-200.0 to 200.0	dB	0.0	6.10

Command	Parameter	Unit	Default setting	Page
SENSe:CORRection:OFFSet:STATe[?]	OFF | ON		OFF	6.10
SENSe:CORRection:SPDev:STATe[?]	OFF | ON		OFF (can be modified by the user)	6.11
SENSe:FREQuency[?]	10.0e6 to 8.0e9 (NRP-Z11) or 18.0e9 (NRP-Z21)	Hz	50.0e6	6.11
SENSe:FUNCtion[?]	"POWer:AVG" | "POWer:TSLot:AVG" | "POWer:BURSt:AVG" | "XTIMe:POWer"		"POWer:AVG"	6.12
SENSe:POWer:AVG:APERture[?]	0.0001 to 0.3	s	0.02	6.13
SENSe:POWer:AVG:BUFFer:SIZE[?]	1 to 1024		1	6.13
SENSe:POWer:AVG:BUFFer:STATe[?]	OFF | ON		OFF	6.14
SENSe:POWer:AVG:SMOothing:STATe[?]	OFF | ON		ON	6.14
SENSe:POWer:BURSt:DTOLerance[?]	0.0 to 0.003	s	0.0001	6.14
SENSe:POWer:TSLot:AVG:COUNt[?]	1 to 128		8	6.15
SENSe:POWer:TSLot:AVG:WIDTh[?]	0.0001 to 0.1	s	0.001	6.15
SENSe:RANGe[?]	0 to 2		2	6.15
SENSe:RANGe:AUTO[?]	OFF | ON		ON	6.16
SENSe:RANGe:AUTO:CLEVel[?]	–20.0 to 0.0	dB	0.0	6.16
SENSe:SAMPLING[?]	FREQ1 | FREQ2		FREQ1	6.16
SENSe:SGAMma:CORRection:STATe[?]	OFF | ON		OFF	6.16
SENSe:SGAMma:MAGNitude[?]	0.0 to 1.0		0.0	6.17
SENSe:SGAMma:PHASe[?]	–360.0 to 360.0	degree	0.0	6.17
SENSe:TRACe:AVERage:COUNt[?]	1 to 65536		4	6.17
SENSe:TRACe:AVERage:COUNt:AUTO[?]	OFF | ON | ONCE		ON	6.17
SENSe:TRACe:AVERage:COUNt:AUTO :MTIMe[?]	1.0 to 999.99	s	30.0	6.18
SENSe:TRACe:AVERage:COUNt:AUTO :NSRatio[?]	0.0001 to 1.0	dB	0.01	6.18
SENSe:TRACe:AVERage:COUNt:AUTO :POINt[?]	1 to <SENSe:TRACe:POINts>		1	6.18
SENSe:TRACe:AVERage:COUNt:AUTO :RESolution[?]	1 to 4		3	6.18
SENSe:TRACe:AVERage:COUNt:AUTO :TYPE[?]	RESolution | NSRatio		RESolution	6.19

Command	Parameter	Unit	Default setting	Page
SENSe:TRACe:AVERage:STATe[?]	OFF | ON		ON	6.19
SENSe:TRACe:AVERage:TCONtrol[?]	MOVing | REPeat		REPeat	6.19
SENSe:TRACe:MPWidth?		s		6.19
SENSe:TRACe:OFFSet:TIME[?]	– (<TRIGger:DELay> + 0.005) to 100.0	s	0.0	6.19
SENSe:TRACe:POINts[?]	1 to 1024		100	6.20
SENSe:TRACe:REALtime[?]	OFF | ON		OFF	6.20
SENSe:TRACe:TIME[?]	0.0001 to 0.3	s	0.01	6.20
SENSe:TIMing:EXCLude:STARt[?]	0.0 to 0.003	s	0.0	6.20
SENSe:TIMing:EXCLude:STOP[?]	0.0 to 0.003	s	0.0	6.20
SYSTem Commands				
SYSTem:INFO? [Item]				6.22
SYSTem:INITialize				6.23
SYSTem:MINPower?		W		6.24
SYSTem:TRANsaction:BEGin				6.23
SYSTem:TRANsaction:END				6.24
Test Commands				
TEST:SENSor?				6.25
Triggersystem Commands				
ABORt				6.26
INITiate:CONTinuous[?]	OFF | ON		OFF	6.26
INITiate:IMMediate				6.27
TRIGger:ATRigger:STATe[?]	OFF | ON		OFF	6.27
TRIGger:COUNt[?]	1 to 2×10^9		1	6.27
TRIGger:DELay[?]	x to 100.0	s	0.0	6.28
TRIGger:DELay:AUTO[?]	OFF | ON		OFF	6.28
TRIGger:HOLDoff[?]	0.0 to 10.0	s	0.0	6.28
TRIGger:HYSTeresis[?]	0.0 to 10.0	dB	0.0	6.28

Command	Parameter	Unit	Default setting	Page
TRIGger:IMMediate				6.28
TRIGger:LEVel[?]	x to y	W	1.0e-6	6.29
TRIGger:SLOPe[?]	POSitive | NEGative		POSitive	6.29
TRIGger:SOURce[?]	BUS | EXTernal | HOLD | IMMediate | INTernal		IMMediate	6.29
SERVice Commands				
SERVice:CALibration:DITHer	ONCE		OFF	
SERVice:CALibration:DITHer:DATA?			0	
SERVice:CALibration:TEMP	ONCE		OFF	
SERVice:CALibration:TEMP:DATA?		K	0.0	
SERVice:CALibration:TEST[?]			-1	
SERVice:CALibration:ZERO:NEG0?			1	
SERVice:CALibration:ZERO:POS0?			2	
SERVice:CALibration:ZERO:NEG1?			3	
SERVice:CALibration:ZERO:POS1?			4	
SERVice:CALibration:ZERO:NEG2?			5	
SERVice:CALibration:ZERO:POS2?			6	
SERVice:DITHer	OFF | ON		ON	
SERVice:MVCorrection[?]	0 to 63		63	
SERVice:PARameter:RTEMp[?]	<float value>	K	0.0	
SERVice:PARameter:RNULL0[?]	<float value>	Ω	0.0	
SERVice:PARameter:RNULL1[?]	<float value>	Ω	0.0	
SERVice:PARameter:RNULL2[?]	<float value>	Ω	0.0	
SERVice:PARameter:RBAHN[?]	<float value>	Ω	0.0	
SERVice:PARameter:NREF[?]	<float value>		0.0	
SERVice:PARameter:ATHERM[?]	<float value>	K^{-1}	0.0	
SERVice:PARameter:BTHERM[?]	<float value>	K	0.0	
SERVice:PARameter:CTHERM[?]	<float value>	K^{-1}	0.0	
SERVice:PARameter:DTHERM[?]	<float value>	K^{-1}	0.0	

Command	Parameter	Unit	Default setting	Page
SERVice:PARameter:CJUNC[?]	<float value>	F	0.0	
SERVice:RCount[?]	1 to 32767		0	
SERVice:RESult[?]	0.0 to 1.0e6	W	0.0	
SERVice:SAMPle[?]	0 to 99999999		1000	
SERVice:TDEScriptor?				
SERVice:TDEScriptor:LENGth?		Bytes		
SERVice:UNLock	1234			

ROHDE & SCHWARZ

Test and Measurement
Division

Service Instructions

Contents

Figures

Tables

Spare Parts Express Service

Phone: **+49 89 4129 - 12465**

Fax: **+49 89 41 29 - 13306**

E-mail:werner.breidling@rsd.rohde-schwarz.com

In case of urgent spare parts requirements for this Rohde & Schwarz unit, please contact our spare parts express service.

Outside business hours, please leave us a message or send a fax or e-mail. We shall contact you promptly.

1 Performance Test

Preliminary Remarks

Verifying the data sheet specifications for the Power Sensors R&S NRP-Z11 and R&S NRP-Z21 requires a considerable amount of equipment and care. Rohde & Schwarz therefore recommends using the Power Calibration System R&S NRVC or corresponding equipment that yields the same accuracy. The tests are to be carried out directly at the manufacturer, its representatives or subsidiaries or at calibration sites that are equipped accordingly.

A **quick test** (see page 1.5) is recommended for checking the sensor with simple means.

Test Instructions

- The tests are to be performed at an ambient temperature of 20°C to 25°C. The DUT should be connected to the (activated) R&S NRP base unit for at least 30 minutes before the tests are performed.

- The test limits used in the following sections are based on the data sheet for the sensors R&S NRP-Z11 and R&S NRP-Z21. The test limits are valid only on the conditions defined in the corresponding test step. They are therefore not legally binding as accuracy specifications; only data sheet specifications are legally binding.

Measuring Equipment and Accessories

Item	Type of unit	Recommended characteristics	Recommended units	R&S order number	Application
1	Power calibration system	10 MHz to 18 GHz Calibration level 0 dBm	R&S NRVC R&S NRVC-B1 R&S SMP02 R&S NRVD	1109.0500.02 1109.1007.02 1035.5005.02 0857.8008.02	Absolute measuring accuracy
2	Linearity calibration system	-30 dBm to +23 dBm Test frequency 50 MHz	R&S NRVC-B2 R&S SMGL	1109.1207.02 1020.2005.52	Linearity
3	Network analyzer	10 MHz to 18 GHz Test port: N connector	R&S ZVM	1127.8500.60	Matching
4	Controller[1]	PC with IEC/IEEE-bus card (NI)			In connection with R&S NRVC and R&S NRVC-B2
5	Power meter	To connect the DUT	R&S NRP	1143.8500.02	Absolute measuring accuracy

[1] For program-controlled calibration in connection with Calibration Kit R&S NRVC and Calibration Software *Recal.*

Performance Test
with Calibration Kit NRVC and Calibration Software *Recal*

For detailed information about the performance test, refer to the operating manual for Calibration Kit R&S NRVC.

SWR measurement has to be carried out on a separate network analyzer. Evaluation is performed by Calibration Software **Recal**.

Performance Test with Other Measuring Equipment

Checking Absolute Measuring Accuracy

The sensor contains three measurement paths. Individual calibration factors are stored for these measurement paths in the sensor. The measurement paths therefore have to be checked separately. (Table 1-1 and Table 1-2). The maximum permissible error depends on the calibration uncertainties of the sensor (Table 1-2) and the uncertainties of the calibration system. It is recommended to combine both uncertainties according to the RSS method (square root based on the sum of squares) and to use the expanded combined uncertainty as the test limit.

To calibrate measurement path 1, the measurement result of measurement path 2 can be used if the calibration system does not provide a calibration power of 10 µW or if its uncertainty is too high. In this case, only the displayed difference between the two measurement paths will be checked (Table 1-3).

Table 1-1   Calibration powers

Measurement path	Power measurement range		Calibration power
1	200 pW to 50 µW	(-67 dBm to -13 dBm)	10 µW
2	20 nW to 5 mW	(-47 dBm to +7 dBm)	1 mW
3	2 µW to 200 mW	(-27 dBm to +23 dBm)	1 mW

Table 1-2   Expanded calibration uncertainties of Sensors R&S NRP-Z11/-Z21 (in dB)

Frequency Measurement path	10 MHz to <20 MHz	20 MHz to <100 MHz	100 MHz to 4 GHz	>4 GHz to 8 GHz	>8 GHz to 12.4 GHz	>12.4 GHz to 18 GHz
					Only R&S NRP-Z21	
1	0.056	0.056	0.066	0.083	0.094	0.123
2	0.047	0.047	0.057	0.071	0.076	0.099
3	0.048	0.047	0.057	0.072	0.076	0.099

Calibration frequencies: 10 MHz, 15 MHz, 20 MHz, 30 MHz, 50 MHz, 100 MHz;
from 250 MHz to 18 GHz in 250 MHz steps.

Table 1-3   Max. measurement error (in dB) between meas. paths 1 and 2 at –20 dBm (10 µW)

Frequency	10 MHz to <20 MHz	20 MHz to <100 MHz	100 MHz to 4 GHz	>4 GHz to 8 GHz	>8 GHz to 12.4 GHz	>12.4 GHz to 18 GHz
					Only R&S NRP-Z21	
Measurement error	0.045	0.044	0.048	0.054	0.063	0.079

Procedure:

- Perform zeroing (without power applied).

- Set measurement path in *Sensor – Range* menu on the R&S NRP.

- Set calibration frequency in *Frequency* menu on the R&S NRP.

- Read power on the R&S NRP and compare with power value of calibration system. At least three measurements are recommended, with the sensor set to a different position with respect to the output connector of the calibration system each time.

Checking the Linearity

The linearity check is performed at 50 MHz with autoranging activated. The reference power is 1 mW (0 dBm). The maximum permissible linearity error depends on the linearity uncertainty of the sensor (Table 1-4) and the linearity uncertainty of the calibration system. It is recommended to combine both uncertainties according to the RSS method (square root based on the sum of squares) and to use the expanded combined uncertainty as the test limit.

Table 1-4   Expanded linearity uncertainties of Sensors R&S NRP-Z11 and R&S NRP-Z21 at 50 MHz (in dB, with reference to 0 dBm)

Test level	-30 dBm to -13 dBm	-13 dBm to +1 dBm	+1 dBm to +23 dBm
Uncertainty	0.044	0.022	0.044

Calibration levels: -30 dBm, -25 dBm, -20 dBm, -15 dBm, -10 dBm, -5 dBm, 0 dBm,
                           +5 dBm, +10 dBm, +15 dBm, +20 dBm, +23 dBm

Procedure:

- Perform zeroing (without power applied).

- Set autoranging in *Sensor – Range* menu on the R&S NRP.

- Set 50 MHz in *Frequency* menu on the R&S NRP.

- Apply level of 0 dBm and activate *Relative On* in the *Measurement* menu on the R&S NRP. Use the current measurement value as the reference value (*Reset*). Set unit to *dB*.

- Set the calibration level and compare the relative level measured by the R&S NRP with that of the calibration system.

Checking Matching

For these measurements, the sensor can be operated with or without the R&S NRP base unit. The measurement procedure depends on the network analyzer used.

Table 1-5   Max. SWR of Sensors R&S NRP-Z11 and R&S NRP-Z21

Frequency	10 MHz to <30 MHz	30 MHz to 2.4 GHz	>2.4 GHz to 8 GHz	>8 GHz to 12.4 GHz	>12.4 GHz to 18 GHz
				Only R&S NRP-Z21	
Max. SWR	1.13	1.11	1.18	1.23	1.23

Quick Test

The following tests are used to check the R&S NRP-Z11 and R&S NRP-Z21 with simple means. If the tests are passed, compliance of the sensors with the specifications within the complete frequency and power range is largely ensured.

The test consists of:

- Zeroing.

- Absolute measuring accuracy at 0 dBm (50 MHz).

- Linearity when changing the measurement path (50 MHz).

- Input resistance (for DC voltage/current).

Test Instructions

- The tests are to be performed at an ambient temperature of 15°C to 35°C. The DUT should be connected to the (activated) R&S NRP base unit for at least 30 minutes before the tests are performed.

- The test limits used in the following sections are based on the data sheet but are valid only on the conditions defined for the corresponding test step. They are therefore not binding as far as accuracy is concerned but are strictly data sheet information.

- The entries made on the Power Meter R&S NRP are abbreviated as follows:

  [**<KEY>**]   Press front-panel key, e.g. **[FREQ]**.

  [<SOFTKEY>]   Press softkey, e.g. [Range].

  [**<nn unit>**]   Enter value and confirm with unit, e.g. **[3 GHz]**.

  Successive entries are separated by [:], e.g. [**FREQ : 3 GHz**].

Measuring Equipment and Accessories Required for the Quick Test

Item	Type of unit	Recommended characteristics	Recommended units	R&S order number	Application
1	Power meter	For connecting the DUT with power reference 1 mW / 50 MHz Expanded uncertainty <1.2 %	R&S NRP R&S NRP-B1	1143.8500.02 1146.9008.02	Absolute measuring accuracy Linearity
2	Signal generator	50 MHz Output level -20 dBm ... 0 dBm	R&S SML01	1090.3000.11	Linearity
3	System voltmeter	4-wire resistance measurement at 50 Ω Expanded measurement uncertainty <0.2 Ω			Input resistance
4	Adapter	BNC (plug) to 4-mm sockets (2-pin).		0017.6742.00	Input resistance
5	Adapter	BNC (socket) to N (socket).			Input resistance

Checking Zeroing

Test setup

- Sensor (DUT) is connected to power reference output of power meter (1).
- Power reference is switched off.

Settings on R&S NRP

- [**(PRE)SET: (PRE)SET**]
  - [**ZERO/CAL: ZERO/CAL**]

Test

- Message "Zeroing A(B) successful".
- Display value is within limits of test report.

Checking the Absolute Measuring Accuracy

Test setup	- Sensor (DUT) is connected to power reference output.
	- Power reference is switched off.
Setting on R&S NRP	- [(PRE)SET: (PRE)SET: System: Power Ref On]
Test	- Display value is within the limits of test report.

Checking the Linearity

Test setup	- Sensor is connected to signal generator output
Setting on signal generator	- Frequency 50 MHz, output level -20 dBm, unmodulated.
Setting on R&S NRP	- [(PRE)SET: (PRE)SET: Sensor: Range: Auto □: Path 1]
Measurement	- On R&S NRP, approx. -20 dBm must be displayed.
Setting on R&S NRP	- [Measurement: Relative On: Reset]
Measurement	- On R&S NRP, 0.00 dB must be displayed.
Setting on R&S NRP	- [Sensor: Range: Auto □: Path 2]
Test	- Displayed value is within limits of Performance Test Report.

Setting on signal generator	- Frequency 50 MHz, output level 0 dBm, unmodulated.
Setting on R&S NRP	- [Sensor: Range: Auto □: Path 2]
Measurement	- On R&S NRP, approx. 0 dBm must be displayed.
Setting on R&S NRP	- [Measurement: Relative On: Reset]
Measurement	- On R&S NRP, 0.00 dB must be displayed.
Setting on R&S NRP	- [Sensor: Range: Auto □: Path 3]
Test	- Displayed value is within limits of Performance Test Report.

Checking Input Resistance

Test setup   - System voltmeter is set to 4-wire impedance measurement and
                                      is connected to DUT according to figure.

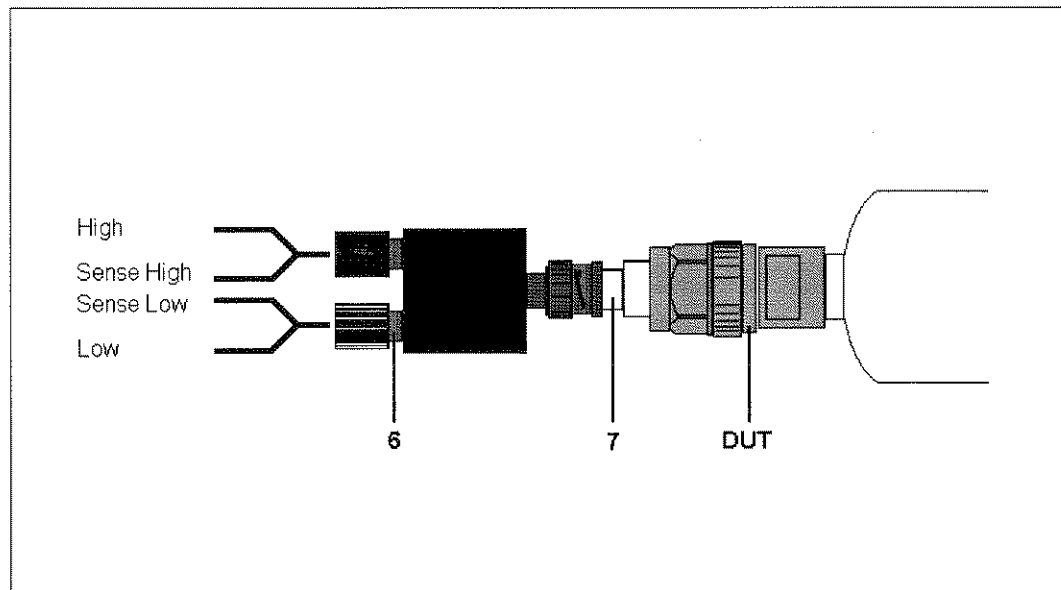Fig. 1-1   Connection of DUT for measuring the input resistance

Test   - Check input resistance of sensor for compliance with limits of
                                      test report.

Test Report

Quick test

Power Sensor R&S NRP-Z11

Stock number: 1138.3004.02   Name: ....

Serial number: ....   Date: ....

Item no.	Characteristic	Min. value	Actual value	Max. value	Unit
1	Zeroing	-------		-67.0	dBm
2	Absolute measuring accur. at 0 dBm / 50 MHz	-0.10		+0.10	dBm
3	Linear. of meas. path 1 → 2	-0.10		+0.10	dB
4	Linear. of meas. path 2 → 3	-0.10		+0.10	dB
5	Input resistance	50.2		51.8	Ω

Quick test

Power Sensor R&S NRP-Z21

Stock number: 1137.6000.02   Name: ....

Serial number: ....   Date: ....

Item no.	Characteristic	Min. value	Actual value	Max. value	Unit
6	Zeroing	-------		-67.0	dBm
7	Absolute measuring accur. at 0 dBm / 50 MHz	-0.10		+0.10	dBm
8	Linear. of meas. path 1 → 2	-0.10		+0.10	dB
9	Linear. of meas. path 2 → 3	-0.10		+0.10	dB
10	Input resistance	50.2		51.8	Ω

2 Adjustment

Preliminary Remarks

The Sensors R&S NRP-Z11 and R&S NRP-Z21 cannot be adjusted manually but have to be adjusted by updating the calibration data in the memory. Calibration Software **Recal**, which is part of the equipment supplied with the Calibration Kit R&S NRVC, is therefore required. The measurement results for the absolute calibration of the three measurement paths which can be obtained during a performance test (see Section 1) form the basis of the adjustment. The Calibration Kit R&S NRVC is recommended but is not mandatory.

To ensure that the measuring accuracy corresponds to the data sheet values after the adjustment, the calibration system must not have any inaccuracies that are higher than those given in the table below.

Table 2-1   Uncertainty of power calibration system at 0 dBm (in dB, including mismatch)

Frequency	10 MHz to <20 MHz	20 MHz to <100 MHz	100 MHz to 4 GHz	>4 GHz to 8 GHz	>8 GHz to 12.4 GHz	>12.4 GHz to 18 GHz
					Only R&S NRP-Z21	
	0.04	0.04	0.05	0.065	0.07	0.09

For further details, refer to the operating manual for the Calibration Kit R&S NRVC or the online help for the **Recal** program.

3 Repair of Sensors R&S NRP-Z11/-Z21

This section describes the design and simple measures for repairing and determining faults as well as the replacement of modules.

The firmware update is explained in section 4 of this service manual.

Design and Circuit Description
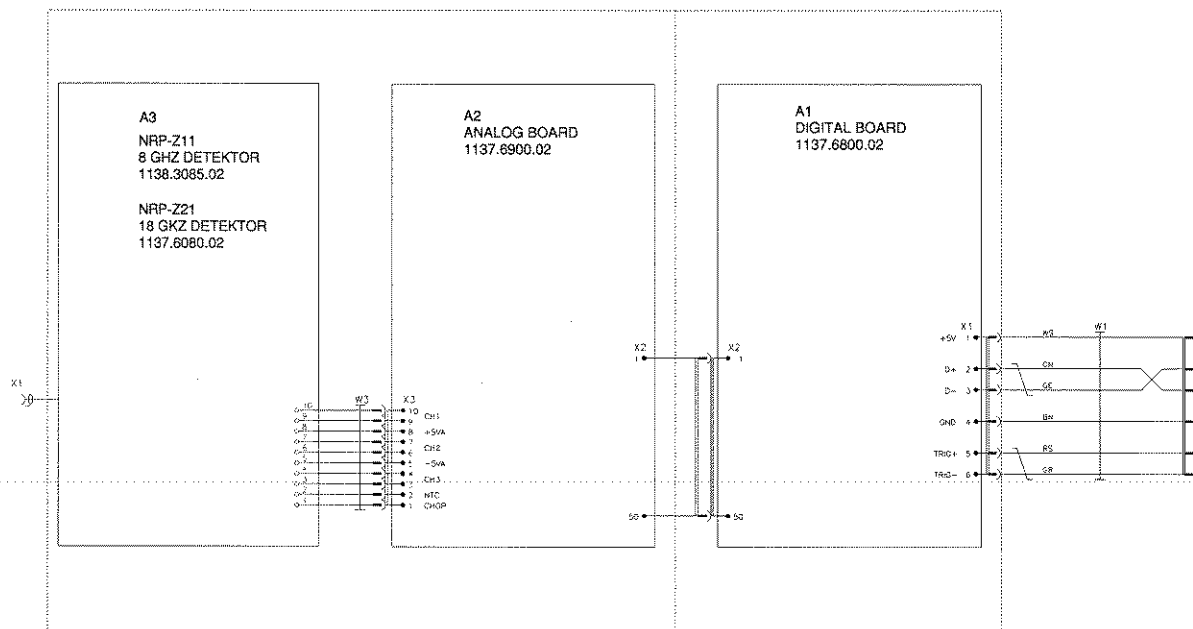
Block Diagram

Fig. 3-1   Block diagram of Sensors R&S NRP-Z11 and R&S NRP-Z21

Description of Block Diagram

The Sensors R&S NRP-Z11 and R&S NRP-Z21 can determine the average power of almost any modulated RF signal over a large dynamic range. They include all modules required for analog and digital signal processing and provide fully corrected measured values. Communication with the R&S NRP base unit is handled via a USB interface.

Three detectors are used to obtain the large dynamic range of 90 dB (–67 dBm to +23 dBm); the input signal is fed unattenuated to path 1, attenuated by 20 dB to path 2 and attenuated by 40 dB to path 3. Sensitivity is highest on path 1, medium on path 2 and lowest on path 3.

Depending on the RF input signal level, one or two test paths are driven at such a level that these paths can be evaluated. A channel is always either driven at a very low level or overdriven. The output voltages of the three detectors are amplified and digitized independently of each other to obtain a continuous transition between the test paths. The digital values provided by the A/D converters undergo various corrections (zero offset, temperature, linearity). A weighting algorithm then decides which path or – in transition ranges – which two paths are to be evaluated, and forms a weighted measured value. Integration values that represent the average power of the RF signal in a predefined integration period are derived by averaging all sampling values within the integration period.

The final measured values are the averaged result from several integration values.

Microwave Detector

The microwave detector A3 is a hybrid circuit. It contains the three test paths and a thermistor for temperature measurement. The detector has an RF signal input and a flexstrip connector for output signals, control signals and operating voltages with the following assignment:

Table 3-1   Assignment of flexstrip connector W3

Connector	Signal name	Description
W3:1	CHOP	Logic signal for controlling the choppers
W3:2	NTC	Thermistor connector (the other connector of the thermistor is connected to ground)
W3:3 W3:4	CH3	Output of the most insensitive test path
W3:5	–5VA	Negative operating voltage for the choppers
W3:6 W3:7	CH2	Output of the medium test path
W3:8	+5VA	Positive operating voltage for the choppers
W3:9 W3:10	CH1	Output of the most sensitive test path

The casing of the detector is at ground potential.

Analog Board

The analog board A2 contains three test channels of the same design, each consisting of an instrumentation amplifier, a buffer amplifier and a 14-bit A/D converter. The instrumentation amplifiers amplify the output difference voltage of the detectors and convert it into a ground-referenced voltage. The buffer amplifiers are quickly settling operational amplifiers with negative current feedback; they isolate the instrumentation amplifiers from the current peaks occurring at the A/D converter inputs. The A/D converters operate on the successive approximation principle. They have serial outputs.

The serial output data streams of the A/D converters are subjected to serial-parallel conversion in a CPLD and stored in three addressable registers. The digital board consecutively addresses and reads out these registers.
The analog board also comprises an 8-bit D/A converter for generating a noise-line large-scale dither signal that is controlled by the digital board with a sequence of pseudo-random digital values.

The analog board contains a four-channel 12-bit A/D converter for measuring the substrate temperature of the detector as well as for monitoring the operating voltages ±5 V and +1.75 V. The 12-bit A/D converter is supplied by the 3.3 V operating voltage of the digital board and is thus operational even if the voltage supply of the analog board is defective. It is connected to the synchronous serial interface of the digital board and utilizes the MICROWIRE™ protocol.

The +5 V operating voltage of the analog board is generated from +3.3 V by a charge pump doubler with subsequent linear regulator. The 5 V operating voltage is generated by a switching regulator with a very low output ripple voltage.

Digital Board

The digital board A1 mainly consists of a controller based on a microcontroller Intel StrongARM SA1110, two SRAMs (together 1 Mbyte) as random access memory and two flash PROMs (together 2 Mbyte).

The interface to the R&S NRP base unit is formed by connector X1 on the digital board. Besides the four lines for the USB interface, the sensor cable contains two signal lines for applying a differential trigger signal.

The connection to the analog board is established by press-in connector X2.

The digital board contains two DC/DC converters that generate the voltages +3.3 V and +1.75 V (for the microcontroller core) from the +5 V operating voltage.

Module Replacement

The following section describes how to exchange the plastic shell halves and how to replace the connecting cable. If one of the electronic modules (microwave detector, analog board or digital board) is defective, the sensor has to be sent to Rohde & Schwarz Central Service for repair.

Caution!

- *Observe the safety instructions at the beginning of this manual.*

- *To avoid damaging electronic components, the instrument should only be opened on a workplace protected against electrostatic discharges.*
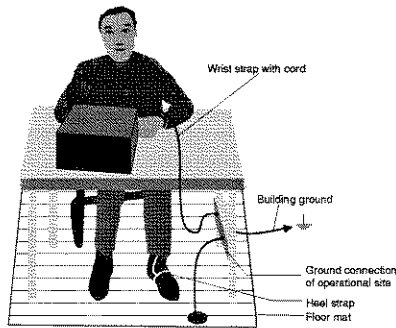
  The following methods can be used separately or combined to ensure protection against electrostatic discharges:

- *Anti-static wrist strap with grounding cable.*

- *Conductive flooring with foot strap.*

Wrist strap with cord

Building ground

Ground connection of operational site

Heel strap

Floor mat

Tools Required

Torx screwdriver	Size	T8
	Thread	M 2.5

Note:

The numeric values in brackets refer to the item in the list of mechanical parts and spare parts in section 5.

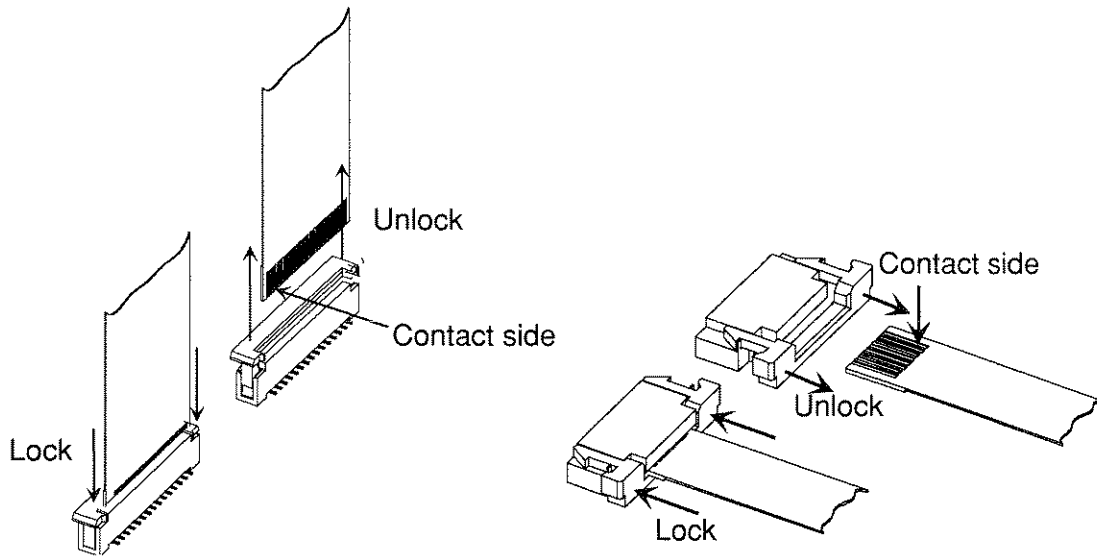*These items are identical to the item numbers in the drawings illustrating the module replacement.*

Fig. 3-2   Membrane cables

Note:

Remove membrane cables:
Membrane cables can be removed after unlocking the female connector.
Connect membrane cables:
Observe the contact side and lock the female connector.

List of Modules

Table 3-2   List of modules/spare parts for R&S NRP-Z11 and R&S NRP-Z21

Item No.	Designation	Electrical identification	Stock No.
20	ANALOG BOARD	A2	**)
40	POWER SENSOR CABLE	W1	1137.7141.02
60	SCREW 7985/ISR-M2X8-A4 FOR POWER SENSOR CABLE W1		1148.2600.00 *)
80	DIGITAL BOARD	A1	**)
90	SCREW 7985/ISR-M2X10-A4 FOR DIGITAL BOARD A1		1148.2917.00 *)
100	18 GHZ DETECTOR (NRP-Z21)	A3	**)
101	8 GHZ DETECTOR (NRP-Z11)	A3	**)
150	SHIELDING		1137.6068.00 *)
160	SENSOR HOUSING		1137.6022.00
170	SCREW 7985/ISR-M2X8-A4 FOR OUTER CASING		1148.2600.00 *)
180	LABEL 1 R&S NRP-Z11		1138.3033.00
190	LABEL 2 R&S NRP-Z11		1138.3040.00
200	LABEL 1 R&S NRP-Z21		1137.6039.00
210	LABEL 2 R&S NRP-Z21		1137.6045.00

*) Available but not maintained in spare parts stock, i.e. delivery time may be longer.
**) Spare part not available; to be replaced only by Rohde & Schwarz Central Service.

Opening and Reassembly (Exchange of Plastic Shell Halves)

Opening

➤ Undo two screws (170) on the two sides of the cable connector.

➤ First pull off the plastic shell halves of the cable connector and take them apart by twisting them at the RF connector.

➤ The shielding is attached by a catch of the body on the RF connector side. Slightly bend and unlock the shielding by firmly pressing on the two slim sides and pull it off in the cable direction.

Reassembly

➤ Push the shielding and lock it into the catch of the body.

➤ Insert the sensor into one of the shell halves and lock the second shell half on the RF connector side and close at the cable connector.

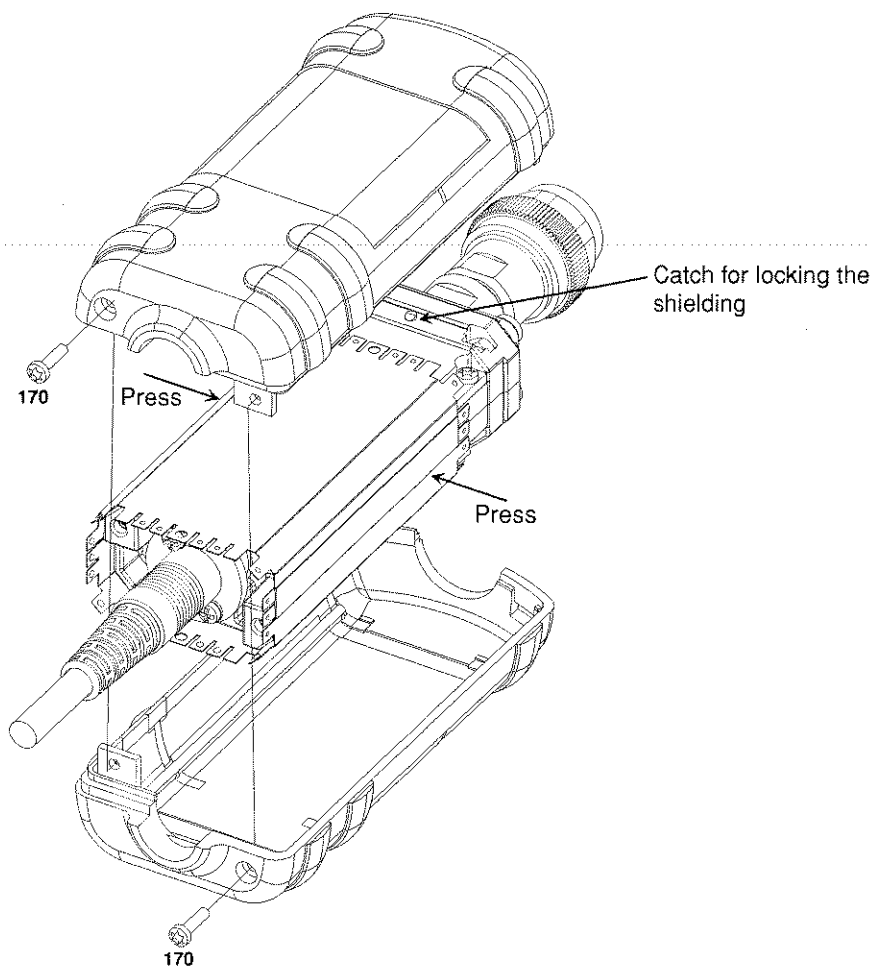➤ Attach the shell halves to the body using two screws (170).

Fig. 3-3   Opening the sensor

> ⚠️ **Caution:**
>
> *Observe a torque of 29 Ncm for all screws.*

Replacement of Sensor Cable W1

Removing the Sensor Cable

➢ Opening the sensor (see page 3.7).

➢ Undo 6 screws (90).

➢ Carefully remove digital board A1 from the body.

➢ Unplug sensor cable W1 from digital board.

➢ For removing sensor cable W1, undo two screws (60) and remove the cable from the body.

Installing the Sensor Cable

➢ Install in the reverse order.

➢ Ensure that the guide pins of press-in connector X2 lock into the corresponding boreholes of the digital board.
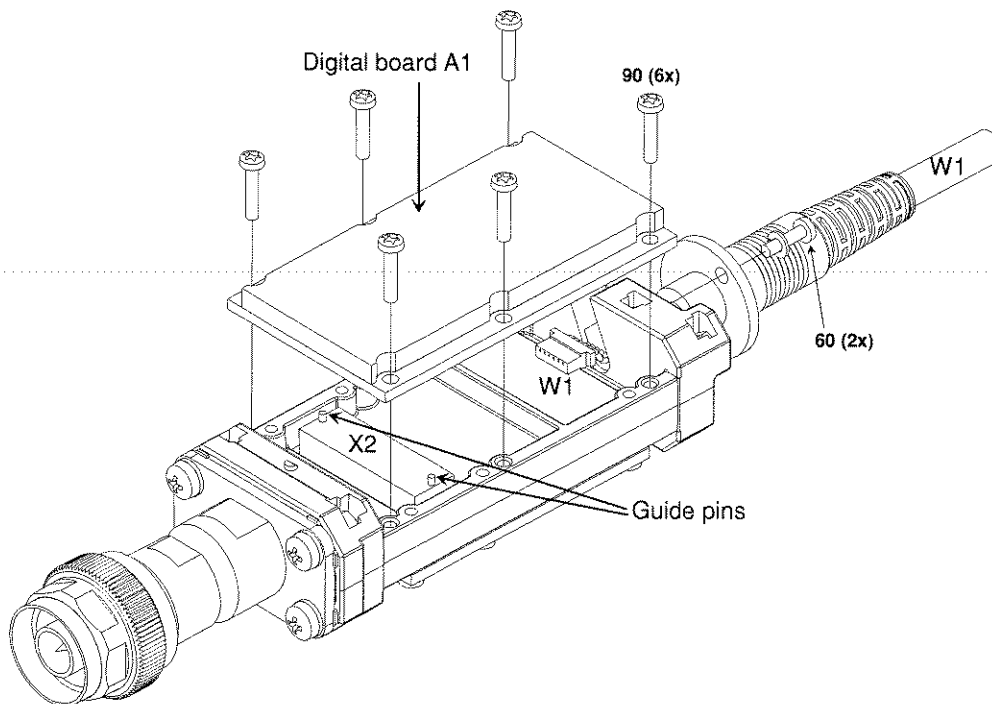

Fig. 3-4   Replacement of sensor cable

Troubleshooting

Malfunctions may sometimes be due to simple reasons but may also result from defective components.

These troubleshooting instructions permit malfunctions or errors to be traced down to module level.

Module replacement and further diagnosis of errors or malfunctions should be carried out by our customer service. It is therefore recommended to send the unit to the nearest service center (see list of addresses at the beginning of this manual).

Caution:

Prior to opening sensor and replacing modules, disconnect sensor from base unit (R&S NRP) or USB adapters (R&S NRP-Z3 or R&S NRP-Z4).

Overview of Errors, Causes and Corrective Steps

This section provides an overview of possible errors, their causes and corrective steps.

Problems when plugging in the sensor or switching on the R&S NRP base unit

- **Error: The power sensor is not found (neither measured values nor error messages are displayed on the R&S NRP base unit).**

Troubleshooting instruction	Potential error source and further corrective steps
Unplug sensor from base unit and check male and female connector for damage.	Defective connection. *Replace the sensor cable and/or the connector in the R&S NRP.*
⇓	
Check whether the error also occurs on another base unit or in another channel.	Error source within base unit. *Refer to chapter 3 of the R&S NRP service manual for detailed troubleshooting.*
	Error source within sensor. Open sensor and check connection of sensor cable W1 with digital board. *Exchange sensor cable.*
	Send sensor in for repair (digital board possibly defective).

- **Error: The R&S NRP base unit has detected an error (pop-up window contains error message, e.g. *Sensor communication error*).**

Troubleshooting instruction	Potential error source and further corrective steps
	Base unit and sensor cannot communicate with each other. The firmware versions may not be compatible.
⇓	
Load current firmware into sensor and base unit according to section 4.	
	If updated firmware does not correct problem, perform the same measures as described above (sensor is not found).

- **Error:** The power sensor has detected an error (*HW Error* displayed at extreme right of title bar).

Troubleshooting instruction	Potential error source and further corrective steps
	The sensor detected an error during selfttest or during communication (hardware defect or defective voltage supply).
⇓	
Check whether error also occurs on a different base unit.	Error source within base unit.
	Refer to chapter 3 of the R&S NRP service manual for detailed troubleshooting.
	Error source within sensor.
	Send sensor in for repair (analog board or digital board is defective).

Problems during measurement

- **Error:** Measured power readings are erroneous.

Troubleshooting instruction	Potential error source and further corrective steps
Perform performance test or selftest according to section 1.	Sensor was overloaded: indicated by very poor matching and/or errors in measurement path 1.
	Send sensor in for repair (microwave detector is defective).
	Other parts of sensor hardware are defective.
	Send sensor in for repair (microwave detector or analog board is defective).
	Sensor hardware is probably ok since test limits are only slightly exceeded.
	Perform update of calibration factors in data memory of sensor according to section 2.

4 Firmware Update/Installation of Options

Chapter 4 provides information on the software update and the installation of options. Descriptions enclosed with the software update or options can be filed here.

Installation of New R&S NRP-Z11/-Z21 Software

Use the Firmware Update program module to load new firmware for the Power Sensors R&S NRP-Z11 and NRP-Z21. The module is part of the R&S NRP Toolkit that is supplied on a CD-ROM together with the power sensors and enables you to update the boot loader and the application firmware.

The current firmware versions can be downloaded from the R&S homepage on the Internet, since the CD-ROM accompanying the power sensors contains the firmware status at the time of delivery.

Hardware and software requirements

The system requirements for a firmware update are the same as for the operation of the power sensor on a PC (an update via the power meter is not possible):

- PC with free USB port.

- USB Interface Adapter R&S NRP-Z3 or R&S NRP-Z4.

- Operating system Windows™ 98, Windows™ ME, Windows™ 2000, or Windows™ XP.

- **The R&S NRP Toolkit software must already be installed on your PC.**

- One of the following files must be selected (depending on the software component to be updated):

  - `<Type>_Sensor<Version Number>.nrp`   Application
  - `Bootloader_<Version Number>.nrp,`   Boot loader

  The files are available in the \software\firmware\sensors directory of the CD-ROM.

Preparation

➢ Connect the R&S NRP power sensor to the PC using one of the two USB interface adapters.

➢ If a second R&S NRP-Z power sensor or an R&S NRP is connected to the PC, unplug these devices from the PC.

➢ Shortly afterwards, the PC should have identified the new USB hardware and assigned the appropriate driver from the **R&S NRP Toolkit** to the power sensor (brief message in a small window).

If you forgot to install the R&S NRP Toolkit beforehand, Windows will try in vain to find a USB driver for the power sensor. If this happens, the R&S NRP-Zxx is highlighted by a yellow exclamation mark in the Windows device manager. In this case, proceed as follows:

➢   *Abort the dialog for driver installation.*

➢   *Install the R&S NRP Toolkit from the CD-ROM.*
   Then manually assign the USB driver from the toolkit to the power sensor.

➢   *Go to Control Panel – Add/Remove Hardware and start the hardware assistant to search for new components.*

➢   *Mark the R&S NRP-Zxx in the list of hardware components and complete the driver installation.*

➢   *Unplug the power sensor and reconnect it.*
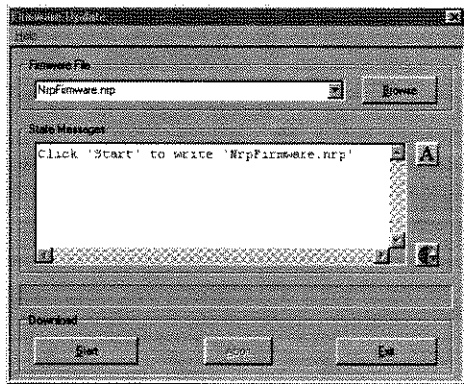
Updating the application firmware

NRP_Z21_Messkopf_0
1_15.nrp
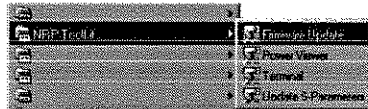
The update can be started as follows:

➤ Either double-click the icon of the update file named `<Type>_Messkopf_<Version Number>.nrp`

➤ Or start **NRP Toolkit – Firmware Update** from the Windows Start menu.

The dialog box on the left is displayed next.

➤ If the update was started via the Windows Start menu, enter the file name of the application firmware in the **Firmware File** box (or search for the name by using the **Browse** button).

➤ Click the **Start** button to start the file transfer, which is performed automatically.

➤ Observe the following:

• *Do not disconnect the power sensor from the PC.*

• *Neither connect nor disconnect the power supply for the R&S NRP-Z3 adapter.*

• *Exit the Firmware Update program only after it has been completely executed.*
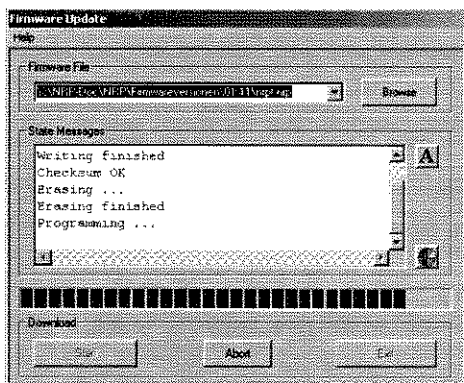
➤ During the update, the State Messages box informs you of the progress. The update has been completed successfully if the message `'Device <Type Designation><Serial Number> is active'` appears.

➤ You can then use the power sensor for measuring.

Potential problems

- Error in the compatibility and consistency checks.

In this case, the update is aborted and an error message is output.

➤ Unplug the power sensor, reconnect it and start the update again.

Updating the boot loader

Bootloader_00_20.
nrp

The boot loader update is similar to the update of the application firmware (see above).

➢ Instead of the application, however, you must load the new boot loader named

    Bootloader_<Version Number>.nrp

Strictly observe the warnings under "Updating the application firmware", since the destruction of the boot loader will generally require a repair of the power sensor.

Potential problems

- The power sensor cannot be accessed after the update (error message).

➢ Exit the Firmware Update program, unplug the power sensor from the PC and reconnect it. The power sensor is now ready for operation.

5 Documents

This section provides information for ordering spare parts and contains the relevant documents for the Rohde & Schwarz Power Sensors R&S NRP-Z11 and R&S NRP-Z21.

Shipping of Instrument and Ordering of Spare Parts

Please contact your Rohde & Schwarz support center or our spare parts express service if you need to request service, repair your equipment, or order spare parts and modules.

The list of Rohde & Schwarz representatives and the address of our spare parts express service are provided in the front section of this service manual.

You will need to provide the following information in order for us to respond to your inquiries quickly and accurately and to determine whether the warranty for your instrument is still valid:

- Instrument model
- Serial number
- Detailed error description in case of repair
- Contact partner for checkbacks

Shipping of Instrument

When shipping the instrument, be sure to provide sufficient mechanical and anti-static protection:

➢ Repack the instrument as it was originally packed. The antistatic packing foil prevents unintentional electrostatic charging from occurring.

➢ If you do not use the original packaging, include sufficient padding to prevent the instrument from slipping inside the package. Wrap antistatic packing foil around the instrument to protect it from electrostatic charging.

Ordering Spare Parts

To deliver replacement parts promptly and correctly, we need the following information:

- R&S stock number (refer to the spare part lists in this section)
- Designation
- Number of units
- Instrument type for the replacement part
- Contact person for possible questions

The R&S stock number to be used when ordering replacement parts and modules as well as power cables can be found further below.

Ordering Replacement Sensors

Rohde & Schwarz maintains a replacement program for a number of power sensors. Within this program, it is possible to provide a fully operational power sensor to replace a defective one at short notice and at a fixed price. Please note that replacement sensors are used equipment but are always tested. They are therefore equivalent to new sensors even though they may exhibit slight signs of use. If required, the delivery of replacement sensors can include a new calibration. If interested, please contact your nearest Rohde & Schwarz office.

Spare Parts

The R&S stock numbers necessary for ordering replacement parts and modules can be found in the spare part lists provided below.

List of R&S NRP-Z11/-Z21 Spare Parts

The following table lists available spare parts together with their R&S stock numbers.

Item No.	Designation	Electrical identification	Stock No.
20	ANALOG BOARD	A2	**)
40	POWER SENSOR CABLE	W1	1137.7141.02
60	SCREW 7985/ISR-M2X8-A4 FOR POWER SENSOR CABLE W1		1148.2600.00 *)
80	DIGITAL BOARD	A1	**)
90	SCREW 7985/ISR-M2X10-A4 FOR DIGITAL BOARD A1		1148.2917.00 *)
100	18 GHZ DETECTOR (NRP-Z21)	A3	**)
101	8 GHZ DETECTOR (NRP-Z11)	A3	**)
150	SHIELDING		1137.6068.00 *)
160	SENSOR HOUSING		1137.6022.00
170	SCREW 7985/ISR-M2X8-A4 FOR OUTER CASING		1148.2600.00 *)
180	LABEL 1 R&S NRP-Z11		1138.3033.00
190	LABEL 2 R&S NRP-Z11		1138.3040.00
200	LABEL 1 R&S NRP-Z21		1137.6039.00
210	LABEL 2 R&S NRP-Z21		1137.6045.00

Note: *The reference can be found in the drawings 3-3 and 3-4 in Section 3.*

---

*) Available but not maintained in spare parts stock, i.e. delivery time may be longer.
**) Spare part not available; to be replaced only by Rohde & Schwarz Central Service.