Software Manual

Measurements with Power Sensors

Applications Firmware
R&S® FS-K9

1157.3006.02

ROHDE & SCHWARZ

Test and Measurement

This Software Manual describes the following models:

R&S®FSP

R&S®FSQ

R&S®FSU

R&S®FSUP

Dear Customer,

throughout this manual, the Application Firmware R&S® FS-K9 is abbreviated as R&S FS-K9. The Spectrum Analyzers R&S® FSP abbreviated as R&S FSP.

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Grouped Safety Messages

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

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

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

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

Symbols and safety labels

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

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

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

Tags and their meaning

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

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

CAUTION   CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE   NOTICE indicates a property damage message.

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

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

Basic safety instructions

1. The product may be operated only under the operating conditions and in the positions specified by the manufacturer. Its ventilation must not be obstructed during operation. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products:
prescribed operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only in enclosed spaces, max. operation altitude 2000 m above sea level, max. transport altitude 4500 m above sea level.
A tolerance of ±10% shall apply to the nominal voltage and of ±5% to the nominal frequency.

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

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

4. If products/components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled, e.g. for disposal purposes, by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.

5. If handling the product yields hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation.

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

7. Operating the products requires special training and intense concentration. Make certain that persons who use the products are physically, mentally and emotionally fit enough to handle operating the products; otherwise injuries or material damage may occur. It is the responsibility of the employer to select suitable personnel for operating the products.

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

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

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

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

12. Never use the product if the power cable is damaged. Check the power cable on a regular basis to ensure that it is in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by e.g. tripping over the cable or suffering an electric shock.

13. The product may be operated only from TN/TT supply networks fused with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).

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

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

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

17. Ensure that the connections with information technology equipment comply with IEC 950/EN 60950.

18. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.

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

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

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

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

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

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

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

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

27. Batteries and storage batteries must not be exposed to high temperatures or fire. Keep batteries and storage batteries away from children. Do not short-circuit batteries and storage batteries.
If batteries or storage batteries are improperly replaced, this can cause an explosion (warning: lithium cells). Replace the battery or storage battery only with the matching Rohde & Schwarz type (see spare parts list). Batteries and storage batteries must be recycled and kept separate from residual waste. Batteries and storage batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.

28. Please be aware that in the event of a fire, toxic substances (gases, liquids etc.) that may be hazardous to your health may escape from the product.

29. The product can be very heavy. Be careful when moving it to avoid back or other physical injuries.

30. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves).

31. Handles on the products are designed exclusively for personnel to hold or carry the product. It is therefore not permissible to use handles for fastening the product to or on means of transport such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport and for observing the safety regulations of the manufacturer of the means of transport. Noncompliance can result in personal injury or material damage.

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

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

34. Prior to cleaning, disconnect the product from the AC supply. Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluent for cellulose lacquers.

Informaciones elementales de seguridad

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

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

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

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

Símbolos y definiciones de seguridad

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

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

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

Palabras de señal y su significado

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

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

Informaciones de seguridad elementales

1. El producto solamente debe ser utilizado según lo indicado por el fabricante referente a la situación y posición de funcionamiento sin que se obstruya la ventilación. Si no se convino de otra manera, es para los productos R&S válido lo que sigue: como posición de funcionamiento se define por principio la posición con el suelo de la caja para abajo, modo de protección IP 2X, grado de suciedad 2, categoría de sobrecarga eléctrica 2, utilizar solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4.500 m sobre el nivel del mar.
Se aplicará una tolerancia de ±10% sobre el voltaje nominal y de ±5% sobre la frecuencia nominal.

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

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

4. Si productos / elementos de construcción son tratados fuera del funcionamiento definido de forma mecánica o térmica, pueden generarse elementos peligrosos (polvos de sustancia de metales pesados como por ejemplo plomo, berilio, níquel). La partición elemental del producto, como por ejemplo sucede en el tratamiento de materias residuales, debe de ser efectuada solamente por personal especializado para estos tratamientos. La partición elemental efectuada inadecuadamente puede generar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes al tratamiento de materias residuales.

5. En el caso de que se produjeran agentes de peligro o combustibles en la aplicación del producto que debieran de ser transferidos a un tratamiento de materias residuales, como por ejemplo agentes refrigerantes que deben ser repuestos en periodos definidos, o aceites para motores, deberán ser tenidas en cuenta las prescripciones de seguridad del fabricante de estos agentes de peligro o combustibles y las regulaciones regionales para el tratamiento de materias residuales. Cuiden también de tener en cuenta en caso dado las prescripciones de seguridad especiales en la descripción del producto.

6. Ciertos productos, como por ejemplo las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. En vista a la protección de la vida en desarrollo deberían ser protegidas personas embarazadas debidamente. También las personas con un bypass pueden correr peligro a causa de la radiación electromagnética.

El empresario/usuario está comprometido a valorar y señalar áreas de trabajo en las que se corra un riesgo aumentado de exposición a radiaciones para evitar riesgos.

7. La utilización de los productos requiere instrucciones especiales y una alta concentración en el manejo. Debe de ponerse por seguro de que las personas que manejen los productos estén a la altura de los requerimientos necesarios referente a sus aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario lleva la responsabilidad de seleccionar el personal usuario apto para el manejo de los productos.

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

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

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

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

12. No utilice nunca el producto si está dañado el cable eléctrico. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegure a través de las medidas de protección y de instalación adecuadas de que el cable de eléctrico no pueda ser dañado o de que nadie pueda ser dañado por él, por ejemplo al tropezar o por un golpe de corriente.

13. Solamente está permitido el funcionamiento en redes de distribución TN/TT aseguradas con fusibles de como máximo 16 A (utilización de fusibles de mayor amperaje sólo previa consulta con el grupo de empresas Rohde & Schwarz).

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

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

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

17. En caso de conexión con aparatos de la técnica informática se deberá tener en cuenta que estos cumplan los requisitos del estándar IEC950/EN60950.

18. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar heridas, fuego o daños en el producto.

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

20. En caso de que los productos que son instalados fijamente en un lugar sean sin protector implementado, autointerruptor o similares objetos de protección, el circuito de suministro de corriente deberá estar protegido de manera que usuarios y productos estén suficientemente protegidos.

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

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

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

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

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

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

27. Baterías y acumuladores no deben de ser expuestos a temperaturas altas o al fuego. Guardar baterías y acumuladores fuera del alcance de los niños. No cortocircuitar baterías ni acumuladores. Si las baterías o los acumuladores no son cambiados con la debida atención existirá peligro de explosión (atención células de litio). Cambiar las baterías o los acumuladores solamente por los del tipo R&S correspondiente (ver lista de piezas de recambio). Las baterías y acumuladores deben reutilizarse y no deben acceder a los vertederos. Las baterías y acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de evacuación y reciclaje.

28. Por favor tengan en cuenta que en caso de un incendio pueden desprenderse del producto agentes venenosos (gases, líquidos etc.) que pueden generar daños a la salud.

29. El producto puede poseer un peso elevado. Muévalo con cuidado para evitar lesiones en la espalda u otras partes corporales.

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

31. Las asas instaladas en los productos sirven solamente de ayuda para el manejo que solamente está previsto para personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como por ejemplo grúas, carretillas elevadoras de horquilla, carros etc. El usuario es responsable de que los productos sean sujetados de forma segura a los medios de transporte y de que las prescripciones de seguridad del fabricante de los medios de transporte sean observadas. En caso de que no se tengan en cuenta pueden causarse daños en personas y objetos.

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

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

34. Antes de proceder a la limpieza, desconecte el producto de la red. Realice la limpieza con un paño suave, que no se deshilache. No utilice de ninguna manera agentes limpiadores químicos como, por ejemplo, alcohol, acetona o nitrodiluyente.

Certified Quality System

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

DQS REG. NO 001954 QM UM

QUALITÄTSZERTIFIKAT

Sehr geehrter Kunde,
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DIN EN 9100:2003
DIN EN ISO 14001:2004

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ROHDE & SCHWARZ

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

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◆ National Websites

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Contents of the Software Manual for Application Firmware R&S FS-K9

This software manual provides information on how to operate Application Firmware R&S FS-K9. It describes the menus and remote control commands for measurements with a power sensor.
All other details about operation can be found in the relevant operating manual.

This software manual consists of the following chapters:

Chapter 1	Describes the installation of the application firmware and the power sensor and how to enable the application firmware.
Chapter 2	Describes the first operating steps for measurements with a power sensor.
Chapter 3	Describes the test setup for measurements with a power sensor.
Chapter 4	Contains a detailed description of all functions as a reference for manual operation. The chapter also lists the corresponding IEC/IEEE bus command for each function.
Chapter 5	Describes all remote control commands defined for the application firmware. An alphabetic list of all remote control commands and a table containing the IEC/IEEE bus commands assigned to the softkeys are included at the end of the chapter.
Chapter 6	Contains the index for this software manual.

1 Installation and Enabling

Installation

Application Firmware R&S FS-K9 is part of the basic firmware of the base unit. The application is available starting with basic firmware version 3.2x.

If the basic firmware has to be updated, start the update with the floppy disks containing the basic firmware by *SETUP → NEXT → FIRMWARE UPDATE*.

> *Caution:*
> - *The instrument must be switched off before connecting the power sensor.*
> - *The drivers required for controlling the power sensor are installed along with the basic firmware for the analyzer, i.e. the software supplied with the power meter does not have to be installed.*

The R&S NRP-Zx power sensor is connected to the instrument using the R&S NRP USB adapter. For details, refer the operating manual for the R&S NRP-Zx power sensor.

Enabling

Application Firmware R&S FS-K9 is enabled in the *SETUP → GENERAL SETUP* menu by entering a keyword. The keyword is supplied together with the application firmware. If the application firmware is installed at the factory, it will already be enabled.

GENERAL SETUP menu:
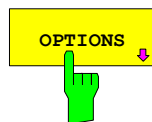
| OPTIONS | The OPTIONS softkey opens a submenu in which you can enter the keywords for the application firmware. The existing applications are displayed in a table that opens when you enter the submenu. |

| INSTALL OPTION | The *INSTALL OPTION* softkey enables entry of the keyword for application firmware. |

If the keyword is valid, the message *OPTION KEY OK* is displayed and the application firmware is entered in the *FIRMWARE OPTIONS* table.

If an invalid keyword is entered, *OPTION KEY INVALID* is displayed.

2 Getting Started

Before you can start measurements, you must adjust the instrument settings to the properties of the device under test. The following procedure is recommended:

1. ***Set the spectrum analyzer to its default state.***

   ➤ Press the *PRESET* button.
   The device is now in its default state.

2. ***Activate measurements with the power sensor.***

   ➤ Press the *PWR METER* hotkey.
   Measurements with the power sensor will be activated and the menu with the settings for the power sensor will be opened.

3. ***Set the frequency***

   ➤ In the default setting, the frequency of the power sensor is coupled with the center frequency of the analyzer, i.e. when the center frequency of the analyzer is set (*FREQ* button), the power sensor is automatically set to the frequency to be measured.

4. ***Set the measurement time.***

   ➤ Press the *MEAS TIME* softkey.
   The list of available measurement times is opened.

   ➤ Using the *cursor keys*, select the desired measurement time and confirm with *ENTER*.

5. ***Set the unit***

   ➤ Press the *UNIT / SCALE* softkey.
   The list of available units will be opened.

   ➤ Using the *cursor keys*, select the desired unit and confirm with *ENTER*.

Additional setting options are described in the following reference section of the manual.

3 Test Setup for Measurements with Power Sensors

> ⚠️ ***Caution:***
>
> *Before the instrument is put into operation, make sure the following are done:*
>
> - *The instrument cover is on and screwed into place.*
> - *The ventilation openings are unobstructed.*
> - *No signal voltage levels exceed permitted limits.*
> - *The instrument outputs are not overloaded or improperly connected.*
>
> ***Not complying with these precautions may cause damage to the instrument.***

This chapter describes the basic settings for the analyzer for measurements with a power sensor. Before measurements can be started, the analyzer must be correctly configured and powered as described in Chapter 1 of the operating manual for the base unit. Furthermore, Application Firmware R&S FS-K9 must be enabled. Chapter 1 of this manual describes how to install and enable the application firmware.

Standard Test Setup
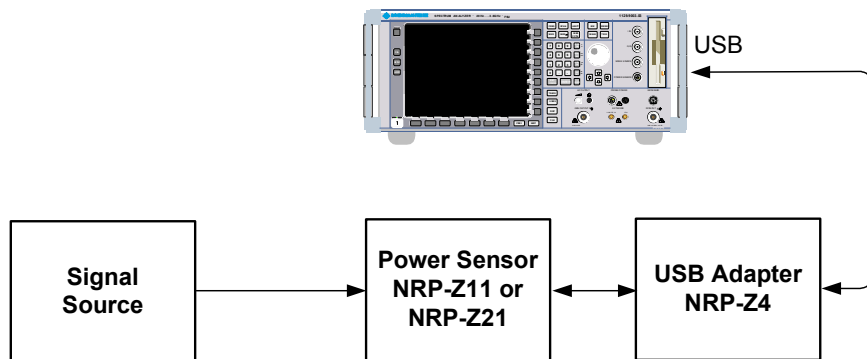
Fig. 3-1   Test setup

4 Configuration of Power Measurement

Application Firmware R&S FS-K9 (measurements with power sensor) is activated with the ***PWR METER*** hotkey.
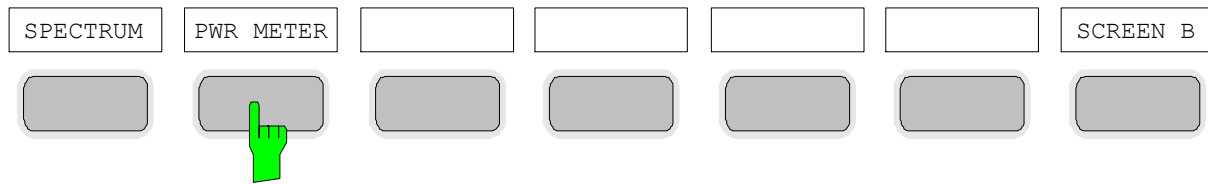

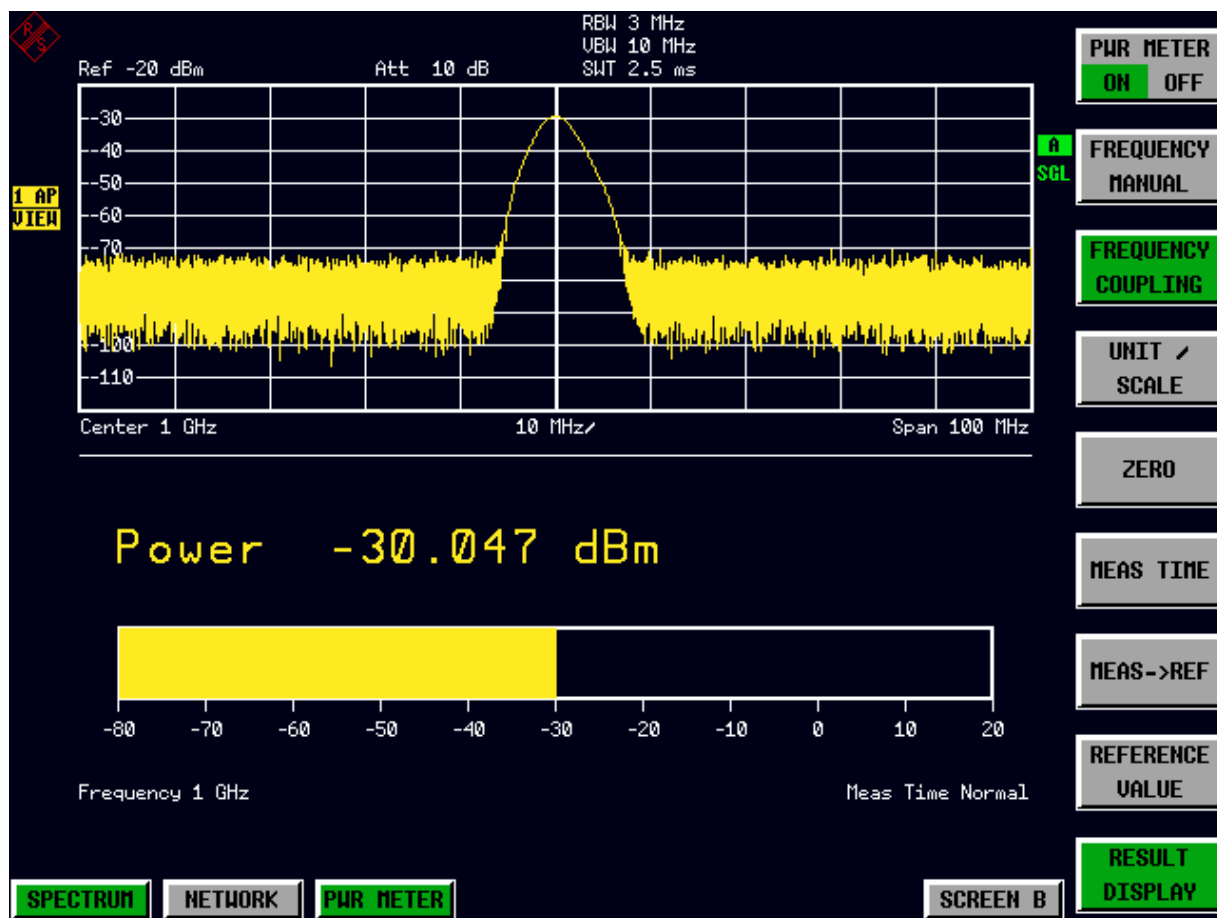Fig. 4-1   Hotkey bar with Application Firmware R&S FS-K9 enabled

Fig. 4-2   Result display of Application Firmware R&S FS-K9

If the hotkey bar is being used by an application, Application Firmware R&S FS-K9 can also be activated by pressing *SETUP → NEXT → PWR METER*.

The **PWR METER** hotkey opens the menu for configuring the power measurement.
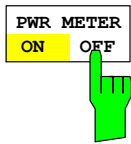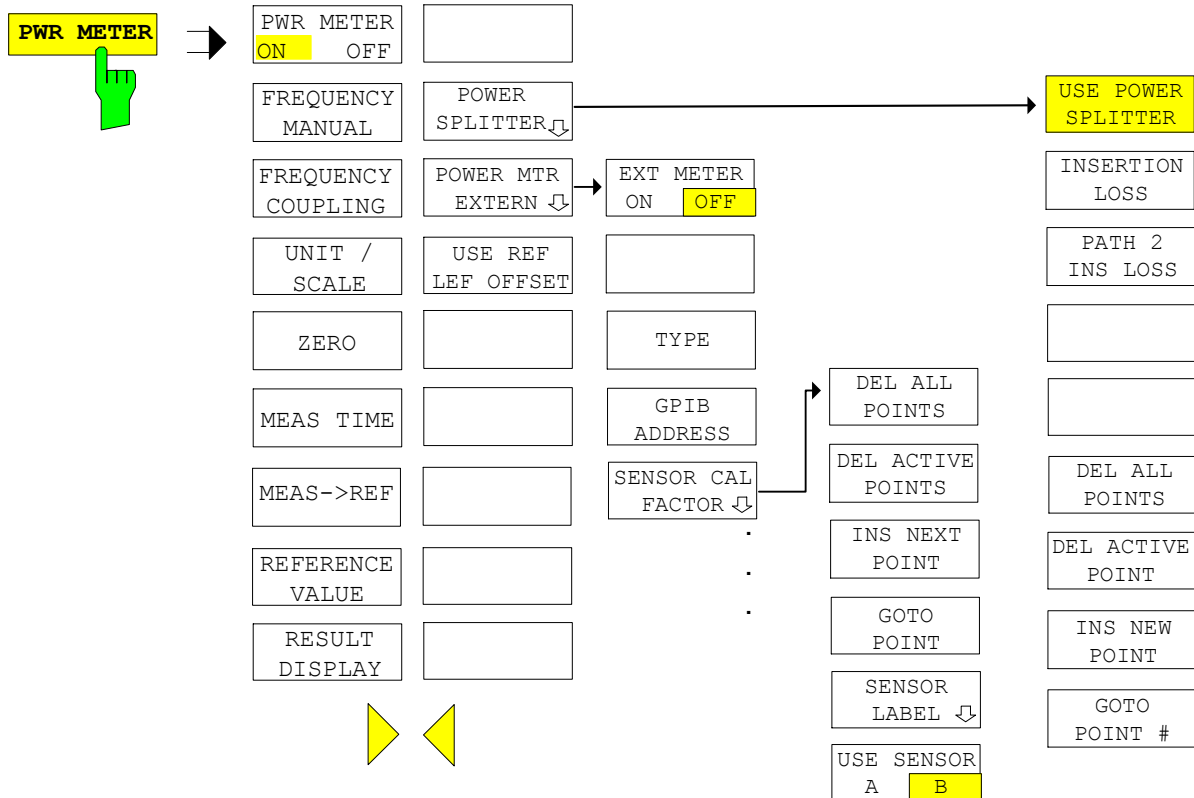
The *PWR METER ON / OFF* softkey switches the power measurement on or off.

IEC/IEEE bus command: `SENS:PMET:STAT ON`
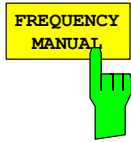
The *FREQUENCY MANUAL* softkey opens the data entry field for the frequency of the signal to be measured.

The power sensor has a memory with frequency-dependent correction factors. This allows extreme accuracy for signals of a known frequency.

IEC/IEEE bus command: `SENS:PMET:FREQ 1GHZ`
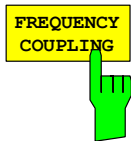
The *FREQUENCY COUPLING* softkey activates automatic coupling of the frequency to the center frequency of the instrument or to marker 1.
A list is used to make a selection. It is opened by pressing the softkey.

> **FREQUENCY COUPLING**
> √ **CENTER**
>   **MARKER 1**
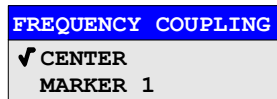
IEC/IEEE bus command: `SENS:PMET:FREQ:LINK CENT`
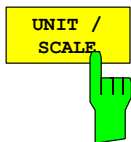
**UNIT /
SCALE**

The *UNIT / SCALE* softkey opens a list for selecting the unit with which the measured power is to be displayed.

```
UNIT / SCALE
√ dBm
  dB
  Watt
  %
```
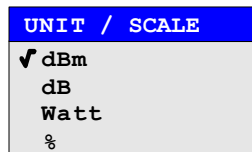
If dB or % is selected, the display is relative to a reference value that is defined with either the *MEAS→REF* softkey or the *REFERENCE VALUE* softkey.

IEC/IEEE bus command: CALC:PMET:REL:STAT ON | OFF
                             UNIT:PMET:POW DBM
                             UNIT:PMET:POW:RAT DB
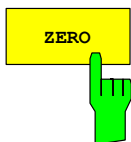
ZERO

The *ZERO* softkey starts zeroing of the power sensor.

Before zeroing starts, the user is prompted to disconnect all signals from the input of the power sensor.

```
ZEROING POWER SENSOR
Before zeroing the power
sensor, please remove all
signals from the sensor input.

 CONTINUE        CANCEL
```
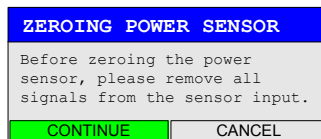
During zeroing, the following message appears:

```
ZEROING POWER SENSOR
Zeroing power sensor, please
wait...

        CANCEL
```
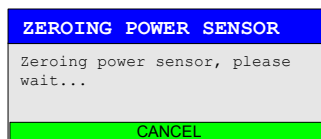
When zeroing is complete, the following message appears:

```
ZEROING POWER SENSOR
Power Sensor Zero OK.


          OK
```
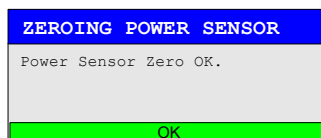
It disappears after approx. 3 seconds.

IEC/IEEE bus command: CAL:PMET:ZERO:AUTO ONCE;*WAI
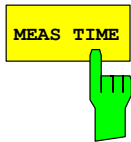
MEAS TIME

The *MEAS TIME* softkey opens a list in which the measurement can be set. Results are more stable with longer measurement times, particularly if signals with lower power are measured.

```
MEAS TIME
√ SHORT
  NORMAL
  LONG
```
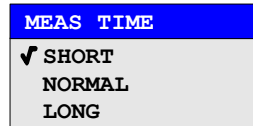
Stationary signals with high power (>-40dBm) require only a short measurement time to yield stable and exact results. In this case, the *SHORT* setting is recommended because it provides the highest repetition rates.

The *NORMAL* setting increases the stability of the displayed results for the measurement of signals with lower power or of modulated signals.

The *LONG* setting is recommended for signals at the lower end of the measurement range (<-50 dBm). This setting can be used to minimize the influence of noise.

IEC/IEEE bus command: SENS:PMET:MTIM LONG
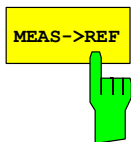
MEAS->REF

The *MEAS→REF* softkey is used to obtain the currently measured power as a reference value for the relative display.

The reference value can also be set manually via the *REFERENCE VALUE* softkey.

IEC/IEEE bus command: CALC:PMET:REL:MAGN:AUTO ONCE
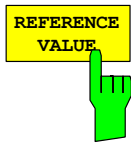
REFERENCE VALUE

The *REFERENCE VALUE* softkey activates manual entry of a reference value for relative measurements in the unit dBm.

IEC/IEEE bus command: CALC:PMET:REL:MAGN –30DBM
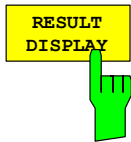
RESULT DISPLAY

The *RESULT DISPLAY* softkey switches the result display of the power measurement on or off. If the display is switched off, the measured power appears in the Marker Info field.

Note: *The softkey is available only in the spectrum analysis mode as long as the lower half of the screen is not already being used for another result display (e.g. ACP measurement).*
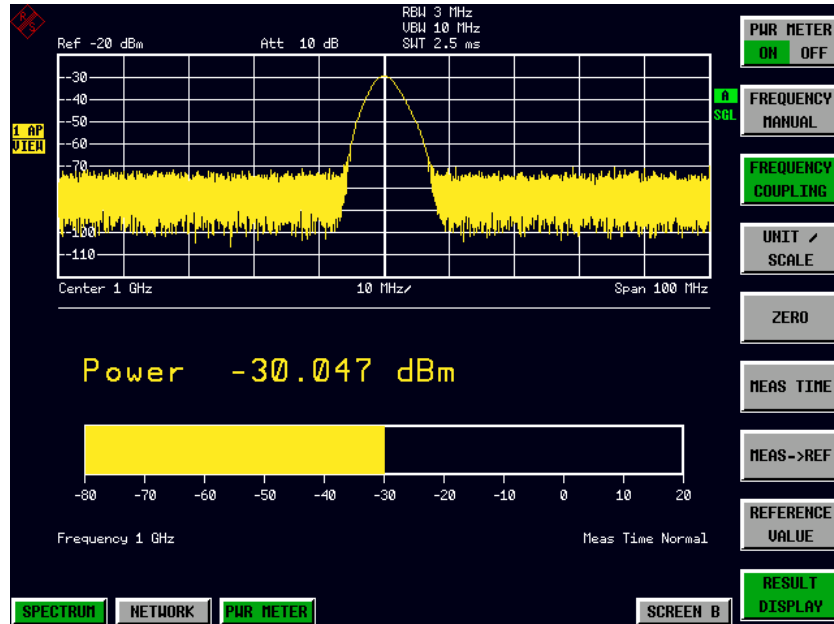
Fig. 4-3   Result display with *RESULT DISPLAY ON*
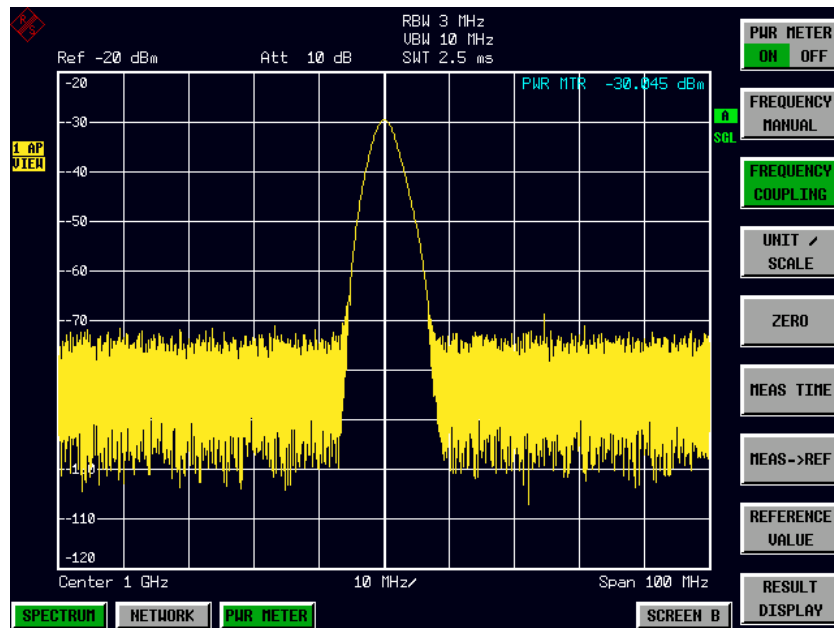
Fig. 4-4 Result display with *RESULT DISPLAY OFF*

IEC/IEEE bus command: DISP:WIND:PMET:STAT OFF

Menu PWR METER - NEXT
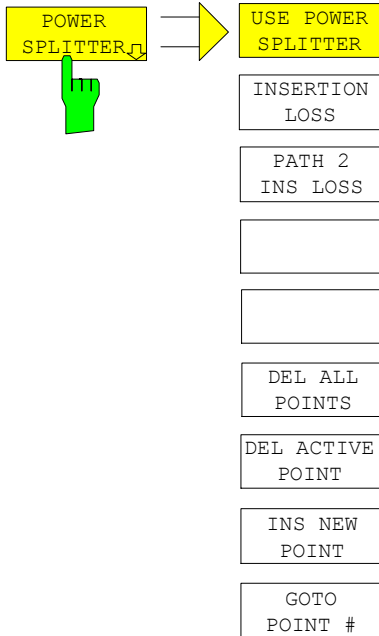
The *POWER SPLITTER* softkey opens a submenu for power splitter settings.

A table for entering the frequency-dependent insertion loss of the power splitter is opened simultaneously. It is valid for the path between power meter and signal source.

POWER SPLITTER INSERTION LOSS		
POINT	FREQUENCY	INS LOSS
1	20.000000000 MHz	5.40 dB
2	50.000000000 MHz	5.56 dB
3	100.000000000 MHz	5.63 dB
4	200.000000000 MHz	5.78 dB
5	500.000000000 MHz	5.89 dB
6	1.000000000 GHz	6.02 dB
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

The *USE POWER SPLITTER* softkey activates and deactivates automatic consideration of a power splitter that splits the present RF signal between the power meter and the R&S analyzer RF input.

IEC/IEEE bus command: `CORR:PLOS:INP:STAT ON`
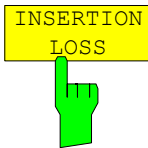
The *INSERTION LOSS* softkey opens the table for entering the frequency-dependent insertion loss of a power splitter.

IEC/IEEE bus command: `CORR:PLOS:INP 1e6,4.6,2e6,4.85`

The *PATH 2 INS LOSS* softkey opens a data entry field for defining the insertion loss of the power splitter between the signal source and the R&S analyzer RF input. This value is corrected during spectrum and IQ measurements.

IEC/IEEE bus command: `CORR:PLOS:INP:SPAT 4 DB`

The *DEL ALL POINTS* softkey deletes all values from the table with the frequency-dependent insertion loss of the power splitter.

IEC/IEEE bus command: –

DEL ACTIVE
POINT

The *DEL ACTIVE POINT* softkey deletes the marked value from the table with the frequency-dependent insertion loss of the power splitter.

IEC/IEEE bus command: –

INS NEW
POINT

The *INS NEW POINT* softkey inserts a new line at the spot where the table is marked.

IEC/IEEE bus command: –

GOTO
POINT #

The *GOTO POINT #* softkey sets the marking to the specified line within the table.

IEC/IEEE bus command: –

POWER MTR
EXTERN

EXT METER
ON   OFF

TYPE

GPIB
ADDRESS

SENSOR CAL
FACTOR

DEL ALL
POINTS

DEL ACTIVE
POINTS

INS NEXT
POINT

GOTO
POINT

SENSOR
LABEL

USE SENSOR
A   B

The *POWER METER EXTERN* softkey opens the submenu fort he external power measurement.

EXT METER
ON   OFF

The *EXT METER ON/OFF* softkey switches the measurement with the external power sensor on and off.

IEC/IEEE bus command: PMET:EXT:STAT ON
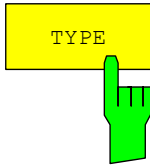
The *TYPE* softkey selects the type of external power meter used from a list.

TYPE

The R&S NRVS, R&S NRVD power meters from Rohde & Schwarz as well as EPM, 437B and 438A from Hewlett-Packard/Agilent are supported.

IEC/IEEE bus command: `SYST:COMM:RDEV:PMET:TYPE 'NRVS'`
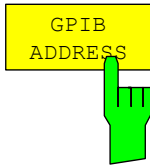
The *GPIB ADDRESS* softkey opens a data entry field for setting the IEC/IEEE bus address via which the external power meter is addressed for remote-control.

GPIB
ADDRESS

IEC/IEEE bus command: `SYST:COMM:GPIB:RDEV:PMET:ADDR 5`
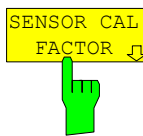
SENSOR CAL
FACTOR

DEL ALL
POINTS

DEL ACTIVE
POINT

INS NEW
POINT

GOTO
POINT #

SENSOR
LABEL

USE SENSOR
A   B

The *SENSOR CAL FACTOR* softkey opens a submenu for entering the frequency-dependent calibration factor of the power sensor used.

SENSOR CAL FACTOR		
LABEL	Sensor #35	
POINT	FREQUENCY	CAL FACTOR
1	2.000000000 GHz	99.30 %
2	10.000000000 GHz	98.10 %
3	14.000000000 GHz	97.60 %
4	18.000000000 GHz	97.10 %
5	20.000000000 GHz	97.10 %
6	22.000000000 GHz	96.40 %
7	24.000000000 GHz	96.00 %
8	26.000000000 GHz	96.60 %
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Due to mismatch, loss and change of sensitivity of the power sensor used, frequency-dependent errors occur during the power measurement. The calibration factor of a sensor, which is usually specified in percentage, describes which section of the forward power toward the sensor is actually sampled and displayed. Some power sensors read in the calibration factor from a memory in the sensor and automatically take this factor into account. With other devices (e.g. HP 436A), you have to set the calibration factor manually on the device; however, the factor applies only to a specific frequency. In this case, you can enter a table of the calibration factor above the frequency via the *SENSOR CAL FACTOR* menu; when measurements are performed, this factor is taken into account. You then have to set the calibration factor of 100% on the power meter.

You can enter the calibration factor for two different sensors on up to 20 frequency points each. Depending on the setting of the *USE SENSOR A B* softkey, either the SENSOR A CAL FACTOR LIST table or the SENSOR B CAL FACTOR LIST table is displayed. In the second line, a name for identifying the sensor is displayed; this name can be defined via the *SENSOR LABEL* softkey. The individual frequency points of the list are detailed below, but they can only be entered in ascending frequency order. Next to the number of the frequency point, there are two editable columns.

FREQUENCY – frequency value of the frequency point
CAL FACTOR – associated calibration factor in percentage

Linear interpolation occurs between the frequency points of the active calibration factor list. The calibration factors of the lower or upper cut-off frequency apply outside the specified frequency range. In the presetting, the table is empty and no correction has been made, i.e. the calibration factor is generally assumed to be 100%. If the list contains only one frequency point, the FREQUENCY field cannot be edited, and CAL FACTOR then applies to all frequencies.

IEC/IEEE bus command:
```
SYST:COMM:RDEV:PMET:CFAC:ASEN 2GHZ,99PCT,4GHZ,98PCT
SYST:COMM:RDEV:PMET:CFAC:BSEN 2GHZ,99PCT,4GHZ,98PCT
```

DEL ALL POINTS

The *DEL ALL POINTS* softkey deletes all values from the table with the frequency-dependent insertion loss of the power splitter.

IEC/IEEE bus command: –

DEL ACTIVE POINT

The *DEL ACTIVE POINT* softkey deletes the marked value from the table with the frequency-dependent insertion loss of the power splitter.

IEC/IEEE bus command: –

INS NEW POINT

The *INS NEW POINT* softkey inserts a new line where the table is marked.

IEC/IEEE bus command: –

GOTO POINT #

The *GOTO POINT #* softkey sets the marking to the specified line within the table.

IEC/IEEE bus command: –
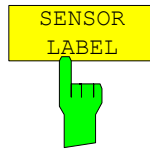
SENSOR
LABEL

The *SENSOR LABEL* softkey sets the marking within the table to the LABEL line so that an alphanumeric label can be entered.

IEC/IEEE bus command:
```
SYST:COMM:RDEV:PMET:CFAC:ASEN:LAB 'SENSOR1'
SYST:COMM:RDEV:PMET:CFAC:BSEN:LAB 'SENSOR2'
```
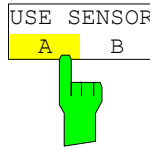
USE SENSOR
A   B

The *USE SENSOR A/B* softkey switches between the calibration factors of the sensors A and B.
Switchover refers both to the table displayed and to the data set used during power calibration.

IEC/IEEE bus command:
```
SYST:COMM:RDEV:PMET:CFAC:SEL ASEN | BSEN
```

USE REF
LEV OFFSET

The USE REF LEV OFFSET softkey controls whether the analyzer reference level offset is taken into account of the measured power (state ON) or not (state OFF).

IEC/IEEE bus command: `SENS1:PMET:ROFF:STAT ON | OFF`

5 Remote Control Commands

This chapter describes the remote control commands for the application firmware. An alphabetic list following the text of the manual provides a quick overview of the commands.

The commands that also apply to the base unit in the *SPECTRUM* mode and the system settings are described in the operating manual for the analyzer.

Common Commands

Command	Parameters	Comment
*OPT?		Option Identification Query; query only

*OPT?

   OPTION IDENTIFICATION QUERY polls the options contained in the device and returns a list of installed options. The options are separated by commas. The identifier for option R&S FS-K9 is contained in the response string at position 34:

Example:
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,K9,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

CALCulate:PMETer Subsystem

This subsystem controls the settings of the instrument for measurements with a power sensor. The measurement window is selected via CALCulate1 (SCREEN A) and CALCulate2 (SCREEN B).

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:PMETer			Option K9
:RELative			
[:MAGNitude]	<numeric_value>	dBm	
:AUTO	ONCE		
:STATe	<Boolean>		

CALCulate<1|2>:PMETer:RELative[:MAGNitude] -200 to 200

This command sets the reference value for relative measurements.

Example: `":CALC:PMET:REL –30"`   ' sets the reference value for relative measurements to –30 dBm

Properties: *RST value: 0
                  SCPI: device-specific

CALCulate<1|2>:PMETer:RELative[:MAGNitude]:AUTO ONCE

This command accepts the current result as a reference value for relative measurements.

Example: `":CALC:PMET:REL:AUTO ONCE"`   'accepts the current result as a reference value for relative measurements

Properties: *RST value: -
                  SCPI: device-specific

CALCulate<1|2>:PMETer:RELative:STATe ON | OFF

This command switches between relative and absolute display of the result.

Example: `":CALC:PMET:REL:STAT ON"`   ' activates relative display of the result

Properties: *RST value: OFF
                  SCPI: device-specific

CALibration Subsystem

The commands of the CALibration subsystem determine the data for system error correction in the instrument.

COMMAND	PARAMETERS	UNIT	COMMENT
CALibration			
:PMETer			Option K9
:ZERO			
:AUTO	ONCE	--	no query

CALibration:PMETer:ZERO:AUTO ONCE

This command zeroes the power sensor.

Example: `":CAL:PMET:ZERO:AUTO ONCE;*WAI"` ' zeroes the power sensor and waits until zeroing is completed before executing additional commands

Properties: *RST value: -
                           SCPI: device-specific

DISPlay Subsystem

The DISPLay subsystem controls the selection and presentation of text and graphics information as well as measurement data on the screen.
The measurement window is selected via WINDow1 (SCREEN A) or WINDow2 (SCREEN B).

COMMAND	PARAMETERS	UNIT	COMMENT
DISPlay			
[:WINDow<1|2>]			
:TRACe<1...3>			
:Y			
[:SCALe]			
:RLEVel		DB	
:OFFSet	<numeric_value>		Option K9
:PMETer		--	
:STATe	<Boolean>		

DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y[:SCALe]:RLEVel:OFFSet −200 dB to 200 dB

> This command defines the reference level offset in the selected measurement window. Depending on the coupling of the measurement windows, this command is valid for both screens (INSTrument:COUPle ALL) or only for the selected measurement window (INSTrument:COUPle NONE).
>
> The numeric suffix under TRACe <1...3> is irrelevant.
>
> **Example:**   "DISP:WIND1:TRAC:Y:RLEV:OFFS −10dB"
>
> **Properties:**   *RST value: 0dB
>   SCPI: compliant

:DISPlay[:WINDow<1|2>]:PMETer:STATe ON | OFF

> This command switches bargraph display on or off for measurements with a power sensor. If bargraph display is switched off, the measurement value appears in the Marker Info field.
>
> **Example:**   "DISP:PMET:STAT OFF"   ' switches bargraph display off
>
> **Properties:**   *RST value: ON
>   SCPI: device-specific

FETCh:PMETer Subsystem

This subsystem contains the commands for outputting the results of the measurements with a power sensor without starting the measurement itself.

COMMAND	PARAMETERS	UNIT	COMMENT
FETCh<1|2>			
:PMETer?	--	--	query only

FETCh<1\|2>:PMETer?

This command outputs the result of the power sensor.

Example: `"FETC:PMET?"`   'outputs the result of the power sensor

Properties: *RST value: -
                   SCPI: device-specific

If no measurement has been carried out yet, a query error is triggered. This command is strictly a query and thus does not have a *RST value.

INITiate Subsystem

The INITiate subsystem is used to control the measurement sequence in the selected measurement window. The measurement window is selected using INITiate1 (SCREEN A) and INITiate2 (SCREEN B) .

COMMAND	PARAMETERS	UNIT	COMMENT
INITiate<1|2>			
:CONTinuous	<Boolean>	--	
[:IMMediate]	--	--	no query

INITiate<1|2>:CONTinuous   ON | OFF

This command determines whether the device performs measurements continuously ("Continuous") or only individual measurements ("Single")

In the spectrum analysis mode, this setting refers to the sweep operation (switchover between Continuous and Single Sweep).

Example: `"INIT2:CONT OFF"`   'switches operation in screen B to Single Sweep

`"INIT2:CONT ON"`   'switches operation to Continuous Sweep

Properties: *RST value: ON
SCPI: compliant

INITiate<1|2>[:IMMediate]

This command starts a new measurement sequence in the specified measurement window.

This command starts a new measurement sequence (sweep) in the specified measurement window. A sweep count > 0 or average count > 0 means the number of specified measurements will be restarted. In the case of the trace functions MAXHold, MINHold and AVERage, the previous results are reset when the measurement is restarted.

In the Single Sweep mode, the commands *OPC, *OPC? or *WAI can be used to perform synchronization with the end of the specified number of measurements. In the Continuous Sweep mode, synchronization with the end of the sweep is not possible because the entire measurement "never" actually ends.

Example: `"INIT:CONT OFF"`   'switches to Single Sweep mode

`"DISP:WIND:TRAC:MODE AVER`   'activates Trace Averaging

`"SWE:COUN 20"`   'sets the sweep counter to 20 sweeps

`"INIT;*WAI"`   'starts the measurement by waiting for the end of 20 measurements

Properties: *RST value: -
SCPI: compliant

This command is an "event" and thus has neither a *RST value nor a query.

READ:PMETer Subsystem

This subsystem contains the commands for starting measurements with a power sensor and outputting the results.

COMMAND	PARAMETERS	UNIT	COMMENT
READ<1|2>			Option FS-K9
:PMETer?	--	--	query only

READ<1|2>:PMETer?

This command triggers a measurement with the power sensor and then outputs the result.

Example:　　　　　`"READ:PMET? "`　　　　　　　' starts a measurement and output the result

Properties:　　　*RST value:　　-
　　　　　　　　　　SCPI:　　　　　device-specific

This command is strictly a query and thus does not have a *RST value.

SENSe:CORRection – Subsystem

This subsystem controls the settings of the power splitter.

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
CORRection			
:PLOSs			
:INPut	<numeric_value>, <numeric_value>...	HZ, DB	
:STATe	<Boolean>		
:SPATh	<numeric_value>	DB	

[SENSe<1|2>:]CORRection:PLOSs:INPut <numeric_value>,<numeric_value>...

This command enters the frequency-dependent insertion loss of a power splitter.

Example: `"CORR:PLOS:INP 1e6,4.6,2e6,4.85"`

Properties: *RST value: -
                             SCPI: device-specific

[SENSe<1|2>:]CORRection:PLOSs:INPut:STATe ON | OFF

This command activates and deactivates automatic consideration of a power splitter that splits the present RF signal between the power meter and the R&S analyzer RF input.

Example: `"CORR:PLOS:INP:STAT ON"`

Properties: *RST value: -
                             SCPI: device-specific

[SENSe<1|2>:]CORRection:PLOSs:INPut:SPATh <numeric_value>

This command defins the insertion loss of the power splitter between the signal source and the R&S analyzer RF input. This value is corrected during spectrum and IQ measurements.

Example: `"CORR:PLOS:INP:SPAT 4 DB"`

Properties: *RST value: -
                             SCPI: device-specific

SENSe:PMETer Subsystem

This subsystem controls the settings of the instrument for measurements with a power sensor. The measurement window is selected via SENSe1 (SCREEN A) and SENSe2 (SCREEN B).

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
:PMETer			
[:STATe]	<Boolean>		
:EXTern			
[:STATe]	<Boolean>		
:FREQuency	<numeric_value>	Hz	
:LINK	CENTer | MARKer1 | OFF		
:MTIMe	SHORT | NORMAL | LONG		
:ROFFset			
[:STATe]	<Boolean>		

[SENSe<1|2>:]PMETer[:STATe] ON | OFF

This command switches measurements with a power sensor on or off.

Example:	`"PMET ON"`	'switches measurements with a power sensor on

Properties:	*RST value:	OFF
	SCPI:	device-specific

[SENSe<1|2>:]PMETer:EXTern[:STATe] ON | OFF

This command switches measurements with an external power sensor on or off.

Example:	`"PMET:EXT ON"`	' witches measurements with an external power sensor on

Properties:	*RST value:	OFF
	SCPI:	device-specific

[SENSe<1|2>:]PMETer:FREQuency f_{min} to f_{max}

This command sets the frequency of the power sensor..
The limit values f_{min} and f_{max} are set by the power sensor that is connected.

Example:	`"PMET:FREQ 1GHZ"`	' sets the frequency of the power sensor to 1 GHz

Properties:	*RST value:	50 MHz
	SCPI:	device-specific

[SENSe<1|2>:]PMETer:FREQuency:LINK CENTer | MARKer1 | OFF

This command sets the coupling for the frequency of the power sensor.

Parameter:	CENTer	couples the frequency to the center frequency of the analyzer
	MARKer1	couples the frequency to the position of marker 1
	OFF	deactivates the coupling of the frequency

Example:	`"PMET:FREQ:LINK CENT"`	' couples the frequency to the center frequency of the analyzer

Properties:	*RST value:	CENT
	SCPI:	device-specific

[SENSe<1|2>:]PMETer:MTIMe SHORt | NORMal | LONG

This command determines the measurement time of the power sensor.

Example: `"PMET:MTIM SHOR"`   'selects the short time for the measurement of
                                                  'stationary signals with high power

Properties: *RST value: NORM
                       SCPI: device-specific

This command defines whether the reference level offset set for the analyzer is taken into account for the measured power or not.

[SENSe<1|2>:]PMETer:ROFFset[:STATe] ON | OFF

This command controls whether the analyzer reference level offset is taken into account of the measured power (state ON) or not (state OFF).

Example: `"PMET ON"`   'switches measurements with a power sensor on
                      `"PMET:ROFF ON"` 'switches the reference level offset

Properties: *RST value: ON
                       SCPI: device-specific

SYSTem Subsystem

This subsystem contains the command for setting the external power sensors.

COMMAND	PARAMETERS	UNIT	COMMENT
SYSTem			
:COMMunicate			
:GPIB			
PMETer			
:ADDRess	<numeric_value>		
:RDEVice			
:PMETer			
:CFACtor			
[:SELect]	ASENsor | BSENsor		
:ASENsor	<numeric_value>, <numeric_value>...		
:LABel	<name>		
:BSENsor	<numeric_value>, <numeric_value>...	HZ, PCT	
:LABel	<name>		
:TYPE	<name>		

SYSTem:COMMunicate:GPIB:RDEVice:PMETer:ADDRess   0 … 30

This command sets the IEC/IEEE bus address via which the external power meter is addressed for remote-control.

Example: `"SYST:COMM:GPIB:RDEV:PMET:ADDR 5"`
                                `'`Changes the IECBUS address `'`of power sensor to 5

Characteristics: *RST value:
                    SCPI: device-specific

SYSTem:COMMunicate:RDEVice:PMETer:CFACtor[:SELect]   ASENsor \| BSENsor

This command switches between the calibration factors of the sensors A and B.

Example: `"SYST:COMM:RDEV:PMET:CFAC ASEN"`

Characteristics: *RST value:
                    SCPI: device-specific

SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:ASENsor <num_value>,<num_value> ...

This command enters the frequency-dependent calibration factor of the power sensor A.

Example: `"SYST:COMM:RDEV:PMET:CFAC:ASEN 2GHZ,99PCT,4GHZ,98PCT"`

Characteristics: *RST value:
                    SCPI: device-specific

SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:ASENsor:LABel <name>

This command sets the marking within the table to the LABEL line so that an alphanumeric label can be entered.

Example: `"SYST:COMM:RDEV:PMET:CFAC:ASEN:LAB 'SENSOR1'"`

Characteristics: *RST value:
                    SCPI: device-specific

SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:BSENsor <num_value>,<num_value> ...

This command enters the frequency-dependent calibration factor of the power sensor A.

Example: "SYST:COMM:RDEV:PMET:CFAC:BSEN 2GHZ,99PCT,4GHZ,98PCT"

Characteristics: *RST value:
                      SCPI: device-specific

SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:BSENsor:LABel <name>

This command sets the marking within the table to the LABEL line so that an alphanumeric label can be entered.

Example: "SYST:COMM:RDEV:PMET:CFAC:BSEN:LAB 'SENSOR2'"

Characteristics: *RST value:
                      SCPI: device-specific

SYSTem:COMMunicate:RDEVice:PMETer:TYPE   'NRVD' | NRVS' | 'EPM' | 437B | '437A'

This command selects the type of external power meter. The R&S NRVS, R&S NRVD power meters from Rohde & Schwarz as well as EPM, 437B and 438A from Hewlett-Packard/Agilent are supported.

Example: "YST:COMM:RDEV:PMET:TYPE 'NRVS'"

Characteristics: *RST value:
                      SCPI: device-specific

UNIT Subsystem

The Unit subsystem is used to switch the basic measurement unit of setting parameters. In split-screen display, a distinction is made between UNIT1 (SCREEN A) and UNIT2 (SCREEN B).

COMMAND	PARAMETERS	UNIT	COMMENT
UNIT<1|2>			
:PMETer:			Option FS-K9
:POWer	DBM | WATT | W		
:RATio	DB | PCT		

UNIT<1|2>:PMETer:POWer   DBM | WATT | W

This command selects the unit for absolute measurements with a power sensor.

Example: `"UNIT:PMET:POW DBM"`

Properties: *RST value: DBM
                       SCPI: compliant

UNIT<1|2>:PMETer:POWer:RATio   DB | PCT

This command selects the unit for relative measurements with a power sensor.

Example: `"UNIT:PMET:POW DB"`

Properties: *RST value: DB
                       SCPI: compliant

Table of Softkeys with Assignment of IEC/IEEE Bus Commands

PWR METER Hotkey

PWR METER ON OFF	`[SENSe<1	2>:]PMETer[:STATe] ON	OFF`
FREQUENCY MANUAL	`[SENSe<1|2>:]PMETer:FREQuency:LINK OFF` `[SENSe<1|2>:]PMETer:FREQuency f_min .. f_max`
FREQUENCY COUPLING	`[SENSe<1	2>:]PMETer:FREQuency:LINK CENTer	MARKer1`
UNIT / SCALE	`CALCulate<1|2>:PMETer:RELative:STATe ON	OFF` `UNIT<1|2>:PMETer:POWer DBM	WATT	W` `UNIT<1|2>:PMETer:POWer:RATio DB	PCT`
ZERO	`CALibration:PMETer:ZERO:AUTO ONCE`
MEAS TIME	`[SENSe<1	2>:]PMETer:MTIMe SHORt	NORMal	LONG`
MEAS→REF	`CALCulate<1|2>:PMETer:RELative[:MAGNitude]:AUTO ONCE`
REFERENCE VALUE	`CALCulate<1|2>:PMETer:RELative[:MAGNitude] -200 .. 200`
RESULT DISPLAY	`DISPlay[:WINDow<1	2>]:PMETer:STATe ON	OFF`
POWER SPLITTER	`DISPlay[:WINDow<1	2>]:PMETer:STATe ON	OFF`
USE POWER SPLITTER	`[SENSe<1	2>:]CORRection:PLOSs:INPut:STATe ON	OFF`
INSERTION LOSS	`[SENSe<1|2>:]CORRection:PLOSs:INPut <numeric_value>`
PATH2 INS LOSS	`[SENSe<1|2>:]CORRection:PLOSs:INPut:SPATh <numeric_value>`
DEL ALL POINTS	---
DEL ACTIVE POINTS	---
INS NEW POINTS	---
GOTO POINT #	---
POWER MTR EXT	--
EXTERN MTR ON OFF	`[SENSe<1	2>:]PMETer:EXTern:STATe ON	OFF`
TYPE	`SYSTem:COMMunicate:RDEVice:PMETer:TYPE 'name'`
GPIB ADDRESS	`SYSTem:COMMunicate:GPIB:RDEVice:PMETer:ADDRess <numeric_value>`

SENSOR CAL
FACTOR
	`SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:ASENsor <numeric_value>,`
	`<numeric_value>`
	`SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:BENsor <numeric_value>,`
	`<numeric_value>`

DEL ALL POINTS	---
DEL ACTIVE POINTS	---
INS NEW POINTS	---
GOTO POINT #	---
SENSOR LABEL	`SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:ASENsor:LABel 'label'` `SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:BSENsor:LABel 'label'`
USE SENSOR A B	`SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:SELect ASENsor	BSENsor`
USE REF LEV OFFSET	`[SENSe<1|2>:]PMETer:ROFFset:STATe ON	OFF`

AMPL Key

REF LEVEL OFFSET	`DISPlay[:WINDow<1|2>]:TRACe:Y[:SCALe]:RLEVel:OFFSet  -200dB to 200dB`

SWEEP Key

CONTINUOUS SWEEP	`INITiate<1|2>:CONTinuous ON`
SINGLE SWEEP	`INITiate<1|2>:CONTinuous OFF` `INITiate<1|2>[:IMMediate]`

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