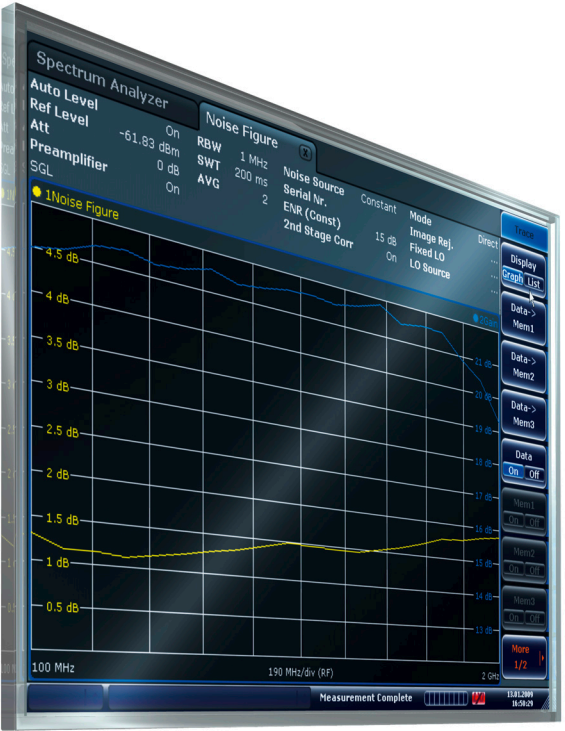


# R&S® FSV-K30

## Firmware Option Noise Figure Measurements

### Operating Manual



1173.0695.02 – 04.1

This manual describes the following options:

- R&S FSV-K30 (1310.8355.02)

The contents of this manual correspond to the following R&S®FSVR models with firmware version 1.56 or higher:

- R&S®FSVR7 (1311.0006K7)
- R&S®FSVR13 (1311.0006K13)
- R&S®FSVR30 (1311.0006K30)
- R&S®FSVR40 (1311.0006K40)

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

Package	Link	License
OpenSSL	<a href="http://www.openssl.org">http://www.openssl.org</a>	OpenSSL/SSLLeavy
Xitami	<a href="http://www.xitami.com">http://www.xitami.com</a>	2.5b6
PHP	<a href="http://www.php.net">http://www.php.net</a>	PHP v.3
DOJO-AJAX	<a href="http://www.dojotoolkit.org">http://www.dojotoolkit.org</a>	Academic Free License (BSD)
ResizableLib	<a href="http://www.geocities.com/ppescher">http://www.geocities.com/ppescher</a>	Artistic License
BOOST Library	<a href="http://www.boost.org">http://www.boost.org</a>	Boost Software v.1
ONC/RPC	<a href="http://www.plt.rwth-aachen.de/index.php?id=258">http://www.plt.rwth-aachen.de/index.php?id=258</a>	SUN

The product Open SSL includes cryptographic software written by Eric Young (eay@cryptsoft.com) and software written by Tim Hudson (tjh@cryptsoft.com).

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

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The following abbreviations are used throughout this manual: R&S®FSV is abbreviated as R&S FSV. R&S®FSVR is abbreviated as R&S FSVR.

# Basic Safety Instructions

## Always read through and comply with the following safety instructions!

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

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

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

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

## Symbols and safety labels

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

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

### Tags and their meaning

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

	indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	indicates the possibility of incorrect operation which can result in damage to the product. In the product documentation, the word ATTENTION is used synonymously.

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

### Operating states and operating positions

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

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

### Electrical safety

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

1. Prior to switching on the product, always ensure that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with an earthing contact and protective earth connection.
3. Intentionally breaking the protective earth connection either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
4. If the product does not have a power switch for disconnection from the AC supply network, the plug of the connecting cable is regarded as the disconnecting device. In such cases, always ensure that the power plug is easily reachable and accessible at all times (corresponding to the length of connecting cable, approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply network. If products without power switches are integrated into racks or systems, a disconnecting device must be provided at the system level.
5. Never use the product if the power cable is damaged. Check the power cable on a regular basis to ensure that it is in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, you can ensure that the cable will not be damaged and that no one can be hurt by, for example, tripping over the cable or suffering an electric shock.
6. The product may be operated only from TN/TT supply networks fused with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, sparks that result in fire and/or injuries may occur.
8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
9. For measurements in circuits with voltages  $V_{\text{rms}} > 30 \text{ V}$ , suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC60950-1/EN60950-1 or IEC61010-1/EN 61010-1 standards that apply in each case.
11. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
12. If a product is to be permanently installed, the connection between the PE terminal on site and the product's PE conductor must be made first before any other connection is made. The product may be installed and connected only by a licensed electrician.
13. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused in such a way that anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.

## Basic Safety Instructions

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

### Operation

1. Operating the products requires special training and intense concentration. Make sure that persons who use the products are physically, mentally and emotionally fit enough to do so; otherwise, injuries or material damage may occur. It is the responsibility of the employer/operator to select suitable personnel for operating the products.
2. Before you move or transport the product, read and observe the section titled "Transport".
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.
4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal", item 1.
5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.
6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.
7. If a laser product (e.g. a CD/DVD drive) is integrated into a Rohde & Schwarz product, absolutely no other settings or functions may be used as described in the product documentation. The objective is to prevent personal injury (e.g. due to laser beams).

### Repair and service

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

### Batteries and rechargeable batteries/cells

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

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

### Transport

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

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

### **Waste disposal**

1. If products or their components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
2. If handling the product releases hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation. The improper disposal of hazardous substances or fuels can cause health problems and lead to environmental damage.

## Informaciones elementales de seguridad

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

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

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



## Informaciones elementales de seguridad

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

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

### Símbolos y definiciones de seguridad

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

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

## Palabras de señal y su significado

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



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



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



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



AVISO indica la posibilidad de utilizar mal el producto y, como consecuencia, dañarlo.

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

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

## Estados operativos y posiciones de funcionamiento

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

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

## Seguridad eléctrica

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

1. Antes de la puesta en marcha del producto se deberá comprobar siempre que la tensión preseleccionada en el producto coincida con la de la red de alimentación eléctrica. Si es necesario modificar el ajuste de tensión, también se deberán cambiar en caso dado los fusibles correspondientes del producto.
2. Los productos de la clase de protección I con alimentación móvil y enchufe individual solamente podrán enchufarse a tomas de corriente con contacto de seguridad y con conductor de protección conectado.
3. Queda prohibida la interrupción intencionada del conductor de protección, tanto en la toma de corriente como en el mismo producto. La interrupción puede tener como consecuencia el riesgo de que el producto sea fuente de choques eléctricos. Si se utilizan cables alargadores o regletas de enchufe, deberá garantizarse la realización de un examen regular de los mismos en cuanto a su estado técnico de seguridad.
4. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de conexión como interruptor. En estos casos se deberá asegurar que el enchufe siempre sea de fácil acceso (de acuerdo con la longitud del cable de conexión, aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para el corte de la red eléctrica. Si los productos sin interruptor están integrados en bastidores o instalaciones, se deberá colocar el interruptor en el nivel de la instalación.
5. No utilice nunca el producto si está dañado el cable de conexión a red. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegúrese, mediante las medidas de protección y de instalación adecuadas, de que el cable de conexión a red no pueda ser dañado o de que nadie pueda ser dañado por él, p. ej. al tropezar o por un choque eléctrico.
6. Solamente está permitido el funcionamiento en redes de alimentación TN/TT aseguradas con fusibles de 16 A como máximo (utilización de fusibles de mayor amperaje solo previa consulta con el grupo de empresas Rohde & Schwarz).
7. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. La no observación de estas medidas puede provocar chispas, fuego y/o lesiones.
8. No sobrecargue las tomas de corriente, los cables alargadores o las regletas de enchufe ya que esto podría causar fuego o choques eléctricos.
9. En las mediciones en circuitos de corriente con una tensión  $U_{\text{eff}} > 30 \text{ V}$  se deberán tomar las medidas apropiadas para impedir cualquier peligro (p. ej. medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
10. Para la conexión con dispositivos informáticos como un PC o un ordenador industrial, debe comprobarse que éstos cumplan los estándares IEC60950-1/EN60950-1 o IEC61010-1/EN 61010-1 válidos en cada caso.
11. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar lesiones, fuego o daños en el producto.

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

## Funcionamiento

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

5. Ciertos productos, como p. ej. las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. Deben tomarse todas las medidas necesarias para la protección de las mujeres embarazadas. También las personas con marcapasos pueden correr peligro a causa de la radiación electromagnética. El empresario/operador tiene la obligación de evaluar y señalar las áreas de trabajo en las que exista un riesgo elevado de exposición a radiaciones.
6. Tenga en cuenta que en caso de incendio pueden desprenderse del producto sustancias tóxicas (gases, líquidos etc.) que pueden generar daños a la salud. Por eso, en caso de incendio deben usarse medidas adecuadas, como p. ej. máscaras antigás e indumentaria de protección.
7. En caso de que un producto Rohde & Schwarz contenga un producto láser (p. ej. un lector de CD/DVD), no debe usarse ninguna otra configuración o función aparte de las descritas en la documentación del producto, a fin de evitar lesiones (p. ej. debidas a irradiación láser).

### **Reparación y mantenimiento**

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

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

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

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

## Informaciones elementales de seguridad

6. En caso de falta de estanqueidad de una celda, el líquido vertido no debe entrar en contacto con la piel ni los ojos. Si se produce contacto, lavar con agua abundante la zona afectada y avisar a un médico.
7. En caso de cambio o recarga inadecuados, las celdas o baterías que contienen electrolitos alcalinos (p. ej. las celdas de litio) pueden explotar. Para garantizar la seguridad del producto, las celdas o baterías solo deben ser sustituidas por el tipo Rohde & Schwarz correspondiente (ver lista de recambios).
8. Las baterías y celdas deben reciclarse y no deben tirarse a la basura doméstica. Las baterías o acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de eliminación y reciclaje.

### Transporte

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

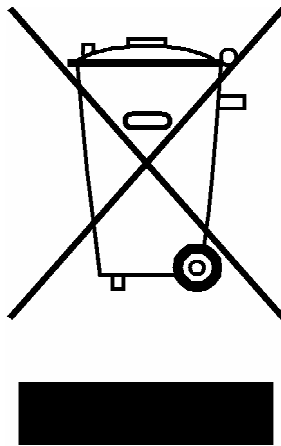
### Eliminación

1. Si se trabaja de manera mecánica y/o térmica cualquier producto o componente más allá del funcionamiento previsto, pueden liberarse sustancias peligrosas (polveros con contenido de metales pesados como p. ej. plomo, berilio o níquel). Por eso el producto solo debe ser desmontado por personal especializado con formación adecuada. Un desmontaje inadecuado puede ocasionar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes a la eliminación de residuos.
2. En caso de que durante el trato del producto se formen sustancias peligrosas o combustibles que deban tratarse como residuos especiales (p. ej. refrigerantes o aceites de motor con intervalos de cambio definidos), deben tenerse en cuenta las indicaciones de seguridad del fabricante de dichas sustancias y las normas regionales de eliminación de residuos. Tenga en cuenta también en caso necesario las indicaciones de seguridad especiales contenidas en la documentación del producto. La eliminación incorrecta de sustancias peligrosas o combustibles puede causar daños a la salud o daños al medio ambiente.

# Customer Information Regarding Product Disposal

The German Electrical and Electronic Equipment (ElektroG) Act is an implementation of the following EC directives:

- 2002/96/EC on waste electrical and electronic equipment (WEEE) and
- 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).



Product labeling in accordance with EN 50419

Once the lifetime of a product has ended, this product must not be disposed of in the standard domestic refuse. Even disposal via the municipal collection points for waste electrical and electronic equipment is not permitted.

Rohde & Schwarz GmbH & Co. KG has developed a disposal concept for the environmental-friendly disposal or recycling of waste material and fully assumes its obligation as a producer to take back and dispose of electrical and electronic waste in accordance with the ElektroG Act.

Please contact your local service representative to dispose of the product.



### Kundeninformation zur Batterieverordnung (BattV)

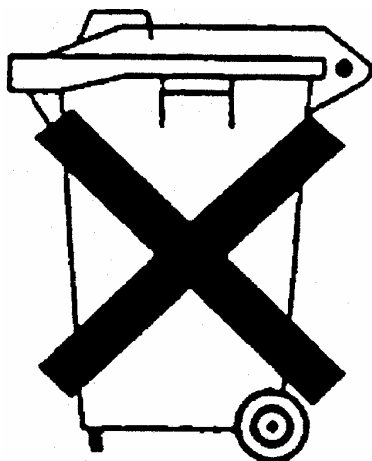
Dieses Gerät enthält eine schadstoffhaltige Batterie. Diese darf nicht mit dem Hausmüll entsorgt werden.

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

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

This equipment houses a battery containing harmful substances that must not be disposed of as normal household waste.

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



### Normas de Seguridad para Baterías (Según BattV)

Este equipo lleva una batería que contiene sustancias perjudiciales, que no se debe desechar en los contenedores de basura domésticos.

Después de la vida útil, la batería sólo se podrá eliminar en un centro de servicio de Rohde & Schwarz o en un depósito apropiado.

### Consignes de sécurité pour batteries (selon BattV)

Cet appareil est équipé d'une pile comprenant des substances nocives. Ne jamais la jeter dans une poubelle pour ordures ménagères.

Une pile usagée doit uniquement être éliminée par un centre de service client de Rohde & Schwarz ou peut être collectée pour être traitée spécialement comme déchets dangereux.



# Customer Support

## Technical support – where and when you need it

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

## Up-to-date information and upgrades

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish. We will take care that you will get the right information.

### Europe, Africa, Middle East

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

### North America

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

### Latin America

Phone +1-410-910-7988  
[customersupport.la@rohde-schwarz.com](mailto:customersupport.la@rohde-schwarz.com)

### Asia/Pacific

Phone +65 65 13 04 88  
[customersupport.asia@rohde-schwarz.com](mailto:customersupport.asia@rohde-schwarz.com)



# Qualitätszertifikat

## Certificate of quality

## Certificat de qualité

Certified Quality System  
**ISO 9001**

Certified Environmental System  
**ISO 14001**

### Sehr geehrter Kunde,

Sie haben sich für den Kauf eines Rohde&Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde&Schwarz-Qualitätsmanagementsystem ist u.a. nach ISO 9001 und ISO 14001 zertifiziert.

### Der Umwelt verpflichtet

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

### Dear Customer,

You have decided to buy a Rohde&Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards. The Rohde&Schwarz quality management system is certified according to standards such as ISO 9001 and ISO 14001.

### Environmental commitment

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

### Cher client,

Vous avez choisi d'acheter un produit Rohde&Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité. Le système de gestion qualité de Rohde&Schwarz a été homologué, entre autres, conformément aux normes ISO 9001 et ISO 14001.

### Engagement écologique

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

**75** Years of  
Driving  
Innovation

  
**ROHDE & SCHWARZ**



**ROHDE & SCHWARZ**

CE Declaration of Conformity



Certificate No.: 2010-50

This is to certify that:

Equipment type	Stock No.	Designation
F5VR	1311.0006.XX	REALTIME ANALYZER

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

- relating to electrical equipment for use within defined voltage limits (2006/95/EC)
- relating to electromagnetic compatibility (2004/108/EC)

Conformity is proven by compliance with the following standards:

EN 61010-1: 2001  
EN 61326-1: 2006  
EN 61326-2-1: 2006  
EN 55011: 2007 + A2: 2007, Class A  
EN 61000-3-2: 2006  
EN 61000-3-3: 1995 + A1: 2001 + A2: 2005

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

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

Munich, 2010-05-26

Central Quality Management MF-QZ / Radde

1311.0006.XX

CE

E-1

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# 1 Documentation Overview

The user documentation for the analyzer is divided as follows:

- Quick Start Guide
- Operating Manuals for base unit and options
- Service Manual
- Online Help
- Release Notes

## Quick Start Guide

This manual is delivered with the instrument in printed form and in PDF format on the CD. It provides the information needed to set up and start working with the instrument. Basic operations and basic measurements are described. Also a brief introduction to remote control is given. The manual includes general information (e.g. Safety Instructions) and the following chapters:

Chapter 1	Introduction, General information
Chapter 2	Front and Rear Panel
Chapter 3	Preparing for Use
Chapter 4	Firmware Update and Installation of Firmware Options
Chapter 5	Basic Operations
Chapter 6	Basic Measurement Examples
Chapter 7	Brief Introduction to Remote Control
Appendix 1	Printer Interface
Appendix 2	LAN Interface

## Operating Manuals

The Operating Manuals are a supplement to the Quick Start Guide. Operating Manuals are provided for the base unit and each additional (software) option.

The Operating Manual for the base unit provides basic information on operating the analyzer in general, and the "Spectrum" mode in particular. Furthermore, the software options that enhance the basic functionality for various measurement modes are described here. The set of measurement examples in the Quick Start Guide is expanded by more advanced measurement examples. In addition to the brief introduction to remote control in the Quick Start Guide, a description of the basic analyzer commands and programming examples is given. Information on maintenance, instrument interfaces and error messages is also provided.

In the individual option manuals, the specific instrument functions of the option are described in detail. For additional information on default settings and parameters, refer to the data sheets. Basic information on operating the analyzer is not included in the option manuals.

The following Operating Manuals are available for the analyzer:

- analyzer base unit; in addition:
  - R&S FSV-K7S Stereo FM Measurements
  - R&S FSV-K9 Power Sensor Support
  - R&S FSV-K14 Spectrogram Measurement
- R&S FSV-K10 GSM/EDGE Measurement
- R&S FSV-K30 Noise Figure Measurement
- R&S FSV-K40 Phase Noise Measurement
- R&S FSV-K70 Vector Signal Analysis
- R&S FSV-K72 3GPP FDD BTS Analysis
- R&S FSV-K73 3GPP FDD UE Analysis
- R&S FSV-K76/77 3GPP TD-SCDMA BTS/UE Measurement
- R&S FSV-K82/83 CDMA2000 BTS/MS Analysis
- R&S FSV-K84/85 1xEV-DO BTS/MS Analysis
- R&S FSV-K91 WLAN IEEE 802.11a/b/g/j/n
- R&S FSV-K93 WiMAX IEEE 802.16 OFDM/OFDMA Analysis
- R&S FSV-K100/K104 EUTRA / LTE Downlink Measurement Application
- R&S FSV-K101/K105 EUTRA / LTE Uplink Measurement Application

These manuals are available in PDF format on the CD delivered with the instrument. The printed manual can be ordered from Rohde & Schwarz GmbH & Co. KG.

### Service Manual

This manual is available in PDF format on the CD delivered with the instrument. It describes how to check compliance with rated specifications, instrument function, repair, troubleshooting and fault elimination. It contains all information required for repairing the analyzer by replacing modules. The manual includes the following chapters:

Chapter 1	Performance Test
Chapter 2	Adjustment
Chapter 3	Repair
Chapter 4	Software Update / Installing Options
Chapter 5	Documents

### Online Help

The online help contains context-specific help on operating the analyzer and all available options. It describes both manual and remote operation. The online help is installed on the analyzer by default, and is also available as an executable .chm file on the CD delivered with the instrument.

**Release Notes**

The release notes describe the installation of the firmware, new and modified functions, eliminated problems, and last minute changes to the documentation. The corresponding firmware version is indicated on the title page of the release notes. The current release notes are provided in the Internet.





## 2 Conventions Used in the Documentation

### 2.1 Typographical Conventions

The following text markers are used throughout this documentation:

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

### 2.2 Conventions for Procedure Descriptions

When describing how to operate the instrument, several alternative methods may be available to perform the same task. In this case, the procedure using the touch screen is described. Any elements that can be activated by touching can also be clicked using an additionally connected mouse. The alternative procedure using the keys on the device or the on-screen keyboard is only described if it deviates from the standard operating procedures.

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



## 3 How to Use the Help System

### Calling context-sensitive and general help

- ▶ To display the general help dialog box, press the HELP key on the front panel.  
The help dialog box "View" tab is displayed. A topic containing information about the current menu or the currently opened dialog box and its function is displayed.



For standard Windows dialog boxes (e.g. File Properties, Print dialog etc.), no context-sensitive help is available.

---

- ▶ If the help is already displayed, press the softkey for which you want to display help.  
A topic containing information about the softkey and its function is displayed.



If a softkey opens a submenu and you press the softkey a second time, the submenu of the softkey is displayed.

---

### Contents of the help dialog box

The help dialog box contains four tabs:

- "Contents" - contains a table of help contents
- "View" - contains a specific help topic
- "Index" - contains index entries to search for help topics
- "Zoom" - contains zoom functions for the help display

To change between these tabs, press the tab on the touchscreen.

### Navigating in the table of contents

- To move through the displayed contents entries, use the UP ARROW and DOWN ARROW keys. Entries that contain further entries are marked with a plus sign.
- To display a help topic, press the ENTER key. The "View" tab with the corresponding help topic is displayed.
- To change to the next tab, press the tab on the touchscreen.

### Navigating in the help topics

- To scroll through a page, use the rotary knob or the UP ARROW and DOWN ARROW keys.
- To jump to the linked topic, press the link text on the touchscreen.

### Searching for a topic

1. Change to the "Index" tab.

2. Enter the first characters of the topic you are interested in. The entries starting with these characters are displayed.
3. Change the focus by pressing the ENTER key.
4. Select the suitable keyword by using the UP ARROW or DOWN ARROW keys or the rotary knob.
5. Press the ENTER key to display the help topic.  
The "View" tab with the corresponding help topic is displayed.

#### **Changing the zoom**

1. Change to the "Zoom" tab.
2. Set the zoom using the rotary knob. Four settings are available: 1-4. The smallest size is selected by number 1, the largest size is selected by number 4.

#### **Closing the help window**

- ▶ Press the ESC key or a function key on the front panel.

## 4 Noise Figure Measurements Option R&S FSV-K30

### Overview of Firmware Option R&S FSV-K30

This section contains all information required for operation of an analyzer equipped with Application Firmware R&S FSV-K30. It covers operation via menus and the remote control commands for accurate and flexible noise measurement functions.

This section consists of the following chapters:

- [Measurement Examples \(R&S FSV-K30\)](#)  
Explains some basic noise figure measurement examples.
- [Instrument Functions of Noise Figure Measurements \(R&S FSV-K30\)](#)  
Describes the instrument functions of noise figure measurements and provides further information.
- [Remote Control Commands](#)  
Describes all remote control commands defined noise figure measurements.
- [Error Reporting and Error Messages](#)  
Contains device-specific error messages for R&S FSV-K30.

This part of the documentation includes only functions of the Application Firmware R&S FSV-K30. For all other descriptions, please refer to the description of the base unit at the beginning of the documentation.

### 4.1 Measurement Examples (R&S FSV-K30)

This section describes measurement examples for the Noise Figure Measurements option (K30). For further information on measurement examples refer to the Quick Start Guide, chapter "Basic Measurement Examples", or the Operating Manual on CD.

This chapter provides the following measurement examples:

4.1.1	Direct Measurements.....	13
4.1.1.1	Basic Measurement Example.....	14
4.1.1.2	DUTs with very Large Gain.....	16
4.1.2	Frequency-Converting Measurements.....	17
4.1.2.1	Fixed LO Measurements.....	17
4.1.2.2	Image-Frequency Rejection (SSB, DSB).....	17

#### 4.1.1 Direct Measurements

Direct measurements are designed for DUTs without frequency-conversion, e.g. amplifiers.

- [chapter 4.1.1.1, "Basic Measurement Example"](#), on page 14
- [chapter 4.1.1.2, "DUTs with very Large Gain"](#), on page 16

#### 4.1.1.1 Basic Measurement Example

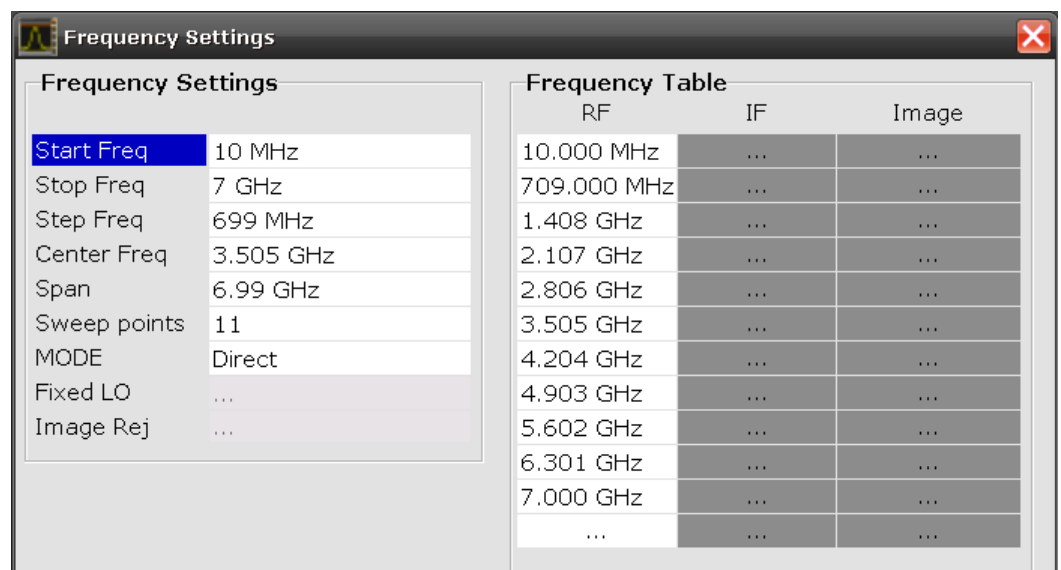
This section provides step-by-step instructions for working through an ordinary noise figure measurement. The following steps are described:

- ["Setting up the measurement"](#) on page 14
- ["Performing the calibration"](#) on page 15
- ["Performing the main measurement"](#) on page 16

The gain and noise figure of an amplifier are to be determined in the range from 220 MHz to 320 MHz.

##### Setting up the measurement

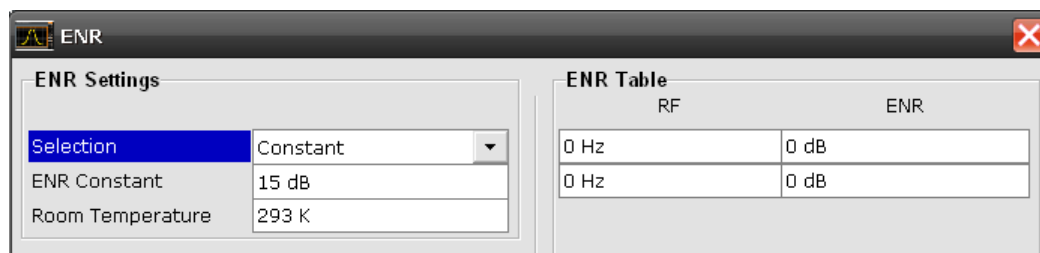
1. Activate the "Noise" mode by pressing the MODE key and selecting "Noise".
2. Press the "Freq Settings" softkey to open the "Frequency Settings" dialog box.



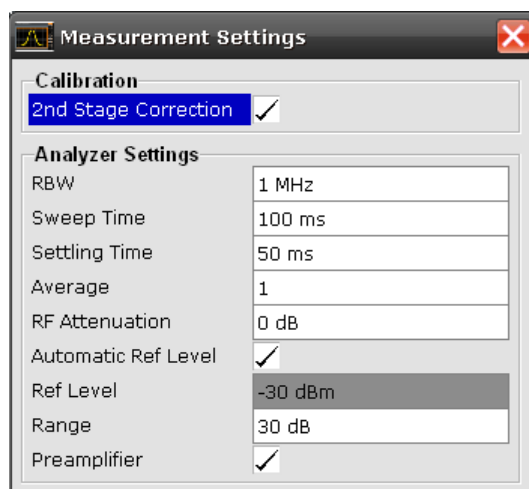
3. In the "Start Freq" field, enter *550 MHz*.
4. In the "Stop Freq" field, enter *560 MHz*.
5. In the "Step Freq" field, enter *2 MHz*.

A measurement at 6 frequency points is performed: 550 MHz, 552 MHz, 554 MHz, ..., 560 MHz.

6. Press the "ENR Settings" softkey to open the "ENR" dialog box.



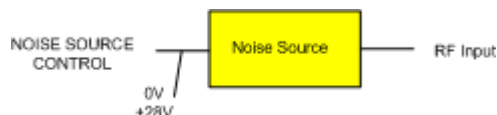
7. In the "ENR Constant" field, enter the average ENR value of the used noise source for the frequency range of interest, for example *15 dB*.
8. Press the "Meas Settings" softkey to open the "Measurement Settings" dialog box.



9. If it is not yet active, activate the "2nd Stage Correction" option to perform the measurement as accurately as possible.

### Performing the calibration

1. Connect the noise source to the RF input of the analyzer (see [figure 4-1](#)).
2. Provide the voltage supply for the noise source by connecting it to the +28 V connector of the analyzer (labeled "NOISE SOURCE CONTROL" on the front panel of the instrument) via a coax cable.



**Fig. 4-1: Preparation for calibration**

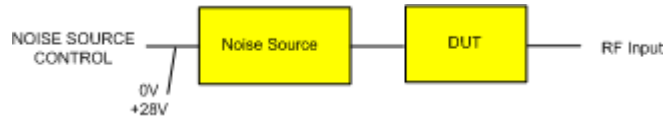
3. Start the calibration for the "Noise Figure Measurements" option.
  - a) Press the SWEEP key.
  - b) Press the "Cal" softkey.

The progress bar indicates the progress of the calibration measurement.



### Performing the main measurement

1. Insert the DUT (in this example, the amplifier) into the test setup between the noise source and RF input of the analyzer (see [figure 4-2](#)).



**Fig. 4-2: Test setup for the main measurement**

2. To select the sweep mode, press the SWEEP key.
3. Press the RUN SINGLE key to start a single measurement.  
Measurement results are updated as the measurement is in progress. The results are displayed in graphical form. There are two traces, one for noise figure/temperature and one for the gain of the DUT.
4. To change the display from the graphical form to a tabular list of measurement points, press the "Display List/Graph" softkey in the "Trace" menu.



#### Note:

If a measurement is started while another measurement is still in progress, the first measurement is aborted and the new measurement started immediately.

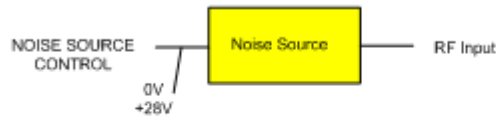
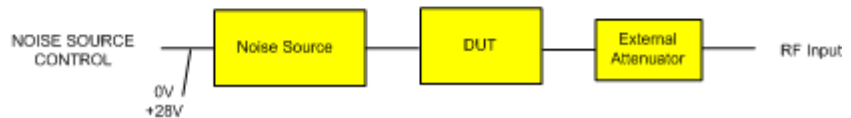
#### 4.1.1.2 DUTs with very Large Gain

If the gain of the DUT exceeds 60 dB, the total gain must be reduced by an external attenuator. The total gain of the DUT together with the external attenuator should lie within the range from 10 dB to 60 dB. A total gain of 20 dB to 30 dB is recommended. For a DUT with a gain of e.g. 64 dB, it is recommended to use an external 40 dB-attenuator.

If an external attenuator is used, in the "Measurement Settings" dialog box, the entry in the "Range" field should be modified according to the total gain (= Gain DUT + external attenuator).

The attenuation values of the external attenuator are entered in the "Loss Settings" dialog box under "Loss Output Settings".

Inaccuracies when entering this attenuation mainly influence the measured gain. The noise figure remains to a large extent unaffected.

**Calibration****Measurement**

*Fig. 4-3: Calibration and measurement on DUTs with a high gain*

## 4.1.2 Frequency-Converting Measurements

The frequency-converting measurement is used for DUTs with an output frequency that differs from the input frequency, e.g. mixers and frequency converters. The frequency-converting measurement allows many variations, which differ from each other in two criteria:

- [chapter 4.1.2.1, "Fixed LO Measurements"](#), on page 17
- [chapter 4.1.2.2, "Image-Frequency Rejection \(SSB, DSB\)"](#), on page 17

### 4.1.2.1 Fixed LO Measurements

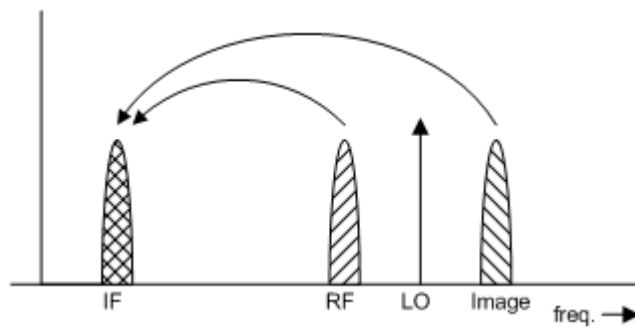
In the "Frequency Settings" dialog box, select one of the following settings for the "Mode" parameter:

- Fixed LO, Up Conv, for up-converting devices with  $IF=RF+LO$
- Fixed LO, Down Conv, for down converters with  $IF=abs(RF-LO)$  or image measurements

### 4.1.2.2 Image-Frequency Rejection (SSB, DSB)

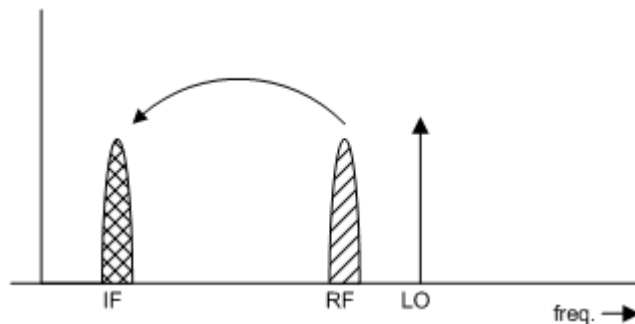
#### Test Setup

- ▶ Set the following parameters:
  - "IF" (intermediate frequency): 100 MHz
  - "RF" (input frequency): 400 MHz
  - "LO" (local oscillator frequency): 500 MHz
  - "image" (image frequency): 600 MHz



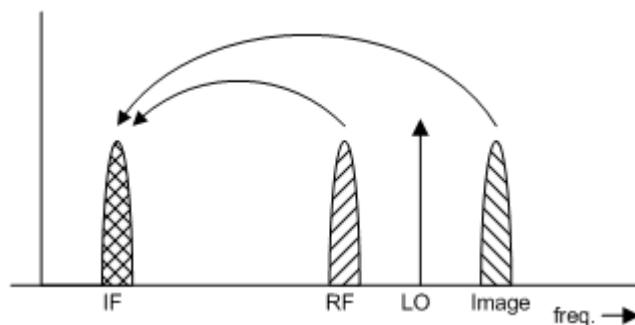
If a DUT, which equally converts the useful signal and the image to the IF frequency, is measured using the conventional y factor method or with the 2nd stage correction switched on, a measuring error of 3 dB is produced. The noise figure is displayed 3 dB lower and the gain 3 dB higher. The following examples help to configure the test setup in order to measure the actual values.

#### Measurement on a single-sideband mixer



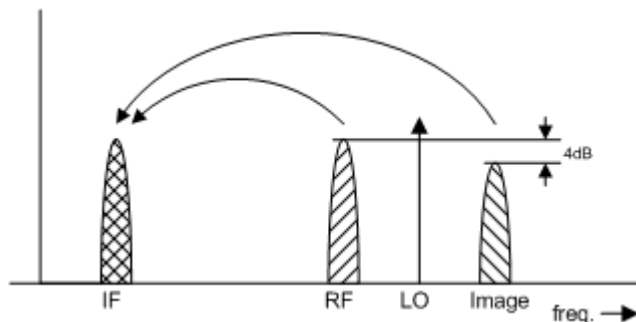
In general, a single-sideband mixer with a very high image rejection causes very few problems. The measurement is analogous to an amplifier. In this case, set the image rejection in the "Frequency Settings" dialog box to a large value (e.g. 999.99 dB).

#### Measurement on a mixer without sideband suppression



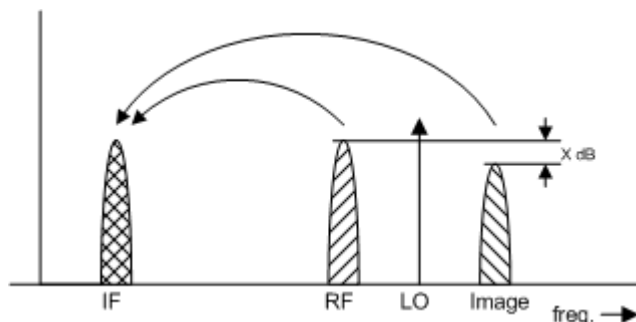
If the input and image frequencies are converted with the same application, an error of 3 dB occurs in the measurement results if the image rejection is not taken into account. In this case, set the image rejection in the "Frequency Settings" dialog box to a small value (e.g. 0.0 dB).

**Measurement on a mixer with an average sideband suppression**



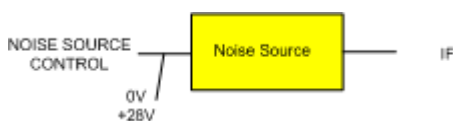
For measurements on a mixer with a low image-frequency rejection, a measuring error of 0 to 3 dB is obtained if the image-frequency rejection is not taken into account. In this case, set the image rejection in the "Frequency Settings" dialog box to the correct image rejection value to produce the correct results.

**Measurement on a mixer with unknown sideband suppression**

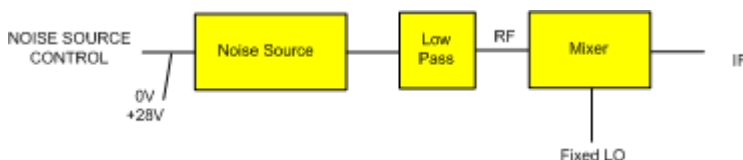


If the image rejection is not known, accurate noise results can still be produced. However, the gain of the DUT must be known and an additional filter is required.

**Test setup**



**Fig. 4-4: Preparation for calibration**



**Fig. 4-5: Test setup for the main measurement**

In this test setup, a low pass filter prevents noise from the noise source from being fed in at the image frequency. Depending on the position of the frequency bands, a highpass or bandpass filter may also be necessary for the RF frequency instead of the lowpass filter. The important point is that noise from the noise source is not converted by a further

receive path of the mixer. The noise of the noise source at the receive frequency must not be reduced. The insertion loss must be considered, if applicable.

With this test setup, the measurement on a mixer without sideband suppression corresponds to the measurement on a single-sideband mixer. As in that case, set the image rejection in the "Frequency Settings" dialog box to a large value (e.g. 999.99 dB) to produce accurate results.

To take the characteristics of the filter into account, in the "Loss Settings" dialog box, enter the insertion loss of the filter at the RF frequency. To consider the actual filter suppression at the image frequency, do not enter 999 dB but the actual attenuation for the image rejection.

#### Measurement on a harmonics mixer

For a harmonics mixer, the input signals are not only converted to the IF by the wanted harmonic, but also by the harmonic of the LO signal produced in the mixer. In many cases, the mixer even features a lower conversion loss in the case of unwanted harmonics. For measurements on this type of mixer, a bandpass filter must be used to make sure that there is only noise at the desired input frequency at the input of the DUT. This measurement is similar to measurements on a mixer with an average sideband suppression.

## 4.2 Instrument Functions of Noise Figure Measurements (R&S FSV-K30)

The "Noise Figure Measurements" option provides noise figure measurements. Using this option, the noise figure of a Device Under Test, e.g. low-noise amplifier circuits, with noise figures of less than 1 dB can be measured.

#### To open the main noise figure measurements menu

- If the "Noise" mode is not the active measurement mode, press the MODE key and activate the "Noise" option.
- If the "Noise" mode is already active, press the HOME key.  
The main noise figure measurements menu is displayed.

#### Menu and softkey description

[chapter 4.3, "Menu and Softkey Description \(R&S FSV-K30\)"](#), on page 32

#### Further information

- [chapter 4.2.1.2, "Measurement Modes of the Noise Figure Measurement"](#), on page 23
- [chapter 4.2.1.6, "Calibration"](#), on page 28
- [chapter 4.2.1.1, "Measurement Types"](#), on page 21
- [chapter 4.2.1.3, "Measurement Settings Overview"](#), on page 24
- [chapter 4.2.1.4, "Result Displays"](#), on page 25
- [chapter 4.2.1.5, "Status Bar Information"](#), on page 27

**Tasks**

- [chapter 4.2.2, "Editing Tables"](#), on page 31
- [chapter 4.2.3, "Working With Limit Lines"](#), on page 32

**4.2.1 Further Information**

This section provides background information on measurements and displayed information.

4.2.1.1	Measurement Types.....	21
4.2.1.2	Measurement Modes of the Noise Figure Measurement.....	23
4.2.1.3	Measurement Settings Overview.....	24
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**4.2.1.1 Measurement Types**

Three types of measurements are possible:

- Frequency list measurement
- Fixed frequency measurement
- Single frequency measurement

**Frequency list measurement**

A measurement is performed at each of the frequencies listed in the frequency list. The noise figure of the DUT across a user-specified range of frequencies is measured. In single sweep mode, each frequency point is measured once until the measurement is complete. In continuous sweep mode, one frequency point after the other is measured in turn until the measurement is aborted.

The frequency list is defined in the "Frequency Table" in the "Frequency Settings" dialog box (see ["Frequency Settings"](#) on page 36). Two methods are possible:

- The list is generated according to the start, stop and step frequencies. The first value in the list is the "Start Freq". For each subsequent value, the "Step Freq" is added until the "Stop Freq" is reached. If the "Stop Freq" is lower than the "Start Freq", the "Step Freq" is subtracted from the "Start Freq" for each subsequent value. A maximum of 100 list entries is generated. If further entries would be required to reach the "Stop Freq", an error message is displayed. If the step frequency is larger than the difference between the start frequency and the stop frequency, the "Frequency

Table" and the "Frequency List Results" (result display) just contain the start and stop frequency.

- The list is generated according to the center frequency, span, and number of sweep points. The number of "Sweep points" defines the number of entries in the frequency table. The start frequency is "Center Freq" - "Span"/2, the stop frequency is "Center Freq" + "Span"/2. The values inbetween are distributed evenly.  
For Digital IQ mode, only this method can be used to define the frequency list.

The results are displayed in a table ("Frequency List Results") or graphically, depending on the display configuration.

#### Remote commands:

To configure the frequency list:

[\[SENSe:\] FREQuency: START](#) on page 97

[\[SENSe:\] FREQuency: STOP](#) on page 98

[\[SENSe:\] FREQuency: STEP](#) on page 98

or

[\[SENSe:\] FREQuency: CENTer](#) on page 96

[\[SENSe:\] FREQuency: SPAN](#) on page 97

[\[SENSe:\] SWEEp: POINTs](#) on page 99

To start the measurement:

[CONFigure: LIST: CONTInuous](#) on page 72 or

[CONFigure: LIST: SINGle](#) on page 73

INIT

To query the results:

[FETCh: ARRay: NOISE: FIGure](#) on page 82

[FETCh: ARRay: NOISE: GAIN](#) on page 82

[FETCh: ARRay: NOISE: TEMPerature](#) on page 83

#### Fixed frequency measurement

A continuous measurement is performed at the single frequency currently selected in the "Frequency List Results" (see also [Fix Freq](#) softkey in the "Sweep" menu). This measurement can only be performed after an initial frequency list or single frequency measurement.

The results are displayed beneath the original "Frequency List Results" in the "Fixed Frequency (Meter)" area.

#### Remote commands:

To configure the fixed frequency:

[\[SENSe:\] FREQuency \[: CW\] : FIXed](#) on page 96

To start the measurement:

`CONFigure:SINgLe` on page 73

INIT

To query the results:

`FETCh:SCALar:NOISE:FIGure` on page 83

`FETCh:SCALar:NOISE:GAIN` on page 83

`FETCh:SCALar:NOISE:TEMPerature` on page 84

### Single frequency measurement

A measurement is performed at a specified single frequency, either once or continuously. Thus, the individual frequency can be investigated in more detail, for example to see the effect of dynamic changes to the noise figure of the DUT at a particular frequency. An initial list measurement is not necessary.

The frequency is defined by activating the "Single Freq" option and entering the frequency in the "Start Freq" field in the "Frequency Settings" dialog box (see "[Frequency Settings](#)" on page 36). The "Frequency Table" is reduced to a single entry. In effect, the single frequency measurement is a list measurement reduced to a single list entry.

The result of a fixed frequency measurement is displayed in the result table only, not graphically.

#### Remote commands:

To configure the single frequency:

`[SENSe:]FREQuency:STARt` on page 97

To start the measurement:

`CONFigure:FREQ:CONTInuous` on page 72 or

`CONFigure:FREQ:SINgLe` on page 72

INIT

To query the results:

`FETCh:ARRay:NOISE:FIGure` on page 82

`FETCh:ARRay:NOISE:GAIN` on page 82

`FETCh:ARRay:NOISE:TEMPerature` on page 83

#### 4.2.1.2 Measurement Modes of the Noise Figure Measurement

Noise measurements are performed on many different types of device under test (DUT). The type of DUT to be measured determines the test setup and also how the frequency list is to be generated. To support these different types of DUT, the following different noise figure measurement modes are available:

- Direct measurement



- Frequency-converting measurement
  - Fixed LO Upconverter,  $IF = RF + LO$
  - Fixed LO Downconverter,  $IF = \text{abs}(RF - LO)$
- Digital IQ; for digital baseband input using the optional R&S FSV-B17 interface; Using the Digital Baseband interface for input, the digital baseband signal from the digital interface is used for measurement, rather than the digitalized IF signal. In this mode, RF attenuation, a Preamplifier and calibration are not available. The frequency list is defined by a center frequency, a span and a number of sweep points (see "Frequency Settings" on page 36). For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

The setup for the different measurement types is described by the "Schematic Overview" softkey. The measurement mode is set in the "Frequency Settings" dialog box, "Mode" field (see "Mode" on page 38).

For details on the measurement types see also [chapter 4.1, "Measurement Examples \(R&S FSV-K30\)"](#), on page 13.

#### 4.2.1.3 Measurement Settings Overview

The overall measurement settings used to obtain the current measurement results are displayed in the diagram header at the top of the display (see [figure 4-6](#)). The following settings are listed:

Setting	Defined in dialog box	Description
Auto Level	Measurement Settings	Enable/Disable automatic reference level
Ref Level	Measurement Settings	Set reference level
Full Scale Lvl.	Measurement Settings	Level that corresponds to an IQ sample with the magnitude "1" (for digital input only)
Sample Rate	Measurement Settings	Input sample rate from the IQ signal source (for digital input only)
Att	Measurement Settings	Set RF attenuation
Preamplifier	Measurement Settings	Enable/disable preamplifier
RBW	Measurement Settings	Set RBW
SWT	Measurement Settings	Set sweep time
AVG	Measurement Settings	Set number of measurement sweeps over which the average is taken
Noise Source	ENR Settings	Set constant ENR or ENR table

Setting	Defined in dialog box	Description
Serial Nr.	ENR Settings	Reserved for serial number of the noise source (currently not available)
ENR (Const)	ENR Settings	Set ENR value (dB), refers to the receive frequency (RF)
2nd Stage Corr	Measurement Settings	Enable/disable 2nd Stage Correction
Mode	Frequency Settings	Set measurement mode
Image Rej	Frequency Settings	Set suppression applied to the second sideband (Image Rej)
Fixed LO	Frequency Settings	Set Local oscillator frequency (Hz), only for frequency-converting measurements
Fixed IF	Frequency Settings	Set IF frequency for Fixed IF measurements
LO Source	Frequency Settings	Reserved for external LO control (currently not available)

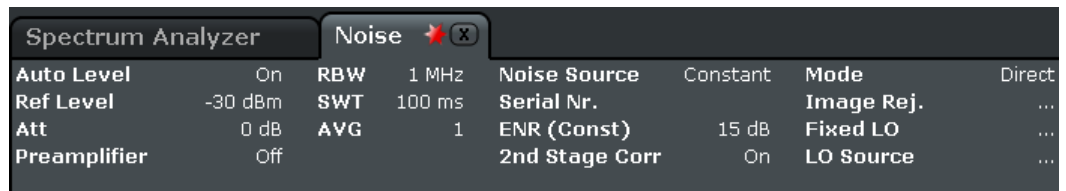


Fig. 4-6: Measurement settings for the noise figure measurements (example)

#### 4.2.1.4 Result Displays

The measurement results are represented according to the measurement type (see [chapter 4.2.1.1, "Measurement Types"](#), on page 21).

##### Frequency list results

The measurement results for all frequencies defined in the "Frequency Table" are displayed as a graph or a table, depending on the currently selected result display (see ["Display Graph/List"](#) on page 51 softkey).

(See [figure 4-8](#) and [figure 4-7](#).)

The measurement results are updated as the measurement is in progress. Under "Current Value", the details of the currently selected frequency in the "Frequency List Results" are displayed.

Instrument Functions of Noise Figure Measurements (R&S FSV-K30)

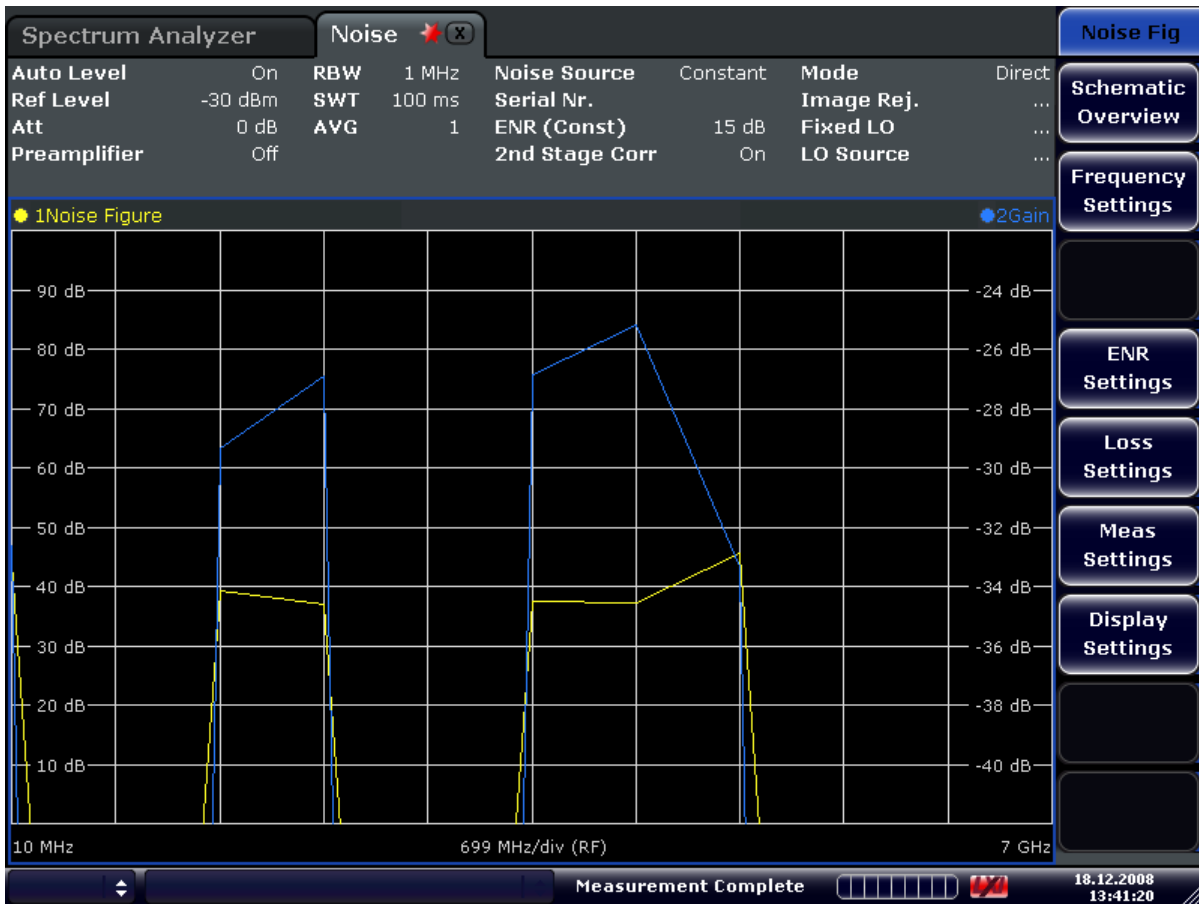


Fig. 4-7: Graphical result display (example)

Frequency List Results			
RF	NF	Noise Temp	Gain
10.000 MHz	43.939 dB	7182451.460 K	-32.646 dB
709.000 MHz	** Not Valid **	** Not Valid **	** Not Valid **
1.408 GHz	39.197 dB	2409984.151 K	-29.356 dB
2.107 GHz	36.960 dB	1439828.740 K	-26.892 dB
2.806 GHz	** Not Valid **	** Not Valid **	** Not Valid **
3.505 GHz	37.582 dB	1661579.886 K	-26.848 dB
4.204 GHz	37.245 dB	1537384.725 K	-25.185 dB
4.903 GHz	45.497 dB	10281335.682 K	-33.337 dB
5.602 GHz	** Not Valid **	** Not Valid **	** Not Valid **
6.301 GHz	** Not Valid **	** Not Valid **	** Not Valid **
7.000 GHz	** Not Valid **	** Not Valid **	** Not Valid **

Fig. 4-8: Result display table (example)

The following information is displayed in the table:

## Instrument Functions of Noise Figure Measurements (R&amp;S FSV-K30)

Column	Description
<b>Used settings</b>	
RF	Receive frequency at the DUT at which the values in this row of the table were measured (Hz).
LO	Local oscillator frequency (Hz) - not displayed for direct or Digital IQ measurements
IF	Intermediate frequency (Hz) - not displayed for direct or Digital IQ measurements
<b>Results</b>	
NF	Noise figure measured (dB)
Noise Temp	Noise temperature (K) derived from measured noise figure
Gain	Gain measured (dB); not available when using the Digital Baseband Interface (R&S FSV-B17)

**Fixed frequency results**

Under "Fixed Frequency (Meter)", the measurement results for the fixed frequency measurement are displayed and continuously updated (see also [chapter 4.2.1.1, "Measurement Types"](#), on page 21). The "Frequency List Results" do not change - these are the results of the last frequency list measurement.

During a running measurement, the "Fixed Frequency (Meter)" area displays the current measurement value.

Frequency List Results			
RF	NF	Noise Temp	Gain
10.000 MHz	-20.460 dB	** Not Valid **	38.997 dB
3.009 GHz	8.920 dB	1971.595 K	38.042 dB
6.008 GHz	14.822 dB	8511.719 K	36.077 dB
...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...
...	...	...	...
Fixed Frequency (Meter)			
Frequency	6.008 GHz	Noise Figure	14.822 dB
		Gain	36.077 dB
UNCAL		Running ...	

**4.2.1.5 Status Bar Information**

The status bar displays the following information:

Parameter values	If a parameter in a settings dialog box is selected, the minimum and maximum values for the selected parameter are displayed.
	If a Boolean or an enumerated parameter in a dialog box is selected, the minimum and maximum values are displayed as N/A for not applicable.
Measurement status	During the measurement, the current measurement status along with detailed information about the progress is displayed.
Error messages	red background
Warning messages	yellow background

#### 4.2.1.6 Calibration

The calibration measures the noise introduced to a signal by the spectrum analyzer itself to compensate it in measurements on a device under test. This compensation is called 2nd stage correction, because the spectrum analyzer is the second stage of the test setup, the DUT being the first stage.

If the second stage correction is activated (see ["2nd Stage Correction"](#) on page 42), a separate calibration measurement is performed before the main measurement (for details on the measurement setup refer to the base unit Operating Manual on CD-ROM, chapter "Advanced Measurement Examples"). The data measured in the calibration measurement are used for compensation in the main measurement.

It is strongly recommended that you perform calibration before running measurements (see ["Cal"](#) on page 48). You can run measurements in an uncalibrated status, but the measurement results will not be corrected for any noise introduced by the spectrum analyzer itself.

If the list of receive frequencies (RF) is changed, at which the measurements are performed, calibration is necessary again to ensure that calibration data is available for every measurement step. For details on frequency settings refer to ["Frequency Settings"](#) on page 36.

Calibration data can be saved and recalled at any time via the SAVE/RCL key (for details refer to the base unit description).

It is also included if "All Traces" are stored.

#### 4.2.1.7 Selecting the Appropriate Filter Type

All resolution bandwidths are realized with digital filters.

The video filters are responsible for smoothing the displayed trace. Using video bandwidths that are small compared to the resolution bandwidth, only the signal average is displayed and noise peaks and pulsed signals are repressed. If pulsed signals are to be measured, it is advisable to use a video bandwidth that is large compared to the resolution bandwidth ( $VBW * 10 \times RBW$ ) for the amplitudes of pulses to be measured correctly.

The following filter types are available:

- Normal (3dB) (Gaussian) filters

The Gaussian filters are set by default. The available bandwidths are specified in the data sheet.

- Channel filters  
For details see [chapter 4.2.1.8, "List of Available RRC and Channel Filters"](#), on page 29 .  
Channel filters do not support FFT mode.
- RRC filters  
For details see [chapter 4.2.1.8, "List of Available RRC and Channel Filters"](#), on page 29 .  
RRC filters do not support FFT mode.
- 5-Pole filters  
The available bandwidths are specified in the data sheet.  
5-Pole filters do not support FFT mode.

#### 4.2.1.8 List of Available RRC and Channel Filters

For power measurement a number of especially steep-edged channel filters are available (see the following table). The indicated filter bandwidth is the 3 dB bandwidth. For RRC filters, the fixed roll-off factor ( $\alpha$ ) is also indicated.

**Table 4-1: Filter types**

Filter Bandwidth	Filter Type	Application
100 Hz	CFILter	
200 Hz	CFILter	A0
300 Hz	CFILter	
500 Hz	CFILter	
1 kHz	CFILter	
1.5 kHz	CFILter	
2 kHz	CFILter	
2.4 kHz	CFILter	SSB
2.7 kHz	CFILter	
3 kHz	CFILter	
3.4 kHz	CFILter	
4 kHz	CFILter	DAB, Satellite
4.5 kHz	CFILter	
5 kHz	CFILter	
6 kHz	CFILter	
6 kHz, $\alpha=0.2$	RRC	APCO
8.5 kHz	CFILter	ETS300 113 (12.5 kHz channels)

## Instrument Functions of Noise Figure Measurements (R&amp;S FSV-K30)

Filter Bandwidth	Filter Type	Application
9 kHz	CFILter	AM Radio
10 kHz	CFILter	
12.5 kHz	CFILter	CDMAone
14 kHz	CFILter	ETS300 113 (20 kHz channels)
15 kHz	CFILter	
16 kHz	CFILter	ETS300 113 (25 kHz channels)
18 kHz, $\alpha=0.35$	RRC	TETRA
20 kHz	CFILter	
21 kHz	CFILter	PDC
24.3 kHz, $\alpha=0.35$	RRC	IS 136
25 kHz	CFILter	
30 kHz	CFILter	CDPD, CDMAone
50 kHz	CFILter	
100 kHz	CFILter	
150 kHz	CFILter	FM Radio
192 kHz	CFILter	PHS
200 kHz	CFILter	
300 kHz	CFILter	
500 kHz	CFILter	J.83 (8-VSB DVB, USA)
1 MHz	CFILter	CDMAone
1.228 MHz	CFILter	CDMAone
1.28 MHz, $\alpha=0.22$	RRC	
1.5 MHz	CFILter	DAB
2 MHz	CFILter	
3 MHz	CFILter	
3.75 MHz	CFILter	
3.84 MHz, $\alpha=0.22$	RRC	W-CDMA 3GPP
4.096 MHz, $\alpha=0.22$	RRC	W-CDMA NTT DOCoMo
5 MHz	CFILter	
20 MHz	CFILter	

Filter Bandwidth	Filter Type	Application
28 MHz	CFILter	
40 MHz	CFILter	

#### 4.2.1.9 ASCII File Export Format

The data of the file header consist of three columns, each separated by a semicolon: parameter name; numeric value; basic unit. The data section starts with the keyword "Trace <n>" (<n> = number of stored trace), followed by the measured data in one or several columns (depending on measurement) which are also separated by a semicolon.

File contents: header and data section	Description
Type;FSVR;	
Version;1.45;	
Date;01.Apr 2010;	Date of data set storage
Screen;A;	Instrument mode
Points per Symbol;4;	Points per symbol
x Axis Start;-13;sym;	Start value of the x axis
x Axis Stop;135;sym;	Stop value of the x axis
Ref value y axis;-10.00;dBm;	Y axis reference value
Ref value position;100;%;	Y axis reference position
Trace;1;	Trace number
Meas;Result;	Result type
Meas Signal;Magnitude;	Result display
Demodulator;Offset QPSK;	Demodulation type
ResultMode;Trace;	Result mode
x unit;sym;	Unit of the x axis
y unit;dBm;	Unit of the y axis
Trace Mode;Clear Write;	Trace mode
Values;592;	Number of results
<values>	List of results

## 4.2.2 Editing Tables

1. Select the table header to enter into the edit mode.
2. Focus the field you want to edit by touching it or using the arrow keys or the rotary knob.



3. Enter the values (for details refer to the Quick Start Guide, chapter 4, "Basic Operations").
4. To insert a new row above the currently selected row, press the "Insert" softkey.
  - a) To delete the currently selected row, press the "Delete" softkey.
  - b) To update the "Frequency Table" according to the "Frequency Settings", press the "Build Tbl" softkey.
5. Press the "Exit" softkey to leave the edit mode.

### 4.2.3 Working With Limit Lines

1. Press the LINES key.  
The "Limit Lines" dialog box is displayed. It contains information on name, limit, status, and a comment.
2. To activate limit lines, select the limit line you want to activate and press the "Enable/Disable" softkey.
3. To define a new limit line, press the "New" softkey and enter the limit line characteristics.
4. To modify a limit line, select the limit line you want to edit and press the "Edit" softkey.
5. To save a limit line, press the "Exit" softkey.  
If data is missing or if some data is invalid, an error message is displayed.
6. To delete a limit line, select the limit line you want to edit and press the "Delete" softkey.

## 4.3 Menu and Softkey Description (R&S FSV-K30)

In the following sections the softkeys available in the noise figure measurements are explained.

The "Auto Set", "Trigger", "Meas Config" and "Marker Functions" menus are not available for noise figure measurements.

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### 4.3.1 Softkeys and Settings of the Noise Menu (R&S FSV-K30)

The following table shows all softkeys available in the noise figure measurements ("Noise") menu.

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### Schematic Overview

Displays the schematic diagram of the test setup for the selected measurement type and the specified frequency ranges. If the frequency ranges are changed, the schematic diagram is updated accordingly. The test setup varies depending on the measurement mode:

- Direct measurement  
The direct measurement mode is designed for DUTs without frequency-conversion, e.g. amplifiers.  
The schematic display for the direct measurement mode is shown in [figure 4-9](#). The upper part of the figure shows the setup for calibration. The lower part of the figure shows the test setup for the measurement.

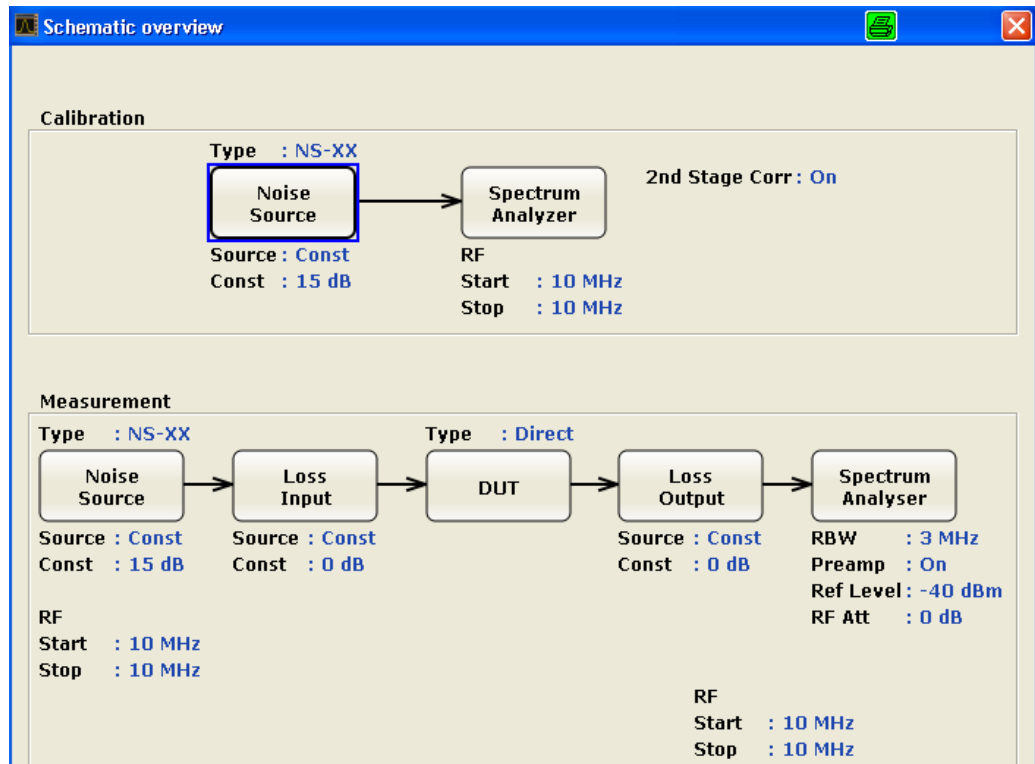


Fig. 4-9: Schematic diagram for direct measurements

- Frequency-converting measurement  
The frequency-converting measurement mode is designed for frequency-converting DUTs that have a fixed Local Oscillator (LO) frequency, for example, satellite converters with a fixed LO frequency. The schematic display for the frequency-converting measurement mode is shown in [figure 4-10](#). The upper part of the figure shows the setup for calibration. The lower part of the figure shows the test setup for the measurement.

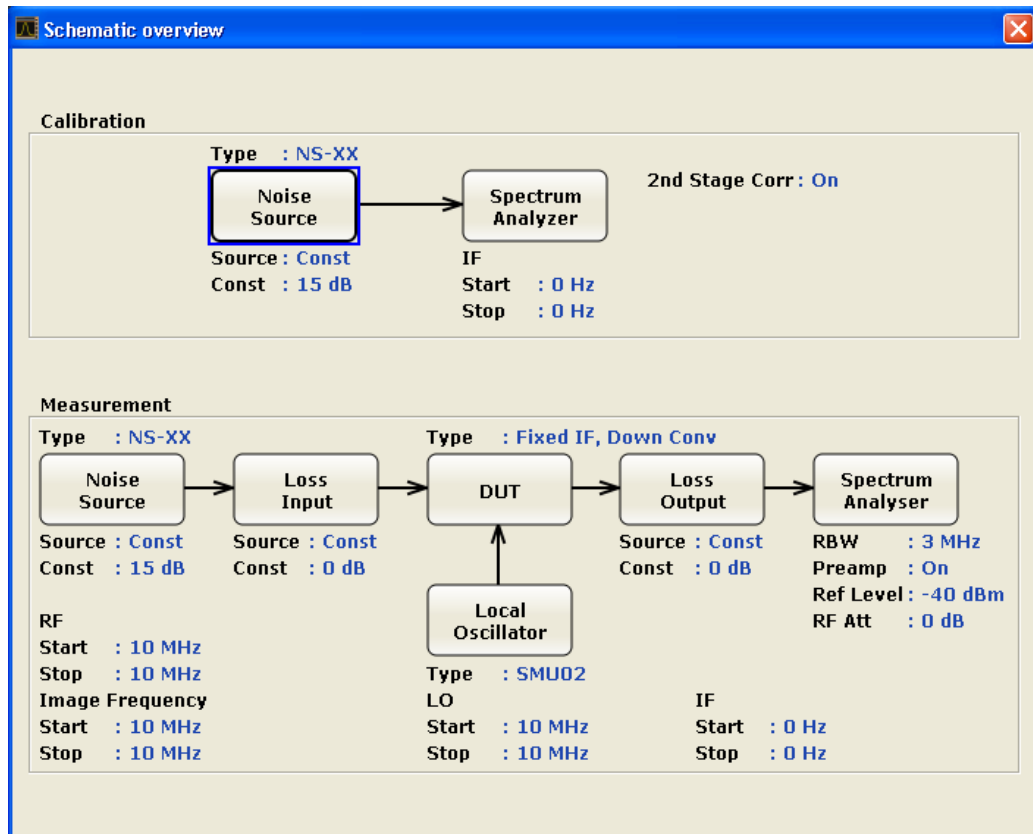


Fig. 4-10: Schematic diagram for frequency converting measurements

**Frequency Settings**

Opens the "Frequency Settings" dialog box.

RF	LO	Image
10.000 MHz	10.000 MHz	10.000 MHz
3.009 GHz	3.009 GHz	3.009 GHz
6.008 GHz	6.008 GHz	6.008 GHz
9.007 GHz	9.007 GHz	9.007 GHz
12.006 GHz	12.006 GHz	12.006 GHz
15.005 GHz	15.005 GHz	15.005 GHz
18.004 GHz	18.004 GHz	18.004 GHz
21.003 GHz	21.003 GHz	21.003 GHz
24.002 GHz	24.002 GHz	24.002 GHz
27.001 GHz	27.001 GHz	27.001 GHz
30.000 GHz	30.000 GHz	30.000 GHz
...	...	...

**Frequency Settings ← Frequency Settings**

Under "Frequency Settings", the frequency settings and the measurement mode are set.

**Single Freq ← Frequency Settings ← Frequency Settings**

Activates a single frequency measurement. Instead of measuring a list of frequencies, a single frequency is measured once or continuously. The frequency to be measured is defined in the [Start Freq](#) field.

SCPI command:

[CONFigure:FREQ:CONTInuous](#) on page 72

[CONFigure:FREQ:SINGle](#) on page 72

**Start Freq ← Frequency Settings ← Frequency Settings**

Specifies the start frequency. This is the first receive frequency (RF) entry in the "Frequency Table" and the "Frequency List Results" (result display). For single frequency measurements, the start frequency defines the single frequency to be measured.

If the start frequency is changed, the "Frequency Table" is updated accordingly. For details see [chapter 4.2.1.1, "Measurement Types"](#), on page 21.

SCPI command:

[\[SENSe:\]FREQuency:STARt](#) on page 97

**Stop Freq ← Frequency Settings ← Frequency Settings**

Specifies the stop frequency. This is the last receive frequency (RF) entry in the "Frequency Table" and the "Frequency List Results" (result display).

If the stop frequency is changed, the "Frequency Table" is updated accordingly.

SCPI command:

[\[SENSe:\]FREQuency:STOP](#) on page 98

**Step Freq ← Frequency Settings ← Frequency Settings**

Specifies the step size between the single measurement steps (i.e. entries in the frequency table). If the step frequency is larger than the difference between the start frequency and the stop frequency, the "Frequency Table" and the "Frequency List Results" (result display) just contain the start and stop frequency. For details see [chapter 4.2.1.1, "Measurement Types"](#), on page 21.

If the step frequency is changed, the "Frequency Table" is updated accordingly.

SCPI command:

[\[SENSe:\]FREQuency:STEP](#) on page 98

**Center Freq ← Frequency Settings ← Frequency Settings**

Defines the center frequency.

SCPI command:

[\[SENSe:\]FREQuency:CENTer](#) on page 96

**Span ← Frequency Settings ← Frequency Settings**

Specifies the frequency span.

SCPI command:

[\[SENSe:\]FREQuency:SPAN](#) on page 97

**Sweep points ← Frequency Settings ← Frequency Settings**

Defines the number of measured values to be collected during one sweep.

SCPI command:

[\[SENSe:\]SWEep:POINTs](#) on page 99

**Mode ← Frequency Settings ← Frequency Settings**

Specifies the measurement mode. For details on modes refer to [chapter 4.2.1.2, "Measurement Modes of the Noise Figure Measurement"](#), on page 23.

If the mode is changed, the "Frequency Table" is updated accordingly.

"Direct"            Direct measurement

"Fixed LO        IF = RF + LO  
Upconverter"

"Fixed LO        IF = |(RF - LO)|  
Downconverter"

"Digital IQ"        Digital baseband input using the optional R&S FSV-B17 interface

SCPI command:

[\[SENSe:\]CONFigure:MODE:DUT](#) on page 94

**Fixed LO ← Frequency Settings ← Frequency Settings**

Specifies the fixed local oscillator frequency. This field is only available if a frequency-converting measurement mode is selected ("Mode" field). For details on modes refer to [chapter 4.2.1.2, "Measurement Modes of the Noise Figure Measurement"](#), on page 23.

If the fixed LO is changed, the "Frequency Table" is updated accordingly.

SCPI command:

[\[SENSe:\]CONFigure:MODE:SYSTem:LOSCillator:FREQuency](#) on page 95

**Image Rej ← Frequency Settings ← Frequency Settings**

Specifies the suppression applied to the second sideband. This field is only available if a frequency-converting measurement mode is selected. For details on modes refer to [chapter 4.2.1.2, "Measurement Modes of the Noise Figure Measurement"](#), on page 23.

The value entered is applied across the complete frequency range. A value of 999.99 dB corresponds to the generally used single-sideband measurement (SSB), where the second sideband does not noticeably affect the measurement result. This is the default value. A value of 0 dB corresponds to the double-sideband measurement (DSB), where both sidebands are converted to the same extent.

SCPI command:

[\[SENSe:\]CORRection:IREJection](#) on page 90

**Frequency Table ← Frequency Settings**

Under "Frequency Table", the individual measurement steps are listed that will be performed exactly in the order of the table. They are generated from the start frequency, the stop frequency, and the step size on basis of the selected mode. If the start frequency is smaller than the stop frequency, the RF values are generated into a list of ascending frequencies. If the start frequency is larger, the list is descending. No more than 100 measurement steps are possible. If the gap between start and stop frequency is too large, increase the step frequency.

Depending on the measurement type, the "Frequency Table" contains the following columns:

Measurement type	Column	Description
Direct measurement	RF	Receive frequency, generated from the "Start Freq", the "Stop Freq", and the "Step Freq" field entries
Frequency-converting measurement	LO	Constant LO frequency, defined via the "Fixed LO" field
Frequency-converting measurement	IF	IF frequency, calculated according to the "Mode" field
	Image	Image frequency, shows whether image frequency filters are required and for which frequency range the image rejection of the DUT is needed ("Image Rej" field)

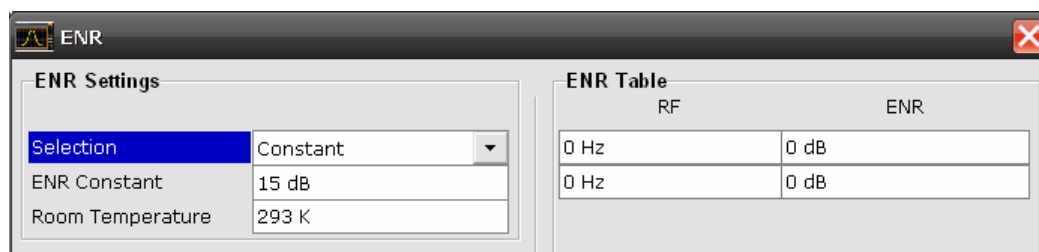
You can customize the "Frequency Table" by editing, deleting, and inserting measurement steps. This is useful in order to insert extra measurement steps near a specific frequency of interest in order to get more detailed results. If the start, stop, or step frequency is changed, the "Frequency Table" is generated afresh and all manual modifications are overwritten. To customize this table, proceed according to [chapter 4.2.2, "Editing Tables"](#), on page 31.

SCPI command:

[\[SENSe:\] FREQuency:LIST:DATA](#) on page 96

### ENR Settings

Opens the "ENR" dialog box.



The abbreviation ENR stands for "excess noise ratio". Correct ENR values for the noise source are essential to perform accurate measurements. They are used to calculate the effective noise temperature of the noise source that in turn is used for calculation of measurement results.

SCPI command:

[\[SENSe:\] CORRection:ENR\[:MEASurement\]:TABLE:DATA](#) on page 90

### Selection ← ENR Settings

Defines the used ENR values. The default ENR value is 15 dB as a constant value that is valid for all frequencies.

"Constant" The value specified in the "ENR Constant" field is used for all frequencies (see ["ENR Constant"](#) on page 40). The entries of the "ENR Table" are ignored.



"Table" The entries of the "ENR Table" provide the basis for the ENR values. Between these values the analyzer uses interpolated values.

SCPI command:

[\[SENSe:\]CORRection:ENR:SPOT](#) on page 89

#### ENR Constant ← ENR Settings

Specifies the constant ENR value of the noise source that is used throughout the entire frequency range. This parameter is only editable if "Constant" is selected in the selection list.

SCPI command:

[\[SENSe:\]CORRection:ENR:SPOT](#) on page 89

#### Room Temperature ← ENR Settings

Specifies the current room temperature as an absolute value in Kelvin. This value is used in the calculation of the noise results.

SCPI command:

[\[SENSe:\]CORRection:TEMPerature](#) on page 93

#### ENR Table ← ENR Settings

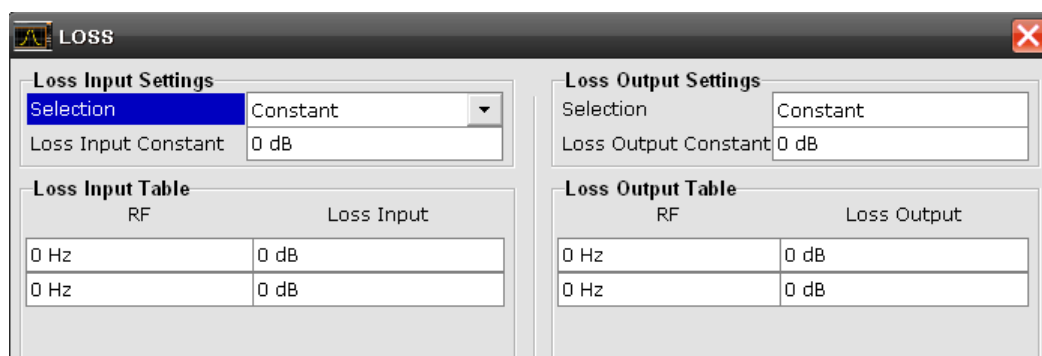
Under "ENR Table", the frequency-dependent ENR values are listed. The list can contain up to 100 RF/ENR pairs. The order of the RF values in the list is not important. To modify this table, proceed as described in [chapter 4.2, "Instrument Functions of Noise Figure Measurements \(R&S FSV-K30\)"](#), on page 20.

ENR tables can be saved and recalled at any time via the SAVE/RCL key (for details refer to the base unit description).

In addition to the data saved by the basic unit, all data entered in the "ENR Settings" dialog box is saved.

#### Loss Settings

Opens the "LOSS" dialog box to take additional losses due to cables or attenuators into account that are not considered in the calibration.



The loss Settings dialog box contains the following elements:

##### Loss Input Settings

Under "Loss Input Settings", the additional loss between the noise source and the DUT is defined.

##### Loss Output Settings

Under "Loss Output Settings", the additional loss between the DUT and the analyzer is defined.

Loss settings can be saved and recalled at any time via the SAVE/RCL key (for details refer to the base unit description).

In addition to the data saved by the basic unit, all data entered in the "Loss Settings" dialog box is saved.

SCPI command:

[\[SENSe:\]CORRection:LOSS:INPut:TABLE](#) on page 91

[\[SENSe:\]CORRection:LOSS:OUTPut:TABLE](#) on page 93

### Selection ← Loss Settings

Defines the used Loss values.

"Constant"	The values specified in the "Loss Input Constant"/"Loss Output Constant" fields are used for all frequencies. The entries of the "Loss Input/Output" table are ignored.
"Table"	The entries of the "Loss Input/Output" table provide the basis for the "Loss" values. Between these values the analyzer uses interpolated values.

SCPI command:

[\[SENSe:\]CORRection:LOSS:INPut:MODE](#) on page 91

[\[SENSe:\]CORRection:LOSS:INPut:TABLE](#) on page 91

### Loss Input Constant/Loss Output Constant ← Loss Settings

Specifies the constant loss value that is used across the entire frequency range. This parameter is only editable if "Constant" is selected in the selection list.

SCPI command:

[\[SENSe:\]CORRection:LOSS:INPut:SPOT](#) on page 91

[\[SENSe:\]CORRection:LOSS:OUTPut:SPOT](#) on page 92

### Loss Input Table/ Loss Output Table ← Loss Settings

Under "Loss Input Table" or "Loss Output Table", the list can contain up to 100 RF/ENR pairs. The order of the RF values in the list is not important. To modify this table, proceed as described in [chapter 4.2, "Instrument Functions of Noise Figure Measurements \(R&S FSV-K30\)"](#), on page 20.

Loss tables can be saved and recalled at any time via the FILE key (for details refer to the base unit description). In addition to the data saved by the basic unit, all loss input & output data entered in the loss settings dialog box is saved.

### Meas Settings

Opens the "Measurement Settings" dialog box to modify all settings related to the overall measurement.

Alternatively, the "Measurement Settings" dialog box is opened as follows:

- AMPT key
- BW key

**Calibration ← Meas Settings**

Under "Calibration", the second stage correction can be activated or deactivated. For details refer also to [chapter 4.2.1.6, "Calibration"](#), on page 28.

**2nd Stage Correction ← Calibration ← Meas Settings**

Activates or deactivates the second stage correction.

For details refer also to [chapter 4.2.1.6, "Calibration"](#), on page 28.

"On"                    The calibration data recorded via the "Cal" softkey is used to correct the measurement results (see "Cal" on page 48). The calibration data is stored regardless of the state of the option.

"Off"                    No correction is applied to the measurement results.

SCPI command:

[\[SENSe:\]CORRection\[:STATe\]](#) on page 88

**Analyzer Settings ← Meas Settings**

Under "Analyzer Settings", the general settings for the spectrum analyzer concerning the level, attenuation and bandwidth of the signal to be measured are defined.

**RBW ← Analyzer Settings ← Meas Settings**

Specifies the resolution bandwidth for the measurement.

A large value improves the averaging of the display considerably, reduces the influence of external sources of interference, and permits the fastest measurement time possible.

A low value should only be used across a very small frequency range. For measurements at low frequencies, the RBW must be reduced to prevent the LO frequency of the analyzer from invalidating the measurement. At receive frequencies of 100 kHz, the RBW must not exceed 10 kHz.

SCPI command:

[\[SENSe:\]BANDwidth|BWIDth\[:RESolution\]](#) on page 94

**Sweep Time ← Analyzer Settings ← Meas Settings**

Specifies the time one complete measurement sweep takes. Two sweeps are performed for each measurement step (once with noise source on, once with noise source off).

For narrow bandwidths, the sweep time should be increased in order to give accurate measurement results.

SCPI command:

[\[SENSe:\]SWEep:TIME](#) on page 99

**Settling Time ← Analyzer Settings ← Meas Settings**

Specifies the time the DUT takes to settle after a noise source has been turned on or off.

Most noise sources generate an interfering DC component in addition to the noise spectrum. If the noise source is switched on or off, low-frequency DUTs may require this settling time for coupling capacitors to be charged or discharged.

SCPI command:

[SYSTem:CONFIgure:DUT:STIME](#) on page 102

**Average ← Analyzer Settings ← Meas Settings**

Specifies the number of measurement sweeps over which the average is taken to produce the displayed measurement results.

The higher the number of sweeps, the more accurate the measurement results, but the measurement time is significantly longer.

An average value of 1 means that each displayed result is produced from one measurement sweep. This is sufficient for most cases.

SCPI command:

[\[SENSe:\]SWEep:COUNT](#) on page 99

**RF Attenuation ← Analyzer Settings ← Meas Settings**

Specifies the attenuation that is applied to the received RF signal.

To obtain a low noise figure for the analyzer and hence more accurate noise measurements, 0 dB should be set. For high DUT power levels or critical matching, a higher setting is also possible. A setting of 10 dB will give a much better VSWR (voltage standing wave ratio) of the analyzer, but will result in a worse noise figure of the analyzer.

SCPI command:

[INPut:ATTenuation](#) on page 85

**Automatic Ref Level ← Analyzer Settings ← Meas Settings**

Activates or deactivates the automatic reference level setting.

The automatic reference level measurement is performed as follows:

- 2nd stage correction activated:  
At the beginning of the calibration measurement, several measurements are performed at the first frequency test point and the reference level is calculated from these results taking into account the maximum gain of the DUT (see "[Range](#)" on page 44).
- 2nd stage correction deactivated:  
At the beginning of the main measurement, several measurements are performed at the first frequency test point and the reference level is calculated from these results. The range setting is not significant.

"Off" Specify a reference level manually (see "[Ref Level](#)" on page 43).

"On" The reference level is measured automatically. The total measurement time increases.

SCPI command:

[DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALE\]:RLEVEL:AUTO](#) on page 79

**Ref Level ← Analyzer Settings ← Meas Settings**

Specifies the reference level. It is only possible to enter a reference level manually, if the automatic reference level is deactivated (see "[Automatic Ref Level](#)" on page 43).

The reference level should be about 5 to 15 dB above the noise display that occurs with the DUT connected and the noise source activated.

Even for DUTs with a high-ripple frequency response it can be useful to enter the reference level manually, because an automatic reference level setting may not always result in optimal settings.

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` on page 79

#### **Range ← Analyzer Settings ← Meas Settings**

Specifies the maximum gain expected from the DUT.

If the 2nd Stage Correction is activated, this value is used to calculate the automatic reference level to ensure that the expected power of the measured signal will be within the optimum operating range of the spectrum analyzer (see "Automatic Ref Level" on page 43).

To ensure accurate measurement results, the range should not exceed the actual gain of the DUT by more than a margin of 10 dB.

SCPI command:

`SYSTem:CONFigure:DUT:GAIN` on page 101

#### **Preamp On/Off (option RF Preamplifier, B22/B24) ← Analyzer Settings ← Meas Settings**

Switches the preamplifier on or off.

If option R&S FSV-B22 is installed, the preamplifier is only active below 7 GHz.

If option R&S FSV-B24 is installed, the preamplifier is active for all frequencies.

This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

SCPI command:

`INPut:GAIN:STATe` on page 86

#### **Input Settings/Baseband Settings ← Meas Settings**

Input and Baseband settings are only required if the Digital Baseband Interface (option R&S FSV-B17) is used to measure digital input.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

#### **Input ← Input Settings/Baseband Settings ← Meas Settings**

Defines whether RF or digital input is to be measured. Digital input is only available if the Digital Baseband Interface (option R&S FSV-B17) is installed.

SCPI command:

`INPut:SElect` on page 87

#### **Input Sample Rate ← Input Settings/Baseband Settings ← Meas Settings**

Defines the sample rate of the digital I/Q signal source. This sample rate must correspond with the sample rate provided by the connected device, e.g. a generator.

SCPI command:

`INPut:DIQ:SRATe` on page 86

**Full Scale Level ← Input Settings/Baseband Settings ← Meas Settings**

The "Full Scale Level" defines the level that should correspond to an I/Q sample with the magnitude "1".

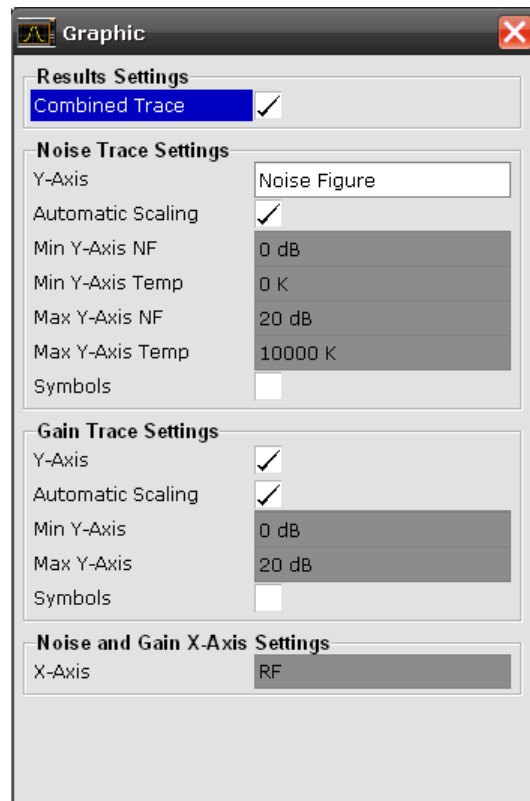
The level is defined in Volts.

SCPI command:

[INPut:DIQ:RANGe\[:UPPer\]](#) on page 85

**Display Settings**

Opens the "Display Settings" dialog box to modify the graphical results display.

**Results Settings ← Display Settings**

The settings that affect the overall results display

**Combined Trace Display ← Results Settings ← Display Settings**

Activates or deactivates the combined trace display of noise and gain results.

"ON" The noise and gain traces are displayed in the same trace display in different colors.

"OFF" The noise and gain traces are displayed in different trace displays.

SCPI command:

[DISPlay:FORMat](#) on page 75

**Noise Trace Settings ← Display Settings**

The settings related to the graphical display of noise results.

Note that when using the Digital Baseband Interface (R&S FSV-B17), the Min/Max Y-axis options are not available.

#### **Y-Axis ← Noise Trace Settings ← Display Settings**

Specifies the type of noise result that is to be displayed graphically:

- Noise Figure
- Noise Temperature
- Off (no noise results are displayed graphically)

SCPI command:

`DISPlay:DATA:TRACe<t>` on page 75

`DISPlay[:WINDow<n>]:TRACe<t>[:STATe]` on page 76

#### **Automatic Scaling ← Noise Trace Settings ← Display Settings**

Activates or deactivates the automatic scaling of the Y-axis.

- |       |   |
|-------|---|
| "On"  | The y-axis is scaled automatically. The automatic scaling algorithm provides the optimal display of the complete range of results.  |
| "Off" | The automatic scaling of the y-axis is switched off, and the scale has to be specified manually via the "Min Y-Axis NF"/"Min Y-Axis Temp"/"Max Y-Axis NF"/"Max Y-Axis Temp" fields. |

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:AUTO` on page 77

#### **Min Y-Axis NF/Max Y-Axis NF ← Noise Trace Settings ← Display Settings**

Specifies the minimum/maximum noise figure result that can be displayed graphically. It is only possible to enter a value if the automatic scaling is deactivated (see "[Automatic Scaling](#)" on page 46), and the y-axis is set to "Noise Figure" (see "[Y-Axis](#)" on page 46).

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:BOTTom` on page 78

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:TOP` on page 80

#### **Min Y-Axis Temp/Max Y-Axis Temp ← Noise Trace Settings ← Display Settings**

Specifies the minimum/maximum noise temperature result that can be displayed graphically. It is only possible to enter a value, if the automatic scaling is deactivated (see "[Automatic Scaling](#)" on page 46), and the y-axis is set to "Noise Figure" (see "[Y-Axis](#)" on page 46).

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:BOTTom` on page 78

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:TOP` on page 80

#### **Symbols ← Noise Trace Settings ← Display Settings**

Activates or deactivates the symbol representation. If activated, each measured value is marked by a symbol. This helps to distinguish result types in a monochrome printout.

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:SYMBOLs` on page 76

#### **Gain Trace Settings ← Display Settings**

The settings related to the graphical display of gain results.

Note that when using the Digital Baseband Interface (R&S FSV-B17), the Gain Trace Settings are not available.

#### **Y-Axis ← Gain Trace Settings ← Display Settings**

Activates or deactivates the display of the gain trace.

SCPI command:

`DISPlay:DATA:TRACe<t>` on page 75

`DISPlay[:WINDow<n>]:TRACe<t>[:STATe]` on page 76

#### **Automatic Scaling ← Gain Trace Settings ← Display Settings**

Activates or deactivates the automatic scaling of the Y-axis.

"On" The y-axis is scaled automatically. The automatic scaling algorithm provides the optimal display of the complete range of results.

"Off" The automatic scaling of the y-axis is switched off, and the scale has to be specified manually via the "Min Y-Axis"/"Max Y-Axis" fields.

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:AUTO` on page 77

#### **Min Y-Axis/Max Y-Axis ← Gain Trace Settings ← Display Settings**

Specifies the minimum/maximum gain result that can be displayed graphically. It is only possible to enter a value if the automatic scaling is deactivated (see "[Automatic Scaling](#)" on page 46), and the y-axis is activated (see "[Y-Axis](#)" on page 47 field).

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:BOTTom` on page 78

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:TOP` on page 80

#### **Symbols ← Gain Trace Settings ← Display Settings**

Activates or deactivates the symbol representation. If activated, each measured value is marked by a symbol. This helps to distinguish result types in a monochrome printout.

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:SYMBOLs` on page 76

#### **Noise and Gain X-Axis Settings ← Display Settings**

The settings related to noise and gain results

#### **X-Axis ← Noise and Gain X-Axis Settings ← Display Settings**

Specifies the scaling of the x-axis. This parameter is only editable in a frequency-converting measurement mode.

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:X[:SCALe]` on page 77

#### **Editing Tables**

The following functions are available as softkeys when a table in a dialog box is focussed for editing.



**Build Tbl ← Editing Tables**

Updates the table according to the "Frequency Settings" (see the "Frequency Settings" softkey, "[Frequency Settings](#)" on page 36).

**Exit ← Editing Tables**

Exits the edit mode of a table.

**Insert ← Editing Tables**

Inserts a row above the currently selected row and sets the focus on the first field of the new row.

This softkey is only available if the "Frequency Table" contains less than 100 measurement steps.

**Delete ← Editing Tables**

Deletes the currently selected row. This action requires no confirmation.

**Cal**

Performs a calibration. The calibration status of the noise figure measurement is displayed in the title bar. For more details see [chapter 4.2.1.6, "Calibration"](#), on page 28

This softkey is only available if the [2nd Stage Correction](#) option in the "Measurement Settings" dialog box is activated.

SCPI command:

[CONFigure:CORRection](#) on page 71

### 4.3.2 Softkeys of the Frequency Menu (R&S FSV-K30)

The FREQ key displays the "Frequency" menu.

**Center Freq**

Defines the center frequency.

SCPI command:

[\[SENSe:\] FREQuency: CENTer](#) on page 96

**Stepsize**

Specifies the step size between the single measurement steps (i.e. entries in the frequency table). For details see "[Step Freq](#)" on page 37.

SCPI command:

[\[SENSe:\] FREQuency: STEP](#) on page 98

**Start**

Specifies the start frequency. For details see "[Start Freq](#)" on page 37.

SCPI command:

[\[SENSe:\] FREQuency: START](#) on page 97

**Stop**

Specifies the stop frequency. For details see ["Stop Freq"](#) on page 37.

SCPI command:

[\[SENSe:\] FREQuency: STOP](#) on page 98

**LO/IF**

Specifies the fixed local oscillator or fixed IF frequency. This function is only available if a frequency-converting measurement mode is selected ("Mode" field).

For details see ["Fixed LO"](#) on page 38.

SCPI command:

LO: [\[SENSe:\] CONFIgure: MODE: SYSTem: LOSCillator: FREQuency](#)  
on page 95

**Frequency Axis**

Specifies the scaling of the x-axis. This function is only available in a frequency-converting measurement mode.

For details see ["X-Axis"](#) on page 47.

SCPI command:

[DISPlay\[:WINDow<n>\]: TRACe<t>: X\[:SCALe\]](#) on page 77

**Frequency Settings**

Opens the "Frequency Settings" dialog box.

For details see ["Frequency Settings"](#) on page 36.

### 4.3.3 Softkeys of the Span Menu (R&S FSV-K30)

The SPAN key displays the "Span" menu.

**Span**

Specifies the frequency span.

SCPI command:

[\[SENSe:\] FREQuency: SPAN](#) on page 97

**Sweep points**

Defines the number of measured values to be collected during one sweep.

SCPI command:

[\[SENSe:\] SWEEp: POINts](#) on page 99

**Frequency Settings**

Opens the "Frequency Settings" dialog box.

For details see ["Frequency Settings"](#) on page 36.

#### 4.3.4 AMPT key

This key opens the "Measurement Settings" dialog box and jumps directly to the "RF Attenuation" field (see ["RF Attenuation"](#) on page 43).

In addition, the standard "Noise" menu is displayed, see [chapter 4.3.1, "Softkeys and Settings of the Noise Menu \(R&S FSV-K30\)"](#), on page 33.

#### 4.3.5 BW key

This key opens the "Measurement Settings" dialog box and jumps directly to the "RBW" field (see ["RBW"](#) on page 42).

#### 4.3.6 Softkeys of the Sweep Menu (R&S FSV-K30)

The following table shows all softkeys available in the "Sweep" menu in Noise mode (SWEEP key).

<a href="#">Continuous sweep</a> .....	50
<a href="#">Sweep Single</a> .....	50
<a href="#">Cal</a> .....	50
<a href="#">Fix Freq</a> .....	51

##### **Continuous sweep**

Sets the continuous sweep mode: the sweep takes place continuously according to the trigger settings. This is the default setting.

SCPI command:

[CONFigure:LIST:CONTInuous](#) on page 72

##### **Sweep Single**

Sets the single sweep mode. The measurement stops after the defined number of sweeps ([Sweep points](#) setting in the "Measurement Settings") has been performed. If a measurement is started while another measurement is in progress, the first measurement is aborted and the new measurement started immediately.

For further details refer to [chapter 4.2.1.1, "Measurement Types"](#), on page 21.

SCPI command:

[CONFigure:LIST:SINGLE](#) on page 73

##### **Cal**

Performs a calibration. The calibration status of the noise figure measurement is displayed in the title bar. For more details see [chapter 4.2.1.6, "Calibration"](#), on page 28

This softkey is only available if the [2nd Stage Correction](#) option in the "Measurement Settings" dialog box is activated.

SCPI command:

[CONFigure:CORRection](#) on page 71

**Fix Freq**

Starts a fixed frequency measurement for the frequency that is currently selected in the "Frequency List Results".

This softkey is only available after a frequency list measurement has been completed and the measurement results are displayed in list form ("[Display Settings](#)" on page 45 softkey).

SCPI command:

[CONFigure:SINGLE](#) on page 73

[\[SENSe:\]FREQuency\[:CW\]:FIXed](#) on page 96

**4.3.7 Softkeys of the Trace Menu (R&S FSV-K30)**

Using the trace memory facility, you can save graphical display results (max. 3 trace sets) for comparison with subsequent measurements. This facility is recommended in order to compare and to document the effects of small changes on the DUT.

The following table shows all softkeys available in the "Trace" menu in Noise mode (TRACE key).

<a href="#">Display Graph/List</a> .....	51
<a href="#">Data-&gt;Mem1/ Data-&gt;Mem2/ Data-&gt;Mem3</a> .....	51
<a href="#">Data On/Off</a> .....	51
<a href="#">Mem1 On/Off/Mem2 On/Off/Mem3 On/Off</a> .....	52
<a href="#">ASCII File Export</a> .....	52
<a href="#">Decim Sep</a> .....	52

**Display Graph/List**

Switches between graphical and table display of the measurement results (see [chapter 4.2.1.4, "Result Displays"](#), on page 25).

**Data->Mem1/ Data->Mem2/ Data->Mem3**

Saves the current trace results to trace memory <n>. If a trace memory <n> contains data, the corresponding softkey has a green background. The content of the trace memory <n> is displayed via the [Mem1 On/Off/Mem2 On/Off/Mem3 On/Off](#) softkeys.

If data is transferred to a trace memory that already contains trace data, the new trace data overwrites the current trace data in the memory.

SCPI command:

[CONFigure:ARRay:MEMory<1...3> ONCE](#) on page 71

[FETCh:ARRay:MEMory<1...3>:NOISe:FIGure](#) on page 81

[FETCh:ARRay:MEMory<1...3>:NOISe:GAIN](#) on page 81

[FETCh:ARRay:NOISE:TEMPerature](#) on page 83

**Data On/Off**

Switches the display of the current measurement results on or off. The display of trace memory results is not affected if this softkey is pressed. If a new frequency list measurement is started, the display of the current result trace is switched on automatically.

SCPI command:

[DISPlay:CURRent:DATA\[:STATe\]](#) on page 74

**Mem1 On/Off/Mem2 On/Off/Mem3 On/Off**

Switches the display of trace memory <n> on or off. This softkey is not available if no data is held in the selected trace memory.

SCPI command:

[DISPlay:ARRay:MEMory<m>\[:STATe\]](#) on page 74

**ASCII File Export**

Opens the "ASCII File Export Name" dialog box and saves the active peak list in ASCII format to the specified file and directory.

The file consists of the header containing important scaling parameters and a data section containing the marker data. For details on an ASCII file see [chapter 4.2.1.9, "ASCII File Export Format"](#), on page 31.

This format can be processed by spreadsheet calculation programs, e.g. MS-Excel. It is necessary to define ';' as a separator for the data import. Different language versions of evaluation programs may require a different handling of the decimal point. It is therefore possible to select between separators '.' (decimal point) and ',' (comma) using the "Decim Sep" softkey (see ["Decim Sep"](#) on page 52).

SCPI command:

[FORMat:DEXPort:DSEParator](#) on page 84

[MMEMemory:STORE<n>:LIST](#) on page 87

**Decim Sep**

Selects the decimal separator with floating-point numerals for the ASCII Trace export to support evaluation programs (e.g. MS-Excel) in different languages. The values '.' (decimal point) and ',' (comma) can be set.

SCPI command:

[FORMat:DEXPort:DSEParator](#) on page 84

**4.3.8 Softkeys of the Marker Menu (R&S FSV-K30)**

The following table shows all softkeys available in the "Marker" menu in Noise mode (MKR key).

<a href="#">Marker 1</a> .....	52
<a href="#">Marker to Trace</a> .....	53
<a href="#">All Marker Off</a> .....	53

**Marker 1**

Activates marker 1 and opens an edit dialog box to enter a value for marker 1 to be set to. Pressing the softkey again deactivates the marker 1. This softkey is only available if measurement results are displayed.

SCPI command:

[CALCulate<n>:MARKer<m>\[:STATe\]](#) on page 69

[CALCulate<n>:MARKer<m>:X](#) on page 70

[CALCulate<n>:MARKer<m>:Y](#) on page 70

**Marker to Trace**

Opens a dialog box to select the trace (noise figure or gain), on which the marker is to be placed.

This softkey is only available if measurement results are displayed.

SCPI command:

`CALCulate<n>:MARKer<m>:TRACe` on page 69

**All Marker Off**

Switches off the active marker. This softkey is only available if measurement results are displayed.

SCPI command:

`CALCulate<n>:MARKer<m>:AOFF` on page 68

**4.3.9 Softkeys of the Marker To Menu (R&S FSV-K30)**

The following table shows all softkeys available in the "Marker To" menu in Noise mode (MKR-> key).

Peak.....	53
Min.....	53
Marker to Trace.....	53

**Peak**

Sets the active marker/delta marker to the highest maximum of the trace.

SCPI command:

`CALCulate<n>:MARKer<m>:MAXimum[:PEAK]` on page 68

**Min**

Sets the active marker/delta marker to the minimum of the selected trace.

SCPI command:

`CALCulate<n>:MARKer<m>:MINimum[:PEAK]` on page 69

**Marker to Trace**

Opens a dialog box to select the trace (noise figure or gain), on which the marker is to be placed.

This softkey is only available if measurement results are displayed.

SCPI command:

`CALCulate<n>:MARKer<m>:TRACe` on page 69

**4.3.10 Softkeys of the Lines Menu (R&S FSV-K30)**

The following table shows all softkeys available in the "Lines" menu in Noise mode (LINES key).

New.....	54
L Name.....	54

L Limit.....	54
L Comment.....	54
L Frequency.....	54
L Limit.....	54
Edit.....	55
Enable/Disable.....	55
Delete.....	55
Edit Table mode.....	55
L Exit.....	55
L Insert.....	55
L Delete.....	55

**New**

Displays the "Limit Line" dialog box in edit mode with all fields necessary to define a new limit line.

**Name ← New**

Specifies the name of the limit line to uniquely identify every limit line. Any combination of alphanumeric characters is allowed. If the entered name already exists, an error message is displayed with the request to alter the name.

SCPI command:

`CALCulate<n>:LIMit<k>:NAME` on page 65

**Limit ← New**

Specifies the result type (noise or gain) and the limit type (upper or lower) for the limit line.

SCPI command:

`CALCulate<n>:LIMit<m>:TRACe` on page 66

**Comment ← New**

Specifies a description for the limit line. Any combination of alphanumeric characters is allowed.

SCPI command:

`CALCulate<n>:LIMit<k>:COMMeNt` on page 62

**Frequency ← New**

Specifies the receive frequencies.

SCPI command:

`CALCulate<n>:LIMit<k>:CONTRol[:DATA]` on page 63

**Limit ← New**

Specifies the limits for the receive frequencies.

SCPI command:

`CALCulate<n>:LIMit<k>:LOWer[:DATA]` on page 63

`CALCulate<n>:LIMit<k>:UPPer[:DATA]` on page 67

**Edit**

Displays the "Limit Line" dialog box in edit mode with all data of the selected limit line. For further details refer to the [New](#) softkey.

**Enable/Disable**

Enables or disables the selected limit line. Limit checking is only performed for activated limit lines. Only one limit line of each type can be active at a given time.

SCPI command:

[CALCulate<n>:LIMit<k>:STATe](#) on page 65

[CALCulate<n>:LIMit<k>:LOWer:STATe](#) on page 65

[CALCulate<n>:LIMit<k>:UPPer:STATe](#) on page 67

**Delete**

Deletes the selected limit line.

SCPI command:

[CALCulate<n>:LIMit<k>:DELete](#) on page 64

**Edit Table mode**

The following functions are available if a limit line table is focussed for editing. For details see [chapter 4.2.3, "Working With Limit Lines"](#), on page 32 and [chapter 4.2.2, "Editing Tables"](#), on page 31

**Exit ← Edit Table mode**

Exits the edit mode of a table.

**Insert ← Edit Table mode**

Inserts a row above the currently selected row and sets the focus on the first field of the new row.

**Delete ← Edit Table mode**

Deletes the currently selected row. This action requires no confirmation.

**4.3.11 Softkeys of the Input/Output Menu (R&S FSV-K30)**

The following chapter describes all softkeys available in the "Input/Output" menu for Noise Figure measurements. Note that the digital baseband functions are only available if the optional Digital Baseband Interface (R&S FSV-B17) is installed.

For details see the base unit description.

<a href="#">EXIQ</a> .....	56
L <a href="#">TX Settings</a> .....	56
L <a href="#">RX Settings</a> .....	56
L <a href="#">Send To</a> .....	56
L <a href="#">Firmware Update</a> .....	56
L <a href="#">R&amp;S Support</a> .....	56
L <a href="#">DiglConf</a> .....	56



**EXIQ**

Opens a configuration dialog box for an optionally connected R&S EX-IQ-BOX and a submenu to access the main settings quickly.

If the optional R&S DigIConf software is installed, the submenu consists only of one key to access the software. **Note that R&S DigIConf requires a USB connection (not LAN!) from the analyzer to the R&S EX-IQ-BOX in addition to the R&S Digital I/Q Interface connection. R&S DigIConf version 2.10 or higher is required.**

For typical applications of the R&S EX-IQ-BOX see also the description of the R&S Digital I/Q Interface (R&S FSV-B17) in the base unit manual.

For details on configuration see the "R&S®Ex I/Q Box - External Signal Interface Module Manual".

For details on installation and operation of the R&S DigIConf software, see the "R&S®EX-IQ-BOX Digital Interface Module R&S®DigIConf Software Operating Manual".

**TX Settings ← EXIQ**

Opens the "EX-IQ-BOX Settings" dialog box to configure the analyzer for digital output to a connected device ("Transmitter" Type).

**RX Settings ← EXIQ**

Opens the "EX-IQ-BOX Settings" dialog box to configure the analyzer for digital input from a connected device ("Receiver" Type).

**Send To ← EXIQ**

The configuration settings defined in the dialog box are transferred to the R&S EX-IQ-BOX.

**Firmware Update ← EXIQ**

If a firmware update for the R&S EX-IQ-BOX is delivered with the analyzer firmware, this function is available. In this case, when you select the softkey, the firmware update is performed.

**R&S Support ← EXIQ**

Stores useful information for troubleshooting in case of errors.

This data is stored in the `C:\R_S\Instr\user\Support` directory on the instrument.

If you contact the Rohde&Schwarz support to get help for a certain problem, send these files to the support in order to identify and solve the problem faster.

**DigIConf ← EXIQ**

Starts the optional R&S DigIConf application. This softkey is only available if the optional software is installed.

To return to the analyzer application, press any key on the front panel. The application is displayed with the "EXIQ" menu, regardless of which key was pressed.

For details on the R&S DigIConf application, see the "R&S®EX-IQ-BOX Digital Interface Module R&S®DigIConf Software Operating Manual".

**Note:** If you close the R&S DigIConf window using the "Close" icon, the window is minimized, not closed.

If you select the "File > Exit" menu item in the R&S DiglConf window, the application is closed. Note that in this case the settings are lost and the EX-IQ-BOX functionality is no longer available until you restart the application using the "DiglConf" softkey in the analyzer once again.

SCPI command:

Remote commands for the R&S DiglConf software always begin with `SOURce:EBOX`. Such commands are passed on from the analyzer to the R&S DiglConf automatically which then configures the R&S EX-IQ-BOX via the USB connection.

All remote commands available for configuration via the R&S DiglConf software are described in the "R&S®EX-IQ-BOX Digital Interface Module R&S®DiglConf Software Operating Manual".

**Example 1:**

`SOURce:EBOX:*RST`

`SOURce:EBOX:*IDN?`

Result:

"Rohde&Schwarz,DiglConf,02.05.436 Build 47"

**Example 2:**

`SOURce:EBOX:USER:CLOCK:REFERENCE:FREQUENCY 5MHZ`

Defines the frequency value of the reference clock.

## 4.4 Status Reporting System (R&S FSV-K30)

Additionally to the registers provided by the base system, the following registers are used or modified in the Noise Figure Measurements option (R&S FSV-K30):

- [chapter 4.4.1, "STATUS:OPERATION Register"](#), on page 58

Although this register is provided by the base system, the Noise Figure Measurements option makes use of bits not used within the base system.

- [chapter 4.4.2, "STATUS:QUESTIONABLE Register"](#), on page 58

Although this register is provided by the base system, the Noise Figure Measurements option uses different bits and definitions.

- [chapter 4.4.3, "STATUS:QUESTIONABLE:CORRECTION Register"](#), on page 58

This register is provided by the R&S FSV-K30 option.

The following registers are provided by the base system and are not available from the Noise Figure Measurements option (R&S FSV-K30) command tree:

- `STATUS:QUESTIONABLE:ACPLimit` Register
- `STATUS:QUESTIONABLE:LIMit` Register
- `STATUS:QUESTIONABLE:LMARgin` Register
- `STATUS:QUESTIONABLE:POWER` Register

Detailed information on the status registers of the base system is given in section Status Reporting System. In this section, only the new and altered status registers/bits for the Noise Figure Measurements option (R&S FSV-K30) are described.

#### 4.4.1 STATus:OPERation Register

Additionally to the bits assigned by the base system (for details refer to STATus:OPERation Register), the bits no. 4 and 7 are defined:

Bit No	Meaning
4	MEASuring A '1' in this bit position indicates that a measurement is in progress.
7	CORRection Indicates that a user calibration is in progress.

#### 4.4.2 STATus:QUESTionable Register

Additionally to the bits assigned by the base system (for details refer to STATus:QUESTionable Register), the bit no. 11 is defined differently:

Bit No	Meaning
11	CORRection This bit is set if questionable correction data occurs (see also section <a href="#">STATus:QUESTionable:CORRection Register</a> ).

#### 4.4.3 STATus:QUESTionable:CORRection Register

This register comprises information about the correction state of noise measurements. It can be queried by `STATus:QUESTionable:CONDition?` and `STATus:QUESTionable[:EVENT]? commands`.

Bit No	Meaning
0	NO CORRection User calibration is required (i.e. not done, or setup changed). Initial value is 1. Will remain 1 until a user calibration is done. Set to 1 at the start of a user calibration. It will go to 0 at the end of a user calibration only if all points of at least one range have been calibrated.
1	Not used
2	Deprecated; not used
3	Missing Loss or ENR values No ENR, Loss In and/or Loss Out can be determined for one or all of the measurement frequencies. This occurs when using tables of ENR, Loss In and/or Loss out values. Check that the frequency ranges of the tables cover the range of frequencies to be measured. For each measurement frequency where ENR, Loss In or Loss Out cannot be determined, 0 is used.
4 to 15	Not used

## 4.5 Remote Control Commands

This section describes the remote commands specific to the Noise Figure Measurements option (R&S FSV-K30). The abbreviation NF stands for the operating mode of noise figure measurements. For details on conventions used in this chapter refer to [chapter 4.5.1, "Notation"](#), on page 59.

For further information on analyzer or basic settings commands, refer to the corresponding Subsystem in the base unit description.

4.5.1	Notation.....	59
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4.5.13	TRACe Subsystem.....	102

### 4.5.1 Notation

In the following sections, all commands implemented in the instrument are first listed and then described in detail, arranged according to the command subsystems. The notation is adapted to the SCPI standard. The SCPI conformity information is included in the individual description of the commands.

#### Individual Description

The individual description contains the complete notation of the command. An example for each command, the \*RST value and the SCPI information are included as well.

The options and operating modes for which a command can be used are indicated by the following abbreviations:

Abbreviation	Description
A	spectrum analysis
A-F	spectrum analysis – span > 0 only (frequency mode)
A-T	spectrum analysis – zero span only (time mode)
ADEMOD	analog demodulation (option R&S FSV-K7)
BT	Bluetooth (option R&S FSV-K8)
CDMA	CDMA 2000 base station measurements (option R&S FSV-K82)
EVDO	1xEV-DO base station analysis (option R&S FSV-K84)
GSM	GSM/Edge measurements (option R&S FSV-K10)
IQ	IQ Analyzer mode
OFDM	WiMAX IEEE 802.16 OFDM measurements (option R&S FSV-K93)
OFDMA/WiBro	WiMAX IEEE 802.16e OFDMA/WiBro measurements (option R&S FSV-K93)
NF	Noise Figure measurements (R&S FSV-K30)
PHN	Phase Noise measurements (R&S FSV-K40)
PSM	Power Sensor measurements (option R&S FSV-K9)
SFM	Stereo FM measurements (option R&S FSV-K7S)
SPECM	Spectrogram mode (option R&S FSV-K14)
TDS	TD-SCDMA base station / UE measurements (option R&S FSV-K76/K77)
VSA	Vector Signal Analysis (option R&S FSV-K70)
WCDMA	3GPP Base Station measurements (option R&S FSV-K72), 3GPP UE measurements (option R&S FSV-K73)
WLAN	WLAN TX measurements (option R&S FSV-K91)



The spectrum analysis mode is implemented in the basic unit. For the other modes, the corresponding options are required.

### Upper/Lower Case Notation

Upper/lower case letters are used to mark the long or short form of the key words of a command in the description. The instrument itself does not distinguish between upper and lower case letters.

### Special Characters

	A selection of key words with an identical effect exists for several commands. These keywords are indicated in the same line; they are separated by a vertical stroke. Only one of these keywords needs to be included in the header of the command. The effect of the command is independent of which of the keywords is used.
--	---

Example:

```
SENSe:FREQuency:CW|:FIXed
```

The two following commands with identical meaning can be created. They set the frequency of the fixed frequency signal to 1 kHz:

```
SENSe:FREQuency:CW 1E3
```

```
SENSe:FREQuency:FIXed 1E3
```

A vertical stroke in parameter indications marks alternative possibilities in the sense of "or". The effect of the command differs, depending on which parameter is used.

Example: Selection of the parameters for the command

```
[SENSe<1...4>:]AVERAge<1...4>:TYPE VIDEo | LINear
```

[]	Key words in square brackets can be omitted when composing the header. The full command length must be accepted by the instrument for reasons of compatibility with the SCPI standards. Parameters in square brackets can be incorporated optionally in the command or omitted as well.
----	---

{ }	Parameters in braces can be incorporated optionally in the command, either not at all, once or several times.
-----	---

### Description of Parameters

Due to the standardization, the parameter section of SCPI commands consists always of the same syntactical elements. SCPI has therefore specified a series of definitions, which are used in the tables of commands. In the tables, these established definitions are indicated in angled brackets (<...>) and is briefly explained in the following.

For details see the chapter "SCPI Command Structure" in the base unit description.

#### <Boolean>

This keyword refers to parameters which can adopt two states, "on" and "off". The "off" state may either be indicated by the keyword OFF or by the numeric value 0, the "on" state is indicated by ON or any numeric value other than zero. Parameter queries are always returned the numeric value 0 or 1.

#### <numeric\_value> <num>

These keywords mark parameters which may be entered as numeric values or be set using specific keywords (character data). The following keywords given below are permitted:

- MAXimum: This keyword sets the parameter to the largest possible value.
- MINimum: This keyword sets the parameter to the smallest possible value.
- DEFault: This keyword is used to reset the parameter to its default value.
- UP: This keyword increments the parameter value.
- DOWN: This keyword decrements the parameter value.

The numeric values associated to MAXimum/MINimum/DEFault can be queried by adding the corresponding keywords to the command. They must be entered following the quotation mark.

Example:

```
SENSe:FREQUency:CENTer? MAXimum
```

Returns the maximum possible numeric value of the center frequency as result.

#### <arbitrary block program data>

This keyword is provided for commands the parameters of which consist of a binary data block.

## 4.5.2 CALCulate Subsystem (Noise Figure, R&S FSV-K30)

The CALCulate subsystem checks the marker functions and contains commands for limit lines and their limit checks.

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### 4.5.2.1 CALCulate:LIMit Subsystem (Noise Figure, K30)

The CALCulate:LIMit subsystem contains commands for the limit lines and the corresponding limit checks.

In contrast to the base unit, only 6 limit lines can be active at the same time (indicated by LIMIT1 to LIMIT6). They are assigned to a particular measurement type rather than a particular trace (see [CALCulate<n>:LIMit<m>:TRACe](#) on page 66). Otherwise, the commands are the same as for the base unit.

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---

#### **CALCulate<n>:LIMit<k>:COMMeNt** <Comment>

This command defines a comment for the selected limit line in all windows (max. 40 characters).

#### **Suffix:**

<n>	irrelevant
<k>	limit line

**Parameters:**

<Comment> <string>, max. 40 alphanumeric characters

**Example:**

```
CALC:LIM5:COMM 'Upper limit for spectrum'
```

Defines the comment for limit line 5.

**Mode:**

A, ADEMOD, CDMA, EVDO, NF, PHN, TDS, WCDMA

**CALCulate<n>:LIMit<k>:CONTrol[:DATA] <XValue>, <XValue>**

This command defines the x-axis values (frequencies or times) of the upper or lower limit lines.

The number of values for the CONTrol axis and for the corresponding UPPer and/or LOWer limit lines has to be identical. Otherwise default values are entered for missing values or not required values are deleted.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> 1...8  
limit line

**Parameters:**

<XValue>, <XValue> <numeric\_value>,<numeric\_value>

\*RST: - (CALC:LIM is set to OFF)

**Example:**

```
CALC:LIM2:CONT 1 MHz,30 MHz,100 MHz,300 MHz,1 GHz
```

Defines 5 reference values for the x-axis of limit line 2.

```
CALC:LIM2:CONT?
```

Outputs the reference values for the x-axis of limit line 2 separated by a comma.

**Mode:**

A, ADEMOD, CDMA, EVDO, NF, PHN, TDS, WCDMA

**CALCulate<n>:LIMit<k>:LOWer[:DATA] <LimitLineValues>**

This command defines the values for the selected lower limit line.

The number of values for the CONTrol axis and for the corresponding LOWer limit line has to be identical. Otherwise default values are entered for missing values or not necessary values are deleted.

The unit must be identical with the unit selected by `CALCulate<n>:LIMit<k>:UNIT`. If no unit is indicated, the unit defined with `CALCulate<n>:LIMit<k>:UNIT` is automatically used.

If the measured values are smaller than the LOWer limit line, the limit check signals errors.

The units DEG, RAD, S, HZ, PCT are not available in the "Spectrum" mode.



**Suffix:**

<n> irrelevant  
 <k> 1...8  
 limit line

**Parameters:**

<LimitLineValues> numeric values, separated by commas  
 \*RST: (LIMit:STATe is set to OFF)

**Example:**

CALC:LIM2:LOW -30,-40,-10,-40,-30  
 Defines 5 lower limit values for limit line 2 in the preset unit.  
 CALC:LIM2:LOW?  
 Outputs the lower limit values of limit line 2 separated by a comma.

**Mode:** A, ADEMOD, CDMA, EVDO, NF, PHN, TDS

**CALCulate<n>:LIMit<k>:DELeTe**

This command deletes the selected limit line.

**Suffix:**

<n> irrelevant  
 <k> limit line

**Example:**

CALC:LIM1:DEL  
 Deletes limit line 1.

**Mode:** A, ADEMOD, CDMA, EVDO, NF, PHN, TDS, WCDMA

**CALCulate<n>:LIMit<k>:FAIL**

This command queries the result of the limit check of the indicated limit line. It should be noted that a complete sweep must have been performed for obtaining a correct result. A synchronization with \*OPC, \*OPC? or \*WAI should therefore be provided. The result of the limit check is given with 0 for PASS, 1 for FAIL, and 2 for MARGIN.

**Suffix:**

<n> irrelevant  
 <k> limit line

**Return values:**

Return values 0 for pass, 1 for fail

**Example:**

INIT;\*WAI  
 Starts a new sweep and waits for its end.  
 CALC:LIM3:FAIL?  
 Queries the result of the check for limit line 3.

**Mode:** A, ADEMOD, CDMA, EVDO, NF, PHN, TDS, WLAN, WCDMA

**CALCulate<n>:LIMit<k>:LOWer:STATe <State>**

This command switches on or off the indicated limit line. The limit check is activated separately with `CALCulate<n>:LIMit<k>:STATe`.

In "Spectrum" mode, the result of the limit check can be queried with `CALCulate<n>:LIMit<k>:FAIL`.

**Suffix:**

<n> irrelevant  
<k> 1...8  
limit line

**Parameters:**

<State> ON | OFF  
  
\*RST: OFF

**Example:**

`CALC:LIM4:LOW:STAT ON`  
Switches on limit line 4 (lower limit).

**Mode:**

A, ADEMOD, CDMA, EVDO, NF, PHN, TDS

**CALCulate<n>:LIMit<k>:NAME <Name>**

This command assigns a name to a limit line numbered 1 to 8. If it does not exist already, a limit line with this name is created.

**Suffix:**

<n> irrelevant  
<k> 1...8 (NF: 1...6)  
limit line

**Parameters:**

<Name> <name of limit line>  
  
\*RST: REM1 to REM8 for lines 1 to 8

**Example:**

`CALC:LIM1:NAME 'FM1'`  
Assigns the name FM1 to limit line 1.

**Mode:**

A, ADEMOD, CDMA, EVDO, NF, TDS, PHN

**CALCulate<n>:LIMit<k>:STATe <State>**

This command switches on or off the limit check for the selected limit line.

The result of the limit check can be queried with `CALCulate<n>:LIMit<k>:FAIL`.

**Suffix:**

<n> irrelevant  
<k> limit line

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

CALC:LIM:STAT ON  
 Switches on the limit check for limit line 1.

**Mode:**

A, ADEMOD, CDMA, EVDO, NF, PHN, TDS

**CALCulate<n>:LIMit<m>:TRACe <MeasType>**

This command assigns a limit line to a particular measurement type.

**Suffix:**

<n> 1...4  
 irrelevant  
 <m> 1...6  
 limit line

**Parameters:**

<MeasType> NFIGure | TEFFective | GAIN

**NFIGure**

noise figure

**TEFFective**

noise temperature

**GAIN**

gain

**Example:**

CALC:LIM2:TRAC NFIG  
 Assigns limit line 2 to the noise figure measurement.  
 CALC:LIM3:TRAC GAIN  
 Assigns limit line 3 to the gain measurement.

**Mode:**

NF

**CALCulate<n>:LIMit<k>:UNIT <Unit>**

This command defines the unit of the selected limit line.

Upon selection of the unit DB the limit line is automatically switched to the relative mode.  
 For units different from DB the limit line is automatically switched to absolute mode.

The units DEG, RAD, S, HZ, PCT are not available in "Spectrum" mode.

**Suffix:**

<n> irrelevant  
 <k> limit line

**Parameters:**

<Unit> DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere  
 | DB | DBUV\_M | DBUA\_M | DEG | RAD | S | HZ | PCT | (unitless)

\*RST: DBM

**Example:**

CALC:LIM4:UNIT DBUV  
 Sets the unit of limit line 4 to dBµV.

**Mode:**

A, AEMOD, CDMA, EVDO, PHN, TDS

**CALCulate<n>:LIMit<k>:UPPer[:DATA] <LimitLineValues>**

This command defines the values for the upper limit lines

The number of values for the CONTROL axis and for the corresponding UPPER and/or LOWER limit line has to be identical. Otherwise default values are entered for missing values or not necessary values are deleted.

The unit must be identical to the unit selected by CALCulate<n>:LIMit<k>:UNIT. If no unit is indicated, the unit defined using CALCulate<n>:LIMit<k>:UNIT is automatically used.

In "Spectrum" mode, the limit check indicates errors if the measured values exceed the UPPER limit line. The units DEG, RAD, S, HZ, PCT are not available in "Spectrum" mode.

**Suffix:**

<n> irrelevant  
 <k> 1...8  
 limit line

**Parameters:**

<LimitLineValues> numeric values, separated by commas

\*RST: ("CALCulate<n>:LIMit<k>" is set to OFF)

**Example:**

CALC:LIM2:UPP -10,0,0,-10,-5  
 Defines 5 upper limit values for limit line 2 in the preset unit.  
 CALC:LIM2:UPP?  
 Outputs the upper limit values for limit line 2 separated by a comma.

**Mode:**

A, AEMOD, CDMA, EVDO, NF, PHN, TDS

**CALCulate<n>:LIMit<k>:UPPer:STATe <State>**

This command switches on or off the indicated limit line. The limit check is activated separately with CALCulate<n>:LIMit<k>:STATe.

In "Spectrum" mode, the result of the limit check can be queried with CALCulate<n>:LIMit<k>:FAIL.

<b>Suffix:</b>	
<n>	irrelevant
<k>	1...8 limit line
<b>Parameters:</b>	
<State>	ON   OFF
	*RST: OFF
<b>Example:</b>	CALC:LIM4:UPP:STAT ON Switches on limit line 4 (upper limit).
<b>Mode:</b>	A, ADEMOD, CDMA, EVDO, NF, PHN, TDS

#### 4.5.2.2 CALculate:MARKer subsystem

---

##### CALCulate<n>:MARKer<m>:AOFF

This command switches off all active markers, delta markers, and marker measurement functions in the specified window.

<b>Suffix:</b>	
<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	depends on mode irrelevant

**Example:** CALC:MARK:AOFF  
Switches off all markers.

**Mode:** all

---

##### CALCulate<n>:MARKer<m>:MAXimum[:PEAK]

This command positions the marker to the current maximum value of the corresponding trace in the specified window. The corresponding marker is activated first or switched to the marker mode.

If no maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

<b>Suffix:</b>	
<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	depends on mode marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.

**Example:** CALC:MARK2:MAX  
Positions marker 2 to the maximum value of the trace.

**Mode:** A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM, NF

**CALCulate<n>:MARKer<m>:MINimum[:PEAK]**

This command positions the marker to the current minimum value of the corresponding trace in the specified window. The corresponding marker is activated first or switched to marker mode, if necessary.

If no minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.  
 <m> depends on mode  
 marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.

**Example:**

`CALC:MARK2:MIN`  
 Positions marker 2 to the minimum value of the trace.

**Mode:**

A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM, NF

**CALCulate<n>:MARKer<m>[:STATe] <State>**

This command activates a marker in the specified window. If no indication is made, marker 1 is selected automatically. If activate, the marker is switched to normal mode.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.  
 <m> depends on mode  
 marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

`CALC:MARK3 ON`  
 Switches on marker 3 or switches to marker mode.

**Mode:**

all

**CALCulate<n>:MARKer<m>:TRACe <Trace>**

This command assigns the selected marker to the indicated trace in the specified window. The corresponding trace must be active, i.e. its status must not be "BLANK".

If necessary, the corresponding marker is switched on prior to the assignment.

In the persistence spectrum result display, the command also defines if the delta marker is positioned on the persistence trace or the maxhold trace.

<b>Suffix:</b>	
<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	depends on mode marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.
<b>Parameters:</b>	
<Trace>	<b>1 to 6</b> Trace number the marker is assigned to.
	<b>MAXHold</b> Defines the maxhold trace as the trace to put the delta marker on. This parameter is available only for the persistence spectrum result display.
	<b>WRITE</b> Defines the persistence trace as the trace to put the delta marker on. This parameter is available only for the persistence spectrum result display.
	<b>NOISe   GAIN   NMEM1   NMEM2   NMEM3   GMEM1   GMEM2   GMEM3</b> Current noise or gain trace or trace in memory.
<b>Example:</b>	<code>CALC:MARK3:TRAC 2</code> Assigns marker 3 to trace 2.
<b>Mode:</b>	all

---

#### **CALCulate<n>:MARKer<m>:X <Position>**

This command positions the marker to the indicated frequency in the window specified by the suffix <n>.

<b>Suffix:</b>	
<n>	irrelevant
<m>	1 marker number
<b>Parameters:</b>	
<Position>	0 to MAX (frequency   sweep time   level)

**Example:** `CALC:MARK:X 10.7MHz`  
Positions marker to frequency 10.7 MHz.

**Mode:** NF

---

#### **CALCulate<n>:MARKer<m>:Y**

This command queries the measured value of the marker. The marker is activated, if necessary.

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed between the activation of the marker and the query of the Y value. This is only possible in single sweep mode.

**Suffix:**

<n> irrelevant  
<m> 1  
marker number

**Example:**

```
INIT:CONT OFF
Switches to single sweep mode.
CALC:MARK ON
Switches marker on.
INIT;*WAI
Starts a sweep and waits for the end.
CALC:MARK:Y?
Outputs the measured value of the marker.
```

### 4.5.3 CONFigure Subsystem (Noise Figure, R&S FSV-K30)

The CONFigure subsystem contains commands for configuring complex measurement tasks.

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CONFigure:FREQ:SINGle.....	72
CONFigure:LIST:CONTInuous.....	72
CONFigure:LIST:SINGle.....	73
CONFigure:SINGle.....	73

---

#### CONFigure:ARRay:MEMory<1...3> ONCE

This command saves the current trace results (noise figure, noise temperature and noise gain traces) to trace memory <n>.

This command is an event and therefore has no \*RST value and no query.

**Example:**

```
INIT
Starts a new measurement, if no measurement sequence is
already in progress.
CONF:ARR:MEM2 ONCE
Copies the last recorded measurement result into the memory 2.
```

**Mode:** NF

---

#### CONFigure:CORRection

This command configures for a second stage correction measurement.



<b>Example:</b>	<pre>CONF:CORR</pre> <p>Configures to run second stage correction measure measurements.</p> <pre>INIT</pre> <p>Starts a new measurement, if no measurement sequence is already in progress.</p>
<b>Usage:</b>	Event
<b>Mode:</b>	NF

---

#### CONFigure:FREQ:CONTInuous

This command configures a single frequency measurement in continuous sweep mode. This command is not available when using Digital Baseband Interface (R&S FSV-B17).

<b>Example:</b>	<pre>FREQ:STAR 20MHz</pre> <p>Defines the single frequency to be measured as 20 MHz.</p> <pre>CONF:FREQ:CONT</pre> <p>Configures to run a single frequency measurement in continuous sweep mode.</p> <pre>INIT</pre> <p>Starts a new measurement, if no measurement sequence is already in progress.</p>
<b>Usage:</b>	Event
<b>Mode:</b>	NF

---

#### CONFigure:FREQ:SINGle

This command configures a single frequency measurement in single sweep mode. This command is not available when using Digital Baseband Interface (R&S FSV-B17).

<b>Example:</b>	<pre>FREQ:STAR 20MHz</pre> <p>Defines the single frequency to be measured as 20 MHz.</p> <pre>CONF:FREQ:SING</pre> <p>Configures to run a single frequency measurement in single sweep mode.</p> <pre>INIT</pre> <p>Starts a new measurement, if no measurement sequence is already in progress.</p>
<b>Usage:</b>	Event
<b>Mode:</b>	NF

---

#### CONFigure:LIST:CONTInuous

This command configures a frequency list measurement in continuous sweep mode.

<b>Example:</b>	<pre>CONF:LIST:CONT</pre> <p>Configures to run a frequency list measurement in continuous sweep mode.</p> <pre>INIT</pre> <p>Starts a new measurement, if no measurement sequence is already in progress.</p>
<b>Usage:</b>	Event
<b>Mode:</b>	NF

---

### CONFigure:LIST:SINGLE

This command configures a frequency list measurement in single sweep mode.

<b>Example:</b>	<pre>CONF:LIST:SING</pre> <p>Configures to run frequency list measurement in single sweep modes.</p> <pre>INIT</pre> <p>Starts a new measurement, if no measurement sequence is already in progress.</p>
<b>Usage:</b>	Event
<b>Mode:</b>	NF

---

### CONFigure:SINGLE

This command configures a fixed frequency measurement. It requires a frequency list measurement to have been performed previously (see [CONFigure:LIST:SINGLE](#)/[CONFigure:LIST:CONTinuous](#) on page 72 or [CONFigure:FREQ:SINGLE](#)/[CONFigure:FREQ:CONTinuous](#) on page 72)

<b>Example:</b>	<pre>CONF:LIST:SING</pre> <p>Configures to run a frequency list measurement in single sweep mode.</p> <pre>INIT</pre> <p>Performs the frequency list measurement.</p> <pre>CONF:SING</pre> <p>Configures to run fixed frequency measurements.</p> <pre>FREQ 10MHz</pre> <p>Sets a fixed frequency of 10 MHz.</p> <pre>INIT</pre> <p>Starts a new measurement, if no measurement sequence is already in progress.</p>
<b>Usage:</b>	Event
<b>Mode:</b>	NF

#### 4.5.4 DISPlay Subsystem (Noise Figure, K30)

The DISPLay subsystem controls the selection and presentation of textual and graphic information as well as of measurement data on the display.

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DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:TOP.....	80

---

##### DISPlay:ARRay:MEMory<m>[:STATe] <State>

This command switches the display of the trace memory on or off.

###### Suffix:

<m>                    1...3  
                          trace memory

###### Parameters:

<State>                ON | OFF  
  
                          \*RST:        OFF

###### Example:

DISP:ARR:MEM2 ON  
Switches on the display of memory 2.

**Mode:**                NF

---

##### DISPlay:CURRent:DATA[:STATe] <State>

This command switches the display of the current measurement results on or off.

###### Parameters:

<State>                ON | OFF  
  
                          \*RST:        ON

###### Example:

DISP:CURR:DATA OFF  
Removes the current result traces from display.

**Mode:**                NF

**DISPlay:DATA:TRACe<t>** <ResultType>

This command specifies the type of noise results to be displayed in trace 1.

**Suffix:**

<t> 1  
trace; only trace 1 is valid for noise results

**Return values:**

<ResultType> NFIGure | TEFFective | GAIN

**NFIGure**

noise figure results in dB

**TEFFective**

noise temperature in K

**GAIN**

gain

Gain is not available when using Digital Baseband Interface (R&S FSV-B17).

\*RST: NFIGure

**Example:**

DISP:DATA:TRAC1 NFIG

Displays the noise figure results in trace 1.

**Mode:**

NF

**DISPlay:FORMat** <Format>

This command activates or deactivates the combined trace display of noise and gain results.

Combined trace display (SPLit) is not available when using Digital Baseband Interface (R&S FSV-B17).

**Parameters:**

<Format> SPLit | SINGLE

\*RST: SING

**Example:**

DISP:FORM SPL

Displays noise and gain results in separate graphs.

**Mode:**

NF

**DISPlay[:WINDow<n>]:TABLe** <State>

This command activates or deactivates the result table display.

**Suffix:**

<n> 1  
window

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

DISP:TABL ON  
 Displays the table of results.

**Mode:**

NF

**DISPlay[:WINDow<n>]:TRACe<t>[:STATe] <State>**

This command activates or deactivates the display of the corresponding trace and related information.

**Suffix:**

<n> 1  
 window  
 <t> 1 | 2  
 indicates the measurement results: Trace 1 is always used for noise results, and trace 2 is always used for gain results. Trace 2 is not available when using Digital Baseband Interface (R&S FSV-B17).

**Parameters:**

<State> ON | OFF  
 \*RST: ON for both traces

**Example:**

DISP:TRAC OFF  
 Switches off the display of trace 1 (noise results).  
 DISP:TRAC2 OFF  
 Switches off the display of trace 2 (gain results).

**Usage:**

SCPI conform

**Mode:**

NF

**DISPlay[:WINDow<n>]:TRACe<t>:SYMBols <State>**

This command activates or deactivates the display of the symbols to mark the measurement points for the specified trace.

**Suffix:**

<n> 1  
 window  
 <t> 1 | 2  
 indicates the measurement results: Trace 1 is always used for noise results, and trace 2 is always used for gain results.

**Parameters:**

<State> ON | OFF  
 \*RST: OFF for both traces

**Example:**            `DISP:TRAC ON`  
                          Switches on the display of trace 1 (noise results).  
                          `DISP:TRAC:SYMB ON`  
                          Switches on the display of symbols for trace 1 (noise results)

**Mode:**                `NF`

#### **DISPlay[:WINDow<n>]:TRACe<t>:X[:SCALe] <Frequency>**

This command selects the frequency to be displayed on the x-axis if the DUT is not an amplifier, i.e. in a frequency-converting measurement mode.

##### **Suffix:**

<n>                    1  
                          window

<t>                    1 | 2  
                          indicates the measurement results: Trace 1 is always used for noise results, and trace 2 is always used for gain results.

##### **Parameters:**

<Frequency>        `IF | RF`

\*RST:                `RF`

**Example:**            `CONF:MODE:DUT DOWN` (see [\[SENSe:\]CONFigure:MODE:DUT](#))  
                          The DUT converts the input frequency to a lower output frequency.  
                          `DISP:TRAC:X IF`  
                          The IF frequency is displayed on x-axis.

**Mode:**                `NF`

#### **DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:AUTO <State>**

This command activates or deactivates the automatic scaling of the Y-axis for the specified trace display. Automatic scaling provides best fit of the Y-axis to the measurement results.

This command is not available when using Digital Baseband Interface (R&S FSV-B17).

##### **Suffix:**

<n>                    1  
                          window

<t>                    1 | 2  
                          indicates the measurement results: Trace 1 is always used for noise results, and trace 2 is always used for gain results.

##### **Parameters:**

<State>                `ON | OFF`

\*RST:                `ON for both traces`

**Example:**            `DISP:TRAC2 ON` (see [DISPlay\[:WINDow<n>\]:TRACe<t>:SYMBOLs](#))  
 Switches on the display of trace 2 (gain results).  
`DISP:TRAC2:Y:AUTO ON`  
 Switches on automatic scaling of the Y-axis for trace 2.

**Usage:**            SCPI conform

**Mode:**            NF

#### **DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALE]:BOTTom <Value>**

This command sets the minimum (bottom) Y-axis display value for the specified trace display. It has no affect if automatic scaling of the Y-axis is enabled ([DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALE\]:AUTO](#) command).

This command is not available when using Digital Baseband Interface (R&S FSV-B17).

#### **Suffix:**

`<n>`                    1  
                           window

`<t>`                    1 | 2  
                           indicates the measurement results: Trace 1 is always used for noise results, and trace 2 is always used for gain results.

#### **Parameters:**

`<Value>`            noise figure: | noise temperature: | gain:

**noise figure:**  
 -75 dB to 75 dB

**noise temperature:**  
 -999990000 K to 999990000 K

**gain:**  
 -75 dB to 75 dB

\*RST:                0 dB

**Example:**            `DISP:DATA:TRAC1 NFIG`  
 Sets the noise figure to trace1.  
`DISP:TRAC ON` (see [DISPlay\[:WINDow<n>\]:TRACe<t>:SYMBOLs](#))  
 Switches on the display of trace 1 (noise results).  
`DISP:TRAC:Y:BOTT -30`  
 Sets the minimum Y-axis display to -30 dB for trace 1.

**Example:**            `DISP:DATA:TRAC1 TEFF`  
 Sets the noise temperature to trace1.  
`DISP:TRAC ON`  
 Switches on the display of trace 1 (noise results).  
`DISP:TRAC:Y:BOTT 100`  
 Sets the minimum Y-axis display to 100 K for trace 1.

**Example:**            `DISP:TRAC2 ON`  
                          Switches on the display of trace 2 (gain results).  
                          `DISP:TRAC2:Y:BOTT 1`  
                          Sets the minimum Y-axis display to 1 dB for trace 2.

**Usage:**             SCPI conform

**Mode:**              NF

#### **DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel <Value>**

This command sets the reference level for the Y-axis display value for all trace displays. This command has no affect if automatic reference level detection is enabled (`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:AUTO` command).

This command is not available when using Digital Baseband Interface (R&S FSV-B17).

#### **Suffix:**

<n>                    1  
                          window

<t>                    irrelevant

#### **Parameters:**

<Value>             <numeric\_value> in dBm, range specified in data sheet

\*RST:                -30 dBm

**Example:**            `DISP:TRAC:Y:RLEV 0`  
                          Sets the reference level 0 dBm

**Usage:**             SCPI conform

**Mode:**              NF

#### **DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:AUTO <State>**

This command enables or disables the automatic reference level detection.

This command is not available when using Digital Baseband Interface (R&S FSV-B17).

#### **Suffix:**

<n>                    1  
                          window

<t>                    irrelevant

#### **Parameters:**

<State>             ON | OFF

\*RST:                ON

**Example:**            `DISP:TRAC:Y:RLEV:AUTO ON`  
                          Turns on automatic reference level detection.

**Usage:**             SCPI conform

**Mode:**              NF



**DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:TOP <Value>**

This command sets the maximum (top) Y-axis display value for the specified trace display. It has no affect if automatic scaling of the Y-axis is enabled or the specified trace is not currently active.

This command is not available when using Digital Baseband Interface (R&S FSV-B17).

**Suffix:**

<n> 1  
window  
<t> 1 | 2  
indicates the measurement results: Trace 1 is always used for noise results, and trace 2 is always used for gain results.

**Parameters:**

<Value> noise figure: | noise temperature: | gain:  
**noise figure:**  
-75 dB to 75 dB  
**noise temperature:**  
-999990000 K to 999990000 K  
**gain:**  
-75 dB to 75 dB  
\*RST: 20 dB for noise and gain figure, 10000K for noise temperature

**Example:** DISP:DATA:TRAC1 NFIG  
Sets the noise figure to trace1.  
DISP:TRAC:Y:TOP 30  
Sets the maximum Y-axis display to 30 dB for trace 1.

**Example:** Example 2  
DISP:DATA:TRAC1 TEFF  
Sets the noise temperature to trace1.  
DISP:TRAC:Y:TOP 100  
Sets the maximum Y-axis display to 100 K for trace 1.

**Example:** DISP:TRAC2:Y:TOP 10  
Sets the maximum Y-axis display to 10 dB for trace 2.

**Usage:** SCPI conform

**Mode:** NF

#### 4.5.5 FETCh Subsystem (Noise Figure, K30)

The FETCh subsystem retrieves results for the most recently completed fixed frequency or frequency list measurements. Frequency list results are returned as a list of results where the result is that requested in the specific fetch command. Single frequency results are single numbers in the described units.

**Note:**

Corrected measurements are only accessible after a calibration has been performed.

<code>FETCh:ARRay:MEMory&lt;1...3&gt;:NOISe:FIGure</code> .....	81
<code>FETCh:ARRay:MEMory&lt;1...3&gt;:NOISe:GAIN</code> .....	81
<code>FETCh:ARRay:MEMory&lt;1...3&gt;:NOISe:TEMPerature</code> .....	82
<code>FETCh:ARRay:NOISe:FIGure</code> .....	82
<code>FETCh:ARRay:NOISe:GAIN</code> .....	82
<code>FETCh:ARRay:NOISe:TEMPerature</code> .....	83
<code>FETCh:SCALar:NOISe:FIGure</code> .....	83
<code>FETCh:SCALar:NOISe:GAIN</code> .....	83
<code>FETCh:SCALar:NOISe:TEMPerature</code> .....	84

---

**FETCh:ARRay:MEMory<1...3>:NOISe:FIGure?**

This command queries the noise measurement results of the selected memory. The results are returned as an array of up to 100 elements of noise figure results. This command produces an error if no data is held in the selected trace memory.

**Example:**

```
INIT
```

Starts a new measurement, if no measurement sequence is already in progress.

```
CONF:ARR:MEM2 ONCE (see CONFigure:ARRay:MEMory<1...3> ONCE on page 71)
```

Copies the last recorded measurement result into the memory 2.

```
FETC:ARR:MEM2:NOIS:FIG?
```

Returns an array of 100 noise figure results from the selected memory 2.

**Usage:**

Query only

**Mode:**

NF

---

**FETCh:ARRay:MEMory<1...3>:NOISe:GAIN?**

This command queries the noise measurement results of the selected memory. The results are returned as an array of up to 100 elements of noise gain results. This command produces an error if no data is held in the selected trace memory.

**Example:**

```
INIT
```

Starts a new measurement, if no measurement sequence is already in progress.

```
CONF:ARR:MEM2 ONCE (see CONFigure:ARRay:MEMory<1...3> ONCE on page 71)
```

Copies the last recorded measurement result into the memory 2.

```
FETC:ARR:MEM2:NOIS:GAIN?
```

Returns an array of 100 noise gain results from the selected memory 2.

**Usage:** Query only  
**Mode:** NF

---

#### **FETCh:ARRay:MEMory<1...3>:NOISe:TEMPerature?**

This command queries the noise measurement results of the selected memory. The results are returned as an array of up to 100 elements of noise temperature results. This command produces an error if no data is held in the selected trace memory.

**Example:**           INIT  
 Starts a new measurement, if no measurement sequence is already in progress.  
 CONF:ARR:MEM2 ONCE (see [CONFigure:ARRay:MEMory<1...3> ONCE](#) on page 71)  
 Copies the last recorded measurement result into the memory 2.  
 FETC:ARR:MEM2:NOIS:TEMP?  
 Returns an array of 100 noise temperature results from the selected memory 2.

**Usage:** Query only  
**Mode:** NF

---

#### **FETCh:ARRay:NOISe:FIGure?**

This command queries the last recorded noise figure measurement results. The results are returned as an array of up to 100 elements of noise figure results.

**Example:**           FETCh:ARRay:NOISe:FIGure?  
 Returns an array of up to 100 measured elements associated with the last noise figure measurement.

**Usage:** Query only  
**Mode:** NF

---

#### **FETCh:ARRay:NOISe:GAIN?**

This command queries the last recorded noise gain measurement results. The results are returned as an array of up to 100 elements of noise gain results.

**Example:**           FETCh:ARRay:NOISe:GAIN?  
 Returns an array of up to 100 measured elements associated with the last noise gain measurement.

**Usage:** Query only  
**Mode:** NF

---

**FETCh:ARRay:NOISE:TEMPerature?**

This command queries the last recorded noise temperature measurement results. The results are returned as an array of up to 100 elements of noise temperature results.

**Example:**                    FETCh:ARRay:NOISE:TEMPerature?  
Returns an array of up to 100 measured elements associated with the last noise temperature measurement.

**Usage:**                    Query only

**Mode:**                    NF

---

**FETCh:SCALar:NOISE:FIGure?**

This command queries the last recorded noise figure measurement result for a fixed frequency measurement. Requires a frequency list measurement to have been performed previously (see [CONFigure:LIST:SINGLE/ CONFigure:LIST:CONTInuous](#) on page 72 or [CONFigure:FREQ:SINGLE/ CONFigure:FREQ:CONTInuous](#) on page 72).

**Example:**                    CONF:LIST:SING  
Configures to run a frequency list measurement in single sweep mode.  
INIT  
Performs the frequency list measurement.  
CONF:SING  
Configures to run fixed frequency measurements.  
FREQ 10MHz  
Sets a fixed frequency of 10 MHz.  
FETC:SCAL:NOISE:FIG?  
Returns the noise figure measurement at 10 MHz.

**Usage:**                    Query only

**Mode:**                    NF

---

**FETCh:SCALar:NOISE:GAIN?**

This command queries the last recorded noise gain measurement result for a fixed frequency measurement. Requires a frequency list measurement to have been performed previously (see [CONFigure:LIST:SINGLE/ CONFigure:LIST:CONTInuous](#) on page 72 or [CONFigure:FREQ:SINGLE/ CONFigure:FREQ:CONTInuous](#) on page 72).

<b>Example:</b>	<pre>CONF:LIST:SING</pre> <p>Configures to run a frequency list measurement in single sweep mode.</p> <pre>INIT</pre> <p>Performs the frequency list measurement.</p> <pre>CONF:SING</pre> <p>Configures to run fixed frequency measurements.</p> <pre>FREQ 10MHz</pre> <p>Sets a fixed frequency of 10 MHz.</p> <pre>FETCh:SCAL:NOISE:GAIN?</pre> <p>Returns the last noise gain measurement at 10 MHz.</p>
<b>Usage:</b>	Query only
<b>Mode:</b>	NF

---

#### FETCh:SCALar:NOISE:TEMPerature?

This command queries the last recorded noise temperature measurement result for a fixed frequency measurement. Requires a frequency list measurement to have been performed previously (see [CONFigure:LIST:SINGLE/ CONFigure:LIST:CONTInuous](#) on page 72 or [CONFigure:FREQ:SINGLE/ CONFigure:FREQ:CONTInuous](#) on page 72).

<b>Example:</b>	<pre>CONF:LIST:SING</pre> <p>Configures to run a frequency list measurement in single sweep mode.</p> <pre>INIT</pre> <p>Performs the frequency list measurement.</p> <pre>CONF:SING</pre> <p>Configures to run fixed frequency measurements.</p> <pre>FREQ 10MHz</pre> <p>Sets a fixed frequency of 10 MHz.</p> <pre>FETCh:SCAL:NOISE:TEMPerature?</pre> <p>Returns the last noise temperature measurement at 10 MHz.</p>
<b>Usage:</b>	Query only
<b>Mode:</b>	NF

### 4.5.6 FORMat Subsystem

---

#### FORMat:DEXPort:DSEParator <Separator>

This command defines which decimal separator (decimal point or comma) is to be used for outputting measurement data to the file in ASCII format. Different languages of evaluation programs (e.g. MS-Excel) can thus be supported.

The suffix <1...4> is irrelevant, the separator is defined globally for all windows.

**Parameters:**

<Separator>            POINT | COMMA

\*RST:            (factory setting is POINT; \*RST does not affect setting)

**Example:**

FORM:DEXP:DSEP POIN  
Sets the decimal point as separator.

**Mode:**            all

### 4.5.7 INPut Subsystem

---

**INPut:ATTenuation** <Value>

This command programs the input attenuator. To protect the input mixer against damage from overloads, the setting 0 dB can be obtained by entering numerals, not by using the DOWN command.

The attenuation can be set in 5 dB steps (with option R&S FSV-B25: 1 dB steps). If the defined reference level cannot be set for the set RF attenuation, the reference level is adjusted accordingly.

In the default state with "Spectrum" mode, the attenuation set on the step attenuator is coupled to the reference level of the instrument. If the attenuation is programmed directly, the coupling to the reference level is switched off.

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

**Parameters:**

<Value>            <numeric\_value> in dB; range specified in data sheet

\*RST:            10 dB (AUTO is set to ON)

**Example:**

INP:ATT 30dB  
Sets the attenuation on the attenuator to 30 dB and switches off the coupling to the reference level.

**Mode:**            all

---

**INPut:DIQ:RANGe[:UPPer]** <Level>

Defines the level that should correspond to an I/Q sample with the magnitude "1".

It can be defined either in dBm or Volt (see "[Full Scale Level](#)" on page 45).

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

**Parameters:**

&lt;Level&gt; &lt;numeric value&gt;

Range: 70.711 nV to 7.071 V

\*RST: 1 V

**Example:**

INP:DIQ:RANG 1V

**Mode:**

A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

**INPut:DIQ:SRATe** <SampleRate>

This command specifies the sample rate of the input signal from the R&S Digital I/Q Interface (see "[Input Sample Rate](#)" on page 44).

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

**Parameters:**

&lt;SampleRate&gt;

Range: 1 Hz to 10 GHz

\*RST: 32 MHz

**Example:**

INP:DIQ:SRAT 200 MHz

**Mode:**

A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

**INPut:GAIN:STATe** <State>

This command switches the preamplifier on or off (only for option RF Preamplifier, R&S FSV-B22/B24).

With option R&S FSV-B22, the preamplifier only has an effect below 7 GHz.

With option R&S FSV-B24, the amplifier applies to the entire frequency range.

This command is not available when using R&S Digital I/Q Interface (R&S FSV-B17).

**Parameters:**

&lt;State&gt; ON | OFF

\*RST: OFF

**Example:**

INP:GAIN:STAT ON

Switches on 20 dB preamplification.

**Mode:**

A, ADEMOD, BT, CDMA, EVDO, NF, PHN, WCDMA, GSM, VSA, TDS

**INPut:SElect** <Source>

This command selects the signal source for measurements.

**Parameters:**

<Source>                    RF | DIQ

**RF**  
Radio Frequency ("RF INPUT" connector)

**DIQ**  
Baseband Digital (IQ) (only available with R&S Digital I/Q Interface, option R&S FSV-B17)

\*RST:                    RF

**Example:**                    INP:SEL RF

**Mode:**                    A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

#### 4.5.8 INSTRument Subsystem (Noise Figure, R&S FSV-K30)

The INSTRument subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

[INSTRument\[:SElect\]](#).....87  
[INSTRument:NSElect](#).....87

**INSTRument[:SElect]** <Mode>

This command switches between the measurement modes by means of text parameters.

**Parameters:**

<Mode>                    **NOISe**  
Noise Figure Measurements option, R&S FSV-K30

**INSTRument:NSElect** <Mode>

This command switches between the measurement modes by means of numbers.

**Parameters:**

<Mode>                    **19**  
Noise Figure Measurements option, R&S FSV-K30

#### 4.5.9 MMEMory Subsystem

**MMEMory:STORe<n>:LIST** <FileName>

This command stores the current list evaluation results in a <file name>.dat file. The file consists of a data section containing the list evaluation results.



**Suffix:**

&lt;n&gt; irrelevant

**Parameters:**

&lt;FileName&gt; &lt;file name&gt;

**Example:**

MMEM:STOR:LIST 'test'

Stores the current list evaluation results in the test.dat file.

**Mode:**

A, ADEMOD, CDMA, EVDO, NF, TDS, WCDMA

### 4.5.10 SENSE Subsystem (Noise Figure, R&S FSV-K30)

The SENSE subsystem is used to set and query the values of parameters in the remote instrument.

:DEFault	If a parameter has a default a value, the command parameter can be substituted with:DEFault which loads the default (reset) value of the parameter.
:UP/DOWN	In addition, all numeric values are able to take:UP or:DOWN in place of the parameter. This will increment or decrement the numeric value.
:MIN/MAX	In addition, all numeric values are able to take either:MINimum or:MAXimum as arguments to determine the minimum or maximum range available for the command.

The SENSE subsystem is divided into equipment settings and measurement settings.

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4.5.10.2	Measurement Settings (SENSE:CONFigure) Commands .....	94

#### 4.5.10.1 Equipment Settings Commands

[SENSE:]CORRection[:STATe].....	88
[SENSE:]CORRection:ENR:MODE.....	89
[SENSE:]CORRection:ENR:SPOT.....	89
[SENSE:]CORRection:ENR[:MEASurement]:TABLe:DATA.....	90
[SENSE:]CORRection:IREJection.....	90
[SENSE:]CORRection:LOSS:INPut:MODE.....	91
[SENSE:]CORRection:LOSS:INPut:SPOT.....	91
[SENSE:]CORRection:LOSS:INPut:TABLe.....	91
[SENSE:]CORRection:LOSS:OUTPut:MODE.....	92
[SENSE:]CORRection:LOSS:OUTPut:SPOT.....	92
[SENSE:]CORRection:LOSS:OUTPut:TABLe.....	93
[SENSE:]CORRection:TEMPerature.....	93

**[SENSE:]CORRection[:STATe] <State>**

This command activates or deactivates the second stage correction.

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

CORR ON  
 Activates the second stage correction.

**Mode:** NF

**[SENSe:]CORRection:ENR:MODE <Mode>**

This command specifies whether a constant ENR value applies for all measured frequencies or an ENR table (ENR values specified at specific input frequencies). The constant ENR value is specified by the [SENSe:]CORRection:ENR:SPOT command.

**Parameters:**

<Mode> TABLE | SPOT  
**TABLE**  
 ENR table is used.  
**SPOT**  
 Constant ENR value is used.  
 \*RST: SPOT

**Example:**

CORR:ENR:MODE SPOT  
 Uses the configured constant ENR value for all measured frequencies.

**Mode:** NF

**[SENSe:]CORRection:ENR:SPOT <Value>**

This command sets the constant ENR value of the noise source that is used throughout the entire frequency range.

**Parameters:**

<Value> -999.99 to 999.99 dB  
 \*RST: 15 dB

**Example:**

CORR:ENR:MODE SPOT, see [SENSe:]CORRection:ENR:MODE on page 89  
 Uses the configured constant ENR value for all measured frequencies.  
 CORR:ENR:SPOT 30  
 Sets the constant ENR value to 30 dB for all input frequencies to be measured.

**Mode:** NF

**[SENSe:]CORRection:ENR[:MEASurement]:TABLe:DATA <TableData>**

This command specifies a new ENR table to determine the correct ENR (excess noise ratio) figure to be used for the input frequencies. This new list completely overwrites all current ENR frequency list entries regardless of how many entries are present and how many entries are being supplied for the new list.

**Parameters:**

<TableData>                    <numeric\_value>,<numeric\_value>, ... (maximum of 100 argument pairs)

numeric value = a frequency ENR pair of arguments

frequency: 0 Hz to 999.99 GHz.

ENR figure: -999.99 to 999.99 (value in dB, accurate to two decimal places)

**Example:**

CORR:ENR:MODE TABL, see [SENSe:]CORRection:ENR:MODE on page 89

Uses the ENR table.

CORR:ENR:MEAS:TABL:DATA 1MHZ,10,2MHZ,12

Specifies a new ENR table and overwrites the current ENR table with the two entry pairs specified.

**Mode:**                        NF

**[SENSe:]CORRection:IREJection <Value>**

This command specifies an image rejection value for the selected DUT ([SENSe:]CONFIgure:MODE:DUT command) which will be effective throughout the entire frequency range.

This command is not available when using Digital Baseband Interface (R&S FSV-B17).

**Parameters:**

<Value>

Range:                    0 dB to 999.99 dB

\*RST:                    999.99 dB

**Example:**

[SENSe:]CONFIgure:MODE:DUT CONF:MODE:DUT DOWN

The DUT converts the input frequency to a lower output frequency.

CORR:IREJ 100

Sets an image rejection value of 100 dB.

**Mode:**                        NF

**[SENSe:]CORRection:LOSS:INPut:MODE <Mode>**

This command specifies whether a constant input loss value applies for all measured frequencies or an input loss list (loss input values specified at specific input frequencies). The constant loss input value is specified by the `[SENSe:]CORRection:LOSS:INPut:SPOT` command.

**Parameters:**

<Mode> SPOT | TABLE

**SPOT**

The constant loss input value for all measurement frequencies is used.

**TABLE**

The loss input table is used.

\*RST: SPOT

**Example:**

```
CORR:LOSS:INP:MODE SPOT
```

Uses the configured constant loss input value for all input frequencies to be measured.

**Mode:** NF

**[SENSe:]CORRection:LOSS:INPut:SPOT <Value>**

This command specifies the loss input constant for all input frequencies to be measured.

**Parameters:**

<Value> -999.99 to 999.99 dB, accurate to two decimal places

\*RST: 0 dB

**Example:**

```
[SENSe:]CONFigure:MODE:DUT CORR:LOSS:INP:MODE SPOT
```

Uses the configured constant loss input value for all input frequencies to be measured.

```
CORR:LOSS:INP:SPOT 10
```

Sets the internal input loss constant value to 10 dB for all input frequencies to be measured.

**Mode:** NF

**[SENSe:]CORRection:LOSS:INPut:TABLE <TableData>**

This command specifies a new input loss table to determine the correct input loss to be used for the input frequencies. This new list completely overwrites all current input loss list entries regardless of how many entries are present and how many entries are being supplied for the new list.

**Parameters:**

<TableData> <numeric\_value>,<numeric\_value>,... (maximum of 100 argument pairs)

<numeric\_value>,<numeric\_value> = a frequency loss pair of arguments

frequency: 0 Hz to 999.99 GHz (max. two decimal places)

loss figure: -999.99 to 999.99 (value in dB, accurate to two decimal places)

**Example:**

```
[SENSe:]CONFigure:MODE:DUT CORR:LOSS:INP:MODE
TABL
```

Uses the loss input table.

```
CORR:LOSS:INP:TABL 1MHz,10,2MHz,12
```

Specifies a new input loss table and overwrites the current input loss table with the two entry pairs specified.

**Mode:** NF

**[SENSe:]CORRection:LOSS:OUTPut:MODE <Mode>**

This command specifies whether a constant output loss value applies for all measured frequencies or an output loss list (loss output values specified at specific input frequencies). The constant loss output value is specified by the [SENSe:]CORRection:LOSS:OUTPut:SPOT command.

**Parameters:**

<Mode> SPOT | TABLE

**SPOT**

The constant loss input value for all measurement frequencies is used.

**TABLE**

The loss input table is used.

```
*RST: SPOT
```

**Example:**

```
CORR:LOSS:OUTP:MODE SPOT
```

Uses the configured constant loss output value for all input frequencies to be measured.

**Mode:** NF

**[SENSe:]CORRection:LOSS:OUTPut:SPOT <Value>**

This command specifies the loss output constant for all input frequencies to be measured.

**Parameters:**

<Value> -999.99 to 999.99 dB, accurate to two decimal places

```
*RST: 0 dB
```

**Example:** `[SENSe:]CORRection:ENR:SPOT` on page 89  
`CORR:LOSS:OUTP:MODE SPOT`  
 Uses the configured constant loss output value for all input frequencies to be measured.  
`CORR:LOSS:OUTP:SPOT 10`  
 Sets the internal output loss constant value to 10 dB for all input frequencies to be measured.

**Mode:** NF

#### **[SENSe:]CORRection:LOSS:OUTPut:TABLE <TableData>**

This command specifies a new output loss table to determine the correct output loss to be used for the input frequencies. This new list completely overwrites all current output loss list entries regardless of how many entries are present and how many entries are being supplied for the new list.

**Parameters:**

<TableData> <numeric\_value>,<numeric\_value>,... (maximum of 100 argument pairs)

<numeric\_value>,<numeric\_value> = a frequency loss pair of arguments

frequency: 0 Hz to 999.99 GHz (max. two decimal places)

loss figure: -999.99 to 999.99 (value in dB, accurate to two decimal places)

**Example:** `[SENSe:]CORRection:ENR:SPOT` on page 89  
`CORR:LOSS:OUTP:MODE TABL`  
 Uses the loss output table.  
`CORR:LOSS:OUTP:TABL 1MHz,10,2MHz,12`  
 Specifies a new output loss table and overwrites the current output loss table with the two entry pairs specified.

**Mode:** NF

#### **[SENSe:]CORRection:TEMPerature <Temperature>**

This command specifies the room temperature of the operating environment. This value is taken into account when calculating noise results.

**Parameters:**

<Temperature> 278.15 to 318.15 K; up to 2 decimal places can be specified.

\*RST: 293 K

**Example:** `CORR:TEMP 291.50`  
 Specifies the room temperature to 291.50 Kelvin (18.5 C).

**Mode:** NF

#### 4.5.10.2 Measurement Settings (SENSe:CONFigure) Commands

Most parameters for the measurements are set using the `SENSe:CONFigure` commands described here.



Some additional measurement settings are defined using the `SENSe:FREQuency` subsystem, see [chapter 4.5.10, "SENSe Subsystem \(Noise Figure, R&S FSV-K30\)"](#), on page 88.

<code>[SENSe:]BANDwidth BWIDth[:RESolution]</code> .....	94
<code>[SENSe:]CONFigure:MODE:DUT</code> .....	94
<code>[SENSe:]CONFigure:MODE:SYSTem:LOSCillator:FREQuency</code> .....	95
<code>[SENSe:]FREQuency[:CW]:FIXed]</code> .....	96
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<code>[SENSe:]FREQuency:LIST:DATA</code> .....	96
<code>[SENSe:]FREQuency:SPAN</code> .....	97
<code>[SENSe:]FREQuency:START</code> .....	97
<code>[SENSe:]FREQuency:STEP</code> .....	98
<code>[SENSe:]FREQuency:STOP</code> .....	98
<code>[SENSe:]SWEep:COUNT</code> .....	99
<code>[SENSe:]SWEep:POINts</code> .....	99
<code>[SENSe:]SWEep:TIME</code> .....	99

#### `[SENSe:]BANDwidth|BWIDth[:RESolution] <Bandwidth>`

This command defines the resolution bandwidth.

The available resolution bandwidths are specified in the data sheet. For details on the correlation between resolution bandwidth and filter type refer to [chapter 4.2.1.7, "Selecting the Appropriate Filter Type"](#), on page 28.

In realtime mode, the resolution bandwidth is always coupled to the span. In all other modes, a change of the resolution bandwidth automatically switches the coupling to the span off.

#### Parameters:

`<Bandwidth>` refer to data sheet

\*RST: (AUTO is set to ON)

#### Example:

```
BAND 1 MHz
Sets the resolution bandwidth to 1 MHz
```

**Mode:** all, except ADEMOD

#### `[SENSe:]CONFigure:MODE:DUT <Type>`

This command defines the type of DUT. This setting determines the method that is used to create the frequency measurement list.

Fixed local oscillator frequencies are taken from the settings supplied by `[SENSe:]CONFigure:MODE:SYSTem:LOSCillator:FREQuency` on page 95.

**Parameters:**

&lt;Type&gt;

AMPLifier | DOWNconv | UPConv | DDOWnconverter

**AMPLifier**

The DUT is an amplifier and not a frequency converting device.

**DOWNconv**The DUT converts the input frequency to a lower output frequency:  
Fixed LO,  $IF=RF+LO$ **UPConv**The DUT converts the input frequency to a higher output frequency:  
Fixed LO,  $IF=abs(RF-LO)$ .**DDOWnconverter**

The DUT provides digital input via the digital baseband interface (R&amp;S FSV-B17 option)

\*RST:        AMPLifier

**Example:**`SENS:CONF:MODE:DUT DOWN`

The DUT converts the input frequency to a lower output frequency.

**Mode:**

NF

**[SENSe:]CONFigure:MODE:SYSTem:LOSCillator:FREQuency** <Frequency>

This command specifies a fixed local oscillator frequency for a new frequency measurement list in frequency-converting measurement mode. If this value is altered, a new frequency list is generated.

This command is not available when using Digital Baseband Interface (R&S FSV-B17).

**Parameters:**

&lt;Frequency&gt;

Range:        0 Hz to 999.99 GHz

\*RST:        - 0 Hz

**Example:**`[SENSe:]CONFigure:MODE:DUT` on page 94`SENS:CONF:MODE:DUT DOWN`

The DUT converts the input frequency to a lower output frequency.

`SENS:CONF:MODE:SYST:LOSC:FREQ 1MHZ`

Specifies the fixed local oscillator frequency for a new list to a value of 1 MHz.

**Mode:**

NF



**[SENSe:]FREQUENCY[:CW]:FIXed** <Frequency>

This command specifies a fixed frequency to measure noise and gain continuously (fixed frequency measurement).

**Parameters:**

<Frequency>            <numeric value>  
                              \*RST:        550 MHz

**Example:**

```
CONF:SING
Configures to run fixed frequency measurements.
FREQ 10MHz
Sets a fixed frequency of 10 MHz.
```

**Usage:**                SCPI conform

**Mode:**                NF

**[SENSe:]FREQUENCY:CENTer** <Frequency>

This command defines the center frequency of the analyzer or the measuring frequency for span = 0.

**Parameters:**

<Frequency>            <numeric\_value>  
                              Range:        0 to fmax  
                              \*RST:        fmax/2  
                              Default unit: Hz  
                               $f_{max}$  is specified in the data sheet. min span is 10 Hz

**Example:**                FREQ:CENT 100 MHz

**Mode:**                all

**[SENSe:]FREQUENCY:LIST:DATA** <FrequencyList>

This command specifies a new frequency list (for frequency list measurement). Each list entry consists of three separate frequency entities: a receive frequency (RF), a local oscillator frequency (LO), and an intermediate frequency (IF). The new list completely overwrites all the current frequency list entries regardless of how many entries are present and how many entries are being supplied for the new list. The new list is the active list until a new list is automatically created.

The values specified in this command are not used for a fixed frequency measurement ([CONFigure:SINGle](#) command).

**Parameters:**

&lt;FrequencyList&gt;

direct measurement | frequency-converting measurement

**direct measurement**

RF: 0 Hz to fmax

**frequency-converting measurement**

RF, LO: 0 Hz to 999.99 GHz

IF: 0 Hz to fmax

\*RST: 550 MHz | 0 Hz | 550 MHz

&lt;numeric\_value&gt;, &lt;numeric\_value&gt;, ... (max. of 100 argument)

numeric value = set of three frequency measurements in the following order: fixed frequency, local oscillator frequency, and intermediate frequency. The frequency range depends on the selected measurement mode:

**Example:**

FREQ:LIST:DATA 550MHz, 300MHz, 900MHz

Specifies one entry frequency list with a receive frequency of 550 MHz, a local oscillator frequency of 300 MHz, and an intermediate frequency of 900 MHz.

**Mode:**

NF

**[SENSe:]FREQuency:SPAN <Span>**

This command defines the frequency span.

**Parameters:**

&lt;Span&gt;

In realtime mode, the minimum span is 100 Hz and the maximum span is 40 MHz.

In analyzer mode, the span range is 10 Hz to  $f_{max}$ . For SEM and Spurious Emission measurements, the minimum span 20 Hz.

\*RST: fmax

**Example:**

FREQ:SPAN 10MHz

**Mode:**

A, CDMA, EVDO, RT, TDS, NF, WCDMA

**[SENSe:]FREQuency:START <Frequency>**

This command specifies the start frequency for a new frequency measurement list. If this value is altered, a new frequency list is generated.

**Parameters:**

<Frequency> 0 to (fmax - min span)  
 In realtime mode, the minimum span is 100 Hz and the maximum span is 40 MHz. If you set a start frequency that would exceed this span, the analyzer adjusts the stop frequency to get a span of 40 MHz.  
 In analyzer mode, the span range is 10 Hz to  $f_{max}$ . For SEM and Spurious Emission measurements, the minimum span 20 Hz.  
 \*RST: 0

**Example:**

```
FREQ:STAR 20MHz
```

**Mode:**

A-F, CDMA, EVDO, RT, TDS, NF, PHN, WCDMA

**[SENSe:]FREQuency:STEP <Frequency>**

This command specifies the step frequency for a new frequency measurement list. If this value is altered, a new frequency list is generated.

**Parameters:**

<Frequency> <numeric value>  
 \*RST: 32 MHz

**Example:**

```
FREQ:STEP 10MHz
```

Sets the step frequency for a new list to a value of 10 MHz.

**[SENSe:]FREQuency:STOP <Frequency>**

This command specifies the stop frequency for a new frequency measurement list. If this value is altered, a new frequency list is generated.

**Parameters:**

<Frequency> min span to fmax  
 In realtime mode, the minimum span is 100 Hz and the maximum span is 40 MHz. If you set a stop frequency that would exceed this span, the analyzer adjusts the start frequency to get a span of 40 MHz.  
 In analyzer mode, the span range is 10 Hz to  $f_{max}$ . For SEM and Spurious Emission measurements, the minimum span 20 Hz.  
 \*RST: fmax

**Example:**

```
FREQ:STOP 2000 MHz
```

**Mode:**

A-F, CDMA, EVDO, RT, TDS, NF, PHN, WCDMA

---

**[SENSe:]SWEep:COUNT <NumberSweeps>**

This command defines the number of sweeps started with single sweep, which are used for calculating the average or maximum value. If the values 0 or 1 are set, one sweep is performed.

**Parameters:**

<NumberSweeps> 0 to 32767  
 \*RST: 0 (GSM: 200)

**Example:**

```
SWE:COUN 64
Sets the number of sweeps to 64.
INIT:CONT OFF
Switches to single sweep mode.
INIT;*WAI
Starts a sweep and waits for its end.
```

**Mode:** A, ADEMOD, BT, CDMA, EVDO, PHN, TDS, WCDMA, GSM, NF

---

**[SENSe:]SWEep:POINTS <NumberPoints>**

This command defines the number of measurement points to be collected during one sweep.

Note: For Spurious Emissions measurements the maximum number of sweep points in all ranges is limited to 100001.

**Parameters:**

<NumberPoints> 101 to 32001 | NF (K30): 2 to 100  
 \*RST: 691 (NF: 11)

**Example:**

```
SWE:POIN 251
```

**Mode:** A, ADEMOD, BT, CDMA, EVDO, TDS, NF, PHN, WCDMA

---

**[SENSe:]SWEep:TIME <Time>**

This command defines the sweep time.

The range depends on the frequency span.

If this command is used in analyzer mode, automatic coupling to resolution bandwidth and video bandwidth is switched off.

**Parameters:**

<Time> refer to data sheet  
 \*RST: (AUTO is set to ON)

**Example:**

```
SWE:TIME 10s
```

**Mode:** ALL

---

#### 4.5.11 STATus Subsystem (Noise Figure, R&S FSV-K30)

The STATus subsystem contains the commands for the status reporting system (See Section "). \*RST does not influence the status registers.

STATus:QUESTionable:CORRection[:EVENT]	100
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STATus:QUESTionable:CORRection:ENABle	100
STATus:QUESTionable:CORRection:NTRansition	101
STATus:QUESTionable:CORRection:PTRansition	101

---

##### STATus:QUESTionable:CORRection[:EVENT]?

This command queries the contents of the EVENT section of the STATus:QUESTionable:CORRection register. Readout deletes the contents of the EVENT section.

**Example:** STAT:QUES:CORR?

**Usage:** Query only  
SCPI conform

**Mode:** NF

---

##### STATus:QUESTionable:CORRection:CONDition?

This command queries the contents of the CONDition section of the STATus:QUESTionable:CORRection register. Readout does not delete the contents of the CONDition section.

**Example:** STAT:QUES:CORR:COND?

**Usage:** Query only  
SCPI conform

**Mode:** NF

---

##### STATus:QUESTionable:CORRection:ENABle <BitDefinition>

This command sets the bits of the ENABle section of the STATus:QUESTionable:CORRection register. The ENABle register selectively enables the individual events of the associated EVENT section for the summary bit.

**Parameters:**  
<BitDefinition>

Range: 0 to 65535

**Example:** STAT:QUES:CORR:ENAB 65535  
All events bits are represented in the CORRection summary bit.

**Usage:** SCPI conform

**Mode:** NF

**STATus:QUESTIONable:CORRection:NTRansition** <BitDefinition>

This command determines what bits in the STATus:QUESTIONable:CORRection Condition register set the corresponding bit in the STATus:QUESTIONable:CORRection Event register if that bit has a negative transition (1 to 0). The variable <number> is the sum of the decimal values of the bits that are to be enabled.

**Parameters:**

&lt;BitDefinition&gt;

Range: 0 to 65535

**Example:**

STAT:QUES:CORR:NTR 65535

All condition bits are summarized in the Event register if a positive transition occurs.

**Usage:**

SCPI conform

**Mode:**

NF

**STATus:QUESTIONable:CORRection:PTRansition** <BitDefinition>

This command determines what bits in the STATus:QUESTIONable:CORRection Condition register set the corresponding bit in the STATus:QUESTIONable:CORRection Event register if that bit has a positive transition (0 to 1). The variable <number> is the sum of the decimal values of the bits that are to be enabled.

**Parameters:**

&lt;BitDefinition&gt;

Range: 0 to 65535

**Example:**

STAT:QUES:CORR:PTR 65535

All condition bits are summarized in the Event register if a positive transition occurs.

**Usage:**

SCPI conform

**Mode:**

NF

#### 4.5.12 SYSTEM Subsystem (Noise Figure, R&S FSV-K30)

This subsystem contains a series of commands for general functions.

SYSTem:CONFigure:DUT:GAIN.....	101
SYSTem:CONFigure:DUT:STIME.....	102

**SYSTem:CONFigure:DUT:GAIN** <Gain>

This command specifies the maximum gain of the DUT.

This command is not available when using Digital Baseband Interface (R&S FSV-B17).

**Parameters:**

&lt;Gain&gt;

Range: 10 dB to 999.99 dB

\*RST: 30 dB

**Example:**

SYST:CONF:DUT:GAIN 10

Specifies the gain of the DUT to be 10 dB.

**Mode:**

NF

**SYSTem:CONFigure:DUT:STIMe <Time>**

This command specifies the DUT settling time. It represents the time to wait for the DUT to settle after a noise source has been turned on or off.

**Parameters:**

&lt;Time&gt;

Range: 0 to 20 s

\*RST: 50 milliseconds

**Example:**

SYST:CONF:DUT:STIM 1000MS

Specifies a period of one second for the DUT to settle down after exposure to the noise source has been removed.

**Mode:**

NF

### 4.5.13 TRACe Subsystem

**TRACe<n>[:DATA]? <ResultType>**

This command returns the current trace data or measurement results. In case of several result displays, you have to use specific parameters to query the results.

**Suffix:**

&lt;n&gt;

1...4

window; For applications that have only one measurement screen, the suffix is irrelevant.

**Query parameters:**

&lt;ResultType&gt;

TRACe1 | TRACe2 | TRACe3 | TRACe4 | TRACe5 | TRACe6 |  
SPECTrogram | SGRam | LIST | SPURious

Selects the type of result to be returned.

**TRACe1 | ... | TRACe6**

The query returns a list of results with one value for each sweep point in the currently set level unit.

For details see [table 4-2](#)**LIST**Returns the results of the list evaluation of the Spectrum Emission Mask and Spurious Emissions measurement (Spectrum mode only). For a description of the syntax see [table 4-3](#) below.**SPURious**

Returns the peak list of the Spurious Emissions measurement (Spectrum mode only)

**SPECTrogram | SGRam**

Returns the results of the spectrogram result display (requires R&amp;S FSV-K14 option). For every frame in the spectrogram, the command returns 801 power levels, one for each horizontal pixel on the display. The power level unit depends on the unit you have currently set. The number of frames depends on the history depth. The data format is either binary or ASCII.

**PSpectrum**

Returns the results of the persistence spectrum result display. The command returns 801\*600 percentages, one for each pixel in the histogram from .

The data format is either binary or ASCII.

**HMAXhold**

Returns the results of the maxhold trace in the persistence spectrum result display. The command returns 801\*600 percentages, one for each pixel in the maxhold trace.

The data format is either binary or ASCII.

**Example:**

TRAC? TRACe1

Returns the trace data for Trace 1.



**Usage:** Query only  
**Mode:** A, ADEMOD, BT, NF, PHN, TDS

**Table 4-2: Results for <TRACe...> ResultTypes**

<p>The query returns a list of results with one value for each sweep point in the currently set level unit. By default, the list contains 691 values. The currently used number of sweep points can be determined using SWE:POIN?, see [SENSe:]SWEep:POINts on page 99.</p> <p>FORMat REAL, 32 is used as format for binary transmission, and FORMat ASCii for ASCII transmission.</p> <p>With the auto peak detector, only positive peak values can be read out.</p> <p>In IQ Analyzer mode, if the result display configuration "Real/Imag (I/Q)" is selected, this query returns the I values of each trace point first, then the Q values:</p> <p>&lt;result&gt;= I<sub>1</sub>,I<sub>2</sub>,...,I<sub>n</sub>, Q<sub>1</sub>,Q<sub>2</sub>,...,Q<sub>n</sub></p> <p>In realtime mode, this parameter queries the results of the realtime spectrum result display.</p>
---

**Table 4-3: Results for <LIST> ResultType**

<p>Using the LIST parameter, the query returns the results of the list evaluation of the Spectrum Emission Mask and Spurious Emissions measurement (Spectrum mode only) with the following syntax:</p> <p>&lt;no&gt;, &lt;start&gt;, &lt;stop&gt;, &lt;rbw&gt;, &lt;freq&gt;, &lt;power abs&gt;, &lt;power rel&gt;, &lt;delta&gt;, &lt;limit check&gt;, &lt;unused1&gt;, &lt;unused2&gt;</p> <p>where:</p>	
<no>:	peak number
<start>:	start frequency of range
<stop>:	stop frequency of range
<rbw>:	resolution bandwidth of range
<freq>:	frequency of peak
<power abs>:	absolute power in dBm of peak
<power rel>:	relative power in dBc (related to the channel power) of peak
<delta>:	distance to the limit line in dB (positive indicates value above the limit, fail)
<limit check>:	limit fail (pass = 0, fail = 1)
<unused1>:	reserved (0.0)
<unused2>:	reserved (0.0)

## 4.6 Error Reporting and Error Messages

Error reporting for the Noise Figure Measurements option is carried out using the Service Request (SRQ) interrupt in the GPIB interface. When an error occurs a Service Request interrupt will be generated. The master can then query the slave instrument for the error that triggered the interrupt. Errors are queried through the "SYSTem:ERRor" command.

Status bar message	Description
Frequency list truncated, max 100 entries	The settings for start, stop and step frequencies would require a frequency list greater than 100 entries. The list calculated is terminated at the 100th entry. Try using a larger step size or splitting the test up into a series of frequency list tests.
Missing [ENR][,]&[LossIn][,]&[LossOut] for meas.freq.	No ENR, loss input and/or loss output can be determined for one or all of the measurement frequencies. This occurs when using tables of ENR, loss input and/or loss output values. Check that the frequency ranges of the tables covers the range of frequencies to be measured. For each measurement frequency, where ENR, loss input or loss output cannot be determined, 0 is used.
Generator connection error	No connection could be made to the external signal generator (with option R&S FSV-B10 only). Check the connection between the analyzer and the signal generator. Also check that the correct GPIB address has been specified for the signal generator.
Generator not initialised	The external signal generator has not been initialized and as such cannot be controlled by the spectrum analyzer (with option R&S FSV-B10 only).The signal generator can be initialized manually by pressing the "INIT GEN" softkey in the "Input/Output" menu, or can automatically be initialized by selecting the "Init before meas" field in the "Measurement Settings".
Generator frequency out of range	The LO frequency to be used for a measurement point is out of range for the selected signal generator (with option R&S FSV-B10 only). Reduce the LO frequency or use a signal generator with the required frequency range.



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