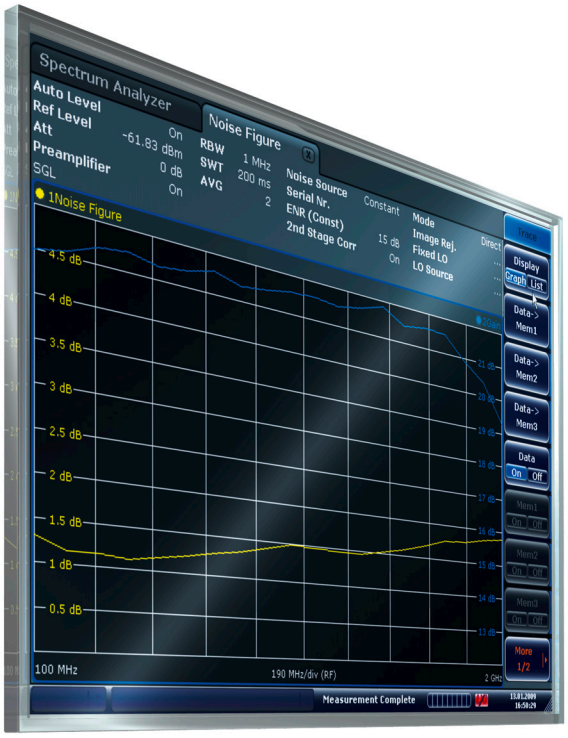
R&S® FSV-K30
Firmware Option Noise Figure Measurements
Operating Manual



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Test & Measurement

Operating Manual

ROHDE&SCHWARZ

This manual describes the following R&S®FSV options:

- R&S FSV-K30 (1310.8355.02)

This manual is applicable for the following analyzer models with firmware version 1.70 and higher:

- R&S®FSV 3 (1307.9002K03)
- R&S®FSV 7 (1307.9002K07)
- R&S®FSV 13 (1307.9002K13)
- R&S®FSV 30 (1307.9002K30)
- R&S®FSV 40 (1307.9002K39)
- R&S®FSV 40 (1307.9002K40)

The firmware of the instrument makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgement" on the user documentation CD-ROM (included in delivery).
Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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

Contents

1 Preface

1.1 Documentation Overview

The user documentation for the R&S FSV 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 R&S FSV 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 R&S FSV is not included in the option manuals.

The following Operating Manuals are available for the R&S FSV:

- R&S FSV base unit; in addition:
  - R&S FSV-K9 Power Sensor Support
  - R&S FSV-K14 Spectrogram Measurement
- R&S FSV-K7 Analog Demodulation and R&S FSV-K7S FM Stereo Measurements
- 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 Operating Manual
  R&S FSV-K70 Vector Signal Analysis Getting Started (First measurements)
- 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 R&S FSV 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 R&S FSV and all available options. It describes both manual and remote operation. The online help is installed on

the R&S FSV 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.

1.2 Conventions Used in the Documentation

1.2.1 Typographical Conventions

The following text markers are used throughout this documentation:

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

1.2.2 Conventions for Procedure Descriptions

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

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

1.3 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.

2 Introduction to R&S FSV-K30 & Noise Measurements

The use of an R&S FSV spectrum analyzer with its high sensitivity and level accuracy enables the accurate and reproducible measurement of the noise figure of a Device Under Test; for example, of low-noise FET amplifier circuits with noise figures of less than 1 dB. Compared with specialist noise-measurement instruments, the properties of the analyzer are ideal for noise measurements:

- Different configurations of the sweep number and sweep time for the level measurement also allows the noise figure (and even the gain) of the DUT to be determined even at low frequencies.
- The high dynamic range of the analyzer enables measurements on highly amplifying DUTs.
- The frequency range of the analyzer can be fully utilised as a measurement range.

R&S FSV-K30 makes full use of the features and accuracy of the spectrum analyzer to provide accurate and flexible noise measurements that are very easy to use.

Overview of Firmware Option R&S FSV-K30

This section contains all information required for operation of an R&S FSV 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 Basics
  Provides basic knowledge on performing noise measurements
- 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.

3 Measurement Basics

This section provides background information on measurements and displayed information.

3.1 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 43). 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 109

`[SENSe:]FREQuency:STOP` on page 109

`[SENSe:]FREQuency:STEP` on page 109

or

`[SENSe:]FREQuency:CENTer` on page 108

`[SENSe:]FREQuency:SPAN` on page 109

`[SENSe:]SWEep:POINts` on page 110

To start the measurement:

`CONFigure:LIST:CONTinuous` on page 86 or

`CONFigure:LIST:SINGle` on page 86

`INIT`

To query the results:

`FETCh:ARRay:NOISE:FIGure` on page 95

`FETCh:ARRay:NOISE:GAIN` on page 95

`FETCh:ARRay:NOISE:TEMPerature` on page 95

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 107

To start the measurement:

CONFigure:SINGle on page 86

INIT

To query the results:

FETCh:SCALar:NOISE:FIGure on page 95

FETCh:SCALar:NOISE:GAIN on page 95

FETCh:SCALar:NOISE:TEMPerature on page 95

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 43). 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 109

To start the measurement:

CONFigure:FREQ:CONTinuous on page 85 or

CONFigure:FREQ:SINGle on page 85

INIT

To query the results:

FETCh:ARRay:NOISE:FIGure on page 95

FETCh:ARRay:NOISE:GAIN on page 95

FETCh:ARRay:NOISE:TEMPerature on page 95

3.2 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 = abs(RF - LO)
  – Fixed IF Upconverter, LO = abs(RF – IF)
  – Fixed IF Downconverter, LO = RF + IF
- 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 43).
  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 44).

For details on the measurement types see also chapter 4, "Measurement Examples (R&S FSV-K30)", on page 25.

3.3 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 3-1). 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

Setting	Defined in dialog box	Description
AVG	Measurement Settings	Set number of measurement sweeps over which the average is taken
Noise Source	ENR Settings	Set constant ENR or ENR table
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	External generator type controlling the LO (requires R&S FSV-B10 option); only displayed when "Automatic Control" is selected (see "Automatic Control" on page 52).

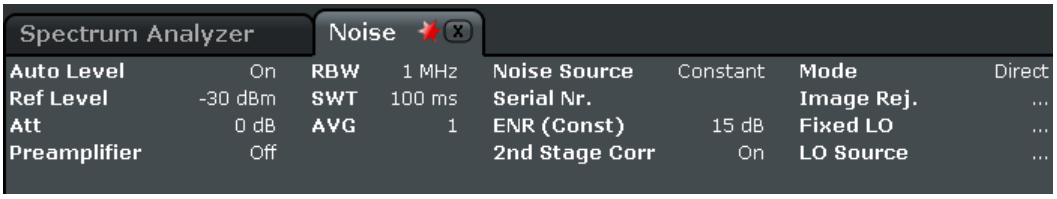


Fig. 3-1: Measurement settings for the noise figure measurements (example)

3.4 Result Displays

The measurement results are represented according to the measurement type (see chapter 3.1, "Measurement Types", on page 11).

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 62 softkey).

(See figure 3-3 and figure 3-2.)

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.

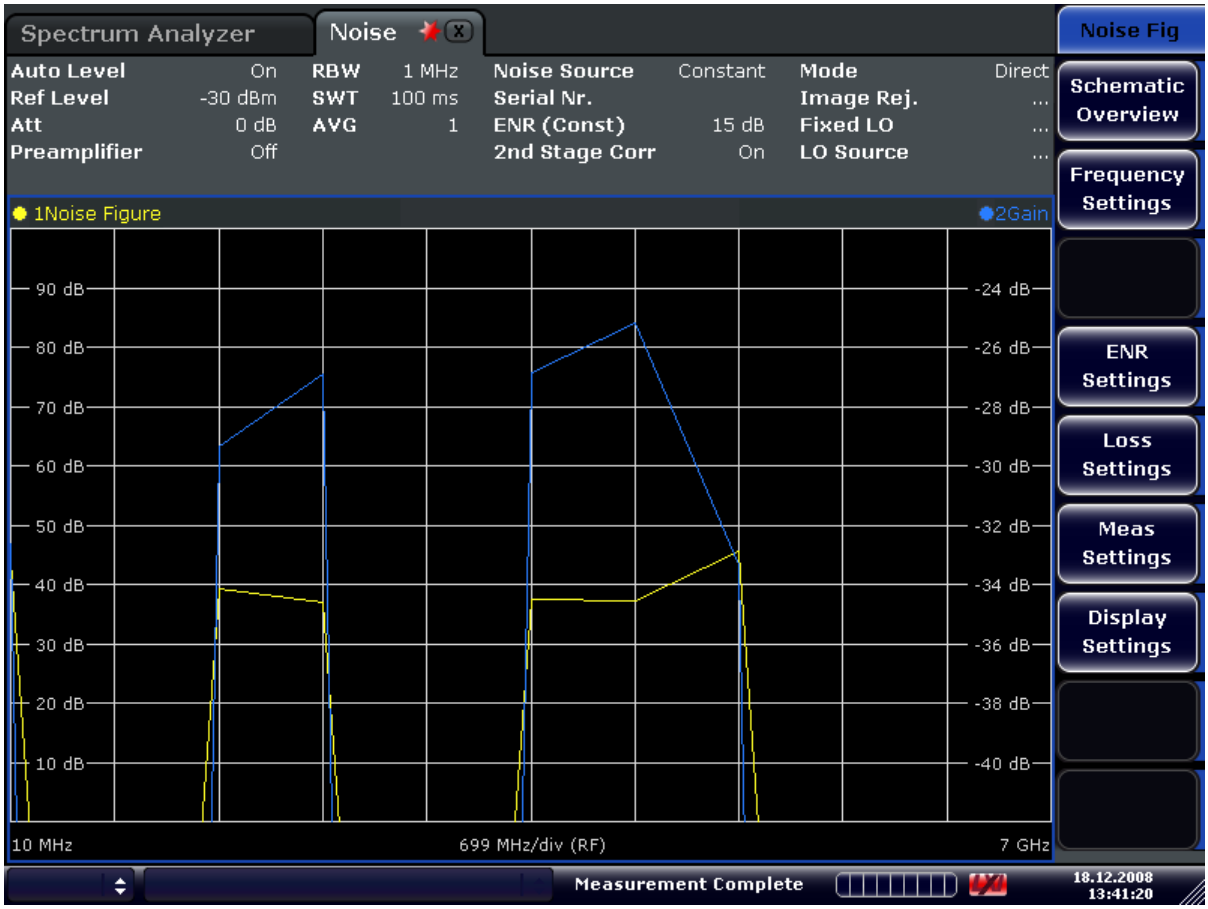


Fig. 3-2: Graphical result display (example)

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. 3-3: Result display table (example)

The following information is displayed in the table:

Column	Description
Used settings	
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
Results	
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 3.1, "Measurement Types", on page 11). 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.

3.5 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 enumarated 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

3.6 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 49), 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 59). 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 43.

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.

3.7 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 x 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.
- CISPR (6 dB) filters
- MIL Std (6 dB) filters
  Note that the 6 dB bandwidths are available only with option R&S FSV-K54.
- Channel filters
  For details see chapter 3.8, "List of Available RRC and Channel Filters", on page 19 .
  Channel filters do not support FFT mode.
- RRC filters
  For details see chapter 3.8, "List of Available RRC and Channel Filters", on page 19 .
  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.

3.8 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 (α) is also indicated.

Table 3-1: 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

Filter Bandwidth	Filter Type	Application
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, α=0.2	RRC	APCO
8.5 kHz	CFILter	ETS300 113 (12.5 kHz channels)
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, α=0.35	RRC	TETRA
20 kHz	CFILter	
21 kHz	CFILter	PDC
24.3 kHz, α=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

Filter Bandwidth	Filter Type	Application
1.28 MHz, α=0.22	RRC	
1.5 MHz	CFILter	DAB
2 MHz	CFILter	
3 MHz	CFILter	
3.75 MHz	CFILter	
3.84 MHz, α=0.22	RRC	W-CDMA 3GPP
4.096 MHz, α=0.22	RRC	W-CDMA NTT DOCoMo
5 MHz	CFILter	
20 MHz	CFILter	
28 MHz	CFILter	
40 MHz	CFILter	

3.9 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;FSV;	Instrument model
Version;1.50;	Firmware version
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

File contents: header and data section	Description
y unit;dBm;	Unit of the y axis
Trace Mode;Clear Write;	Trace mode
Values;592;	Number of results
<values>	List of results

3.10 Overview of Generators Supported by the R&S FSV

The R&S SMA and R&S SMU require the following firmware versions:
R&S SMA: V2.10.x or higher
R&S SMU: V1.10 or higher

Generator	Interface Type	Generator Min Freq	Generator Max Freq	Generator Min Power dBm	Generator Max Power dBm
SMA01A	TTL	9 kHz	3.0 GHz	-145	+30
SMBV100A3	TTL	9 kHz	3.2 GHz	-145	+30
SMBV100A6	TTL	9 kHz	6.0 GHz	-145	+30
SMC100A1	TTL	9 kHz	1.1 GHz	-120	+30
SMC100A3	TTL	9 kHz	3.2 GHz	-145	+30
SME02	TTL	5 kHz	1.5 GHz	-144	+16
SME03	TTL	5 kHz	3.0 GHz	-144	+16
SME06	TTL	5 kHz	6.0 GHz	-144	+16
SMG	GPIB	100 kHz	1.0 GHz	-137	+13
SMGL	GPIB	9 kHz	1.0 GHz	-118	+30
SMGU	GPIB	100 kHz	2.16 GHz	-140	+13
SMH	GPIB	100 kHz	2.0 GHz	-140	+13
SMHU	GPIB	100 kHz	4.32 GHz	-140	+13
SMIQ02B	TTL	300 kHz	2.2 GHz	-144	+13
SMIQ02E	GPIB	300 kHz	2.2 GHz	-144	+13
SMIQ03B	TTL	300 kHz	3.3 GHz	-144	+13
SMIQ03E	GPIB	300 kHz	3.3 GHz	-144	+13
SMIQ04B	TTL	300 kHz	4.4 GHz	-144	+10
SMIQ06B	TTL	300 kHz	6.4 GHz	-144	+10

Generator	Interface Type	Generator Min Freq	Generator Max Freq	Generator Min Power dBm	Generator Max Power dBm
SML01	GPIB	9 kHz	1.1 GHz	-140	+13
SML02	GPIB	9 kHz	2.2 GHz	-140	+13
SML03	GPIB	9 kHz	3.3 GHz	-140	+13
SMR20	TTL	1 GHz	20 GHz	-130 2)	+11 2)
SMR20B11 1)	TTL	10 MHz	20 GHz	-130 2)	+13 2)
SMR27	TTL	1 GHz	27 GHz	-130 2)	+11 2)
SMR27B11 1)	TTL	10 MHz	27 GHz	-130 2)	+12 2)
SMR30	TTL	1 GHz	30 GHz	-130 2)	+11 2)
SMR30B11 1)	TTL	10 MHz	30 GHz	-130 2)	+12 2)
SMR40	TTL	1 GHz	40 GHz	-130 2)	+9 2)
SMR40B11 1)	TTL	10 MHz	40 GHz	-130 2)	+12 2)
SMR50	TTL	1 GHz	50 GHz	-130 2)	+9 2)
SMR50B11 1)	TTL	10 MHz	50 GHz	-130 2)	+12 2)
SMR60	TTL	1 GHz	60 GHz	-130 2)	+9 2)
SMR60B11 1)	TTL	10 MHz	60 GHz	-130 2)	+12 2)
SMP02	TTL	10 MHz	20 GHz	-130 3)	+17 3)
SMP03	TTL	10 MHz	27 GHz	-130 3)	+13 3)
SMP04	TTL	10 MHz	40 GHz	-130 3)	+12 3)
SMP22	TTL	10 MHz	20 GHz	-130 3)	+20 3)
SMT02	GPIB	5.0 kHz	1.5 GHz	-144	+13
SMT03	GPIB	5.0 kHz	3.0 GHz	-144	+13
SMT06	GPIB	5.0 kHz	6.0 GHz	-144	+13
SMV03	GPIB	9 kHz	3.3 GHz	-140	+13
SMU200A	TTL	100 kHz	2.2 GHz	-145	+13
SMU02B31	TTL	100 kHz	2.2 GHz	-145	+19
SMU03	TTL	100 kHz	3 GHz	-145	+13
SMU03B31	TTL	100 kHz	3 GHz	-145	+19
SMU04	TTL	100 kHz	4 GHz	-145	+13
SMU04B31	TTL	100 kHz	4 GHz	-145	+19
SMU06	TTL	100 kHz	6 GHz	-145	+13
SMU06B31	TTL	100 kHz	6 GHz	-145	+19
SMX	GPIB	100 kHz	1.0 GHz	-137	+13

Generator	Interface Type	Generator Min Freq	Generator Max Freq	Generator Min Power dBm	Generator Max Power dBm
SMY01	GPIB	9 kHz	1.04 GHz	-140	+13
SMY02	GPIB	9 kHz	2.08 GHz	-140	+13
HP8340A	GPIB	10 MHz	26.5 GHz	-110	10
HP8648	GPIB	9 kHz	4 GHz	-136	10
HP ESG-A Series 1000A, 2000A, 3000A, 4000A	GPIB	250 kHz	4 GHz	-136	20
HP ESG-D SERIES E4432B	GPIB	250 kHz	3 GHz	-136	+10

1) Requires the option SMR-B11 to be fitted.

2) Maximum/minimum power depends on presence of Option SMR-B15/-B17 and set frequency range. For more details see SMR data sheet.

3) Maximum/minimum power depends on presence of Option SMP-B15/-B17 and set frequency range. For more details see SMP data sheet.

4 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 Direct Measurements

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

- chapter 4.1.1, "Basic Measurement Example", on page 25
- chapter 4.1.2, "DUTs with very Large Gain", on page 28

4.1.1 Basic Measurement Example

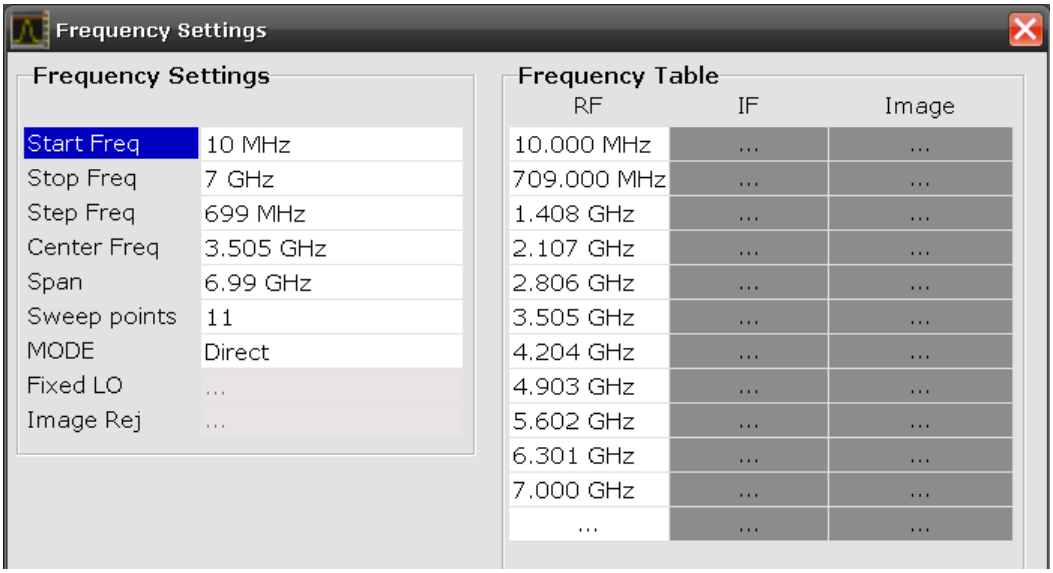
This section provides step-by-step instructions for working through an ordinary noise figure measurement. The following steps are described:

- "Setting up the measurement" on page 25
- "Performing the calibration" on page 27
- "Performing the main measurement" on page 27

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

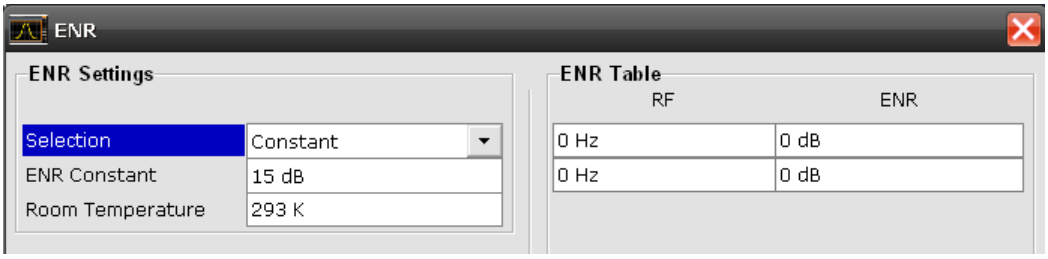
Setting up the measurement

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.

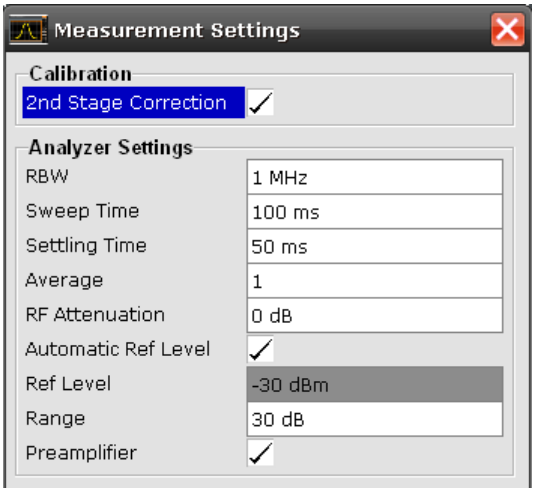


3. In the "Start Freq" field, enter *550 MHz*.
4. In the "Stop Freq" field, enter *560 MHz*.
5. In the "Step Freq" field, enter *2 MHz*.

   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 R&S FSV (see figure 4-1).
2. Provide the voltage supply for the noise source by connecting it to the +28 V connector of the R&S FSV (labeled "NOISE SOURCE CONTROL" on the front panel of the instrument) via a coax cable.

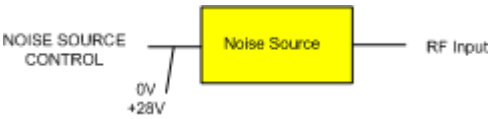


Fig. 4-1: Preparation for calibration

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 R&S FSV (see figure 4-2).

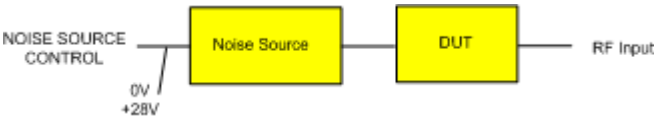


Fig. 4-2: Test setup for the main measurement

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.

4.1.2 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 â€“ 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.

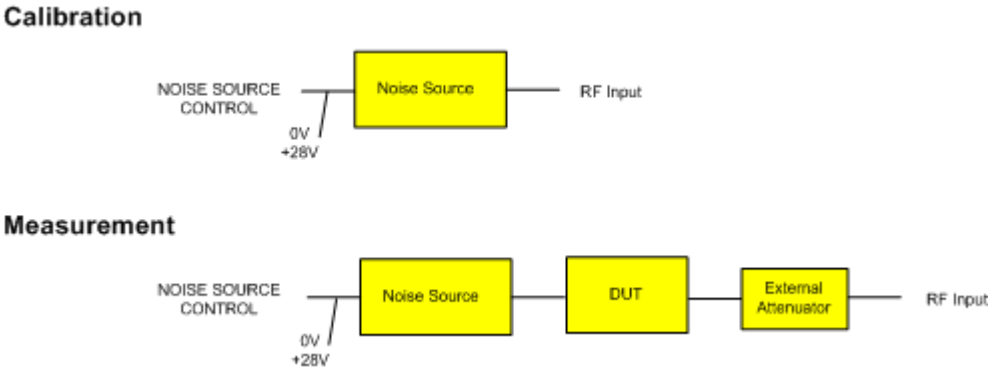


Fig. 4-3: Calibration and measurement on DUTs with a high gain

4.2 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 4.2.1, "Fixed LO Measurements", on page 29
- chapter 4.2.2, "Image-Frequency Rejection (SSB, DSB)", on page 29

4.2.1 Fixed LO Measurements

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

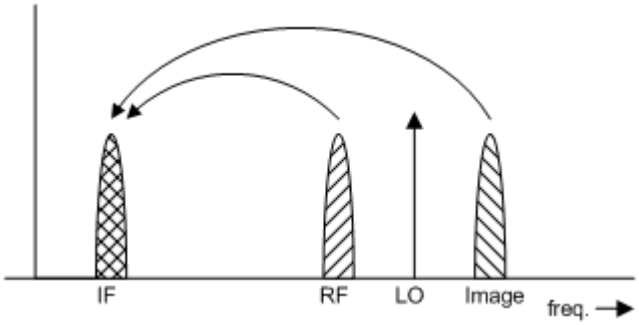
- Fixed LO, Up Conv, for up-converting devices with IF=RF+LO
- Fixed LO, Down Conv, for down converters with IF=abs(RF-LO) or image measurements

4.2.2 Image-Frequency Rejection (SSB, DSB)

Test Setup

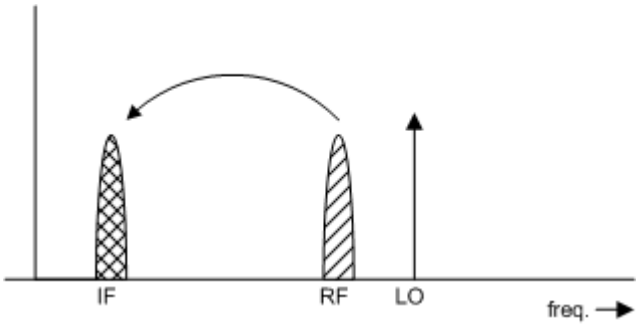
► Set the following parameters:

a) "IF" (intermediate frequency): *100 MHz*
b) "RF" (input frequency): *400 MHz*
c) "LO" (local oscillator frequency): *500 MHz*
d) "image" (image frequency): *600 MHz*



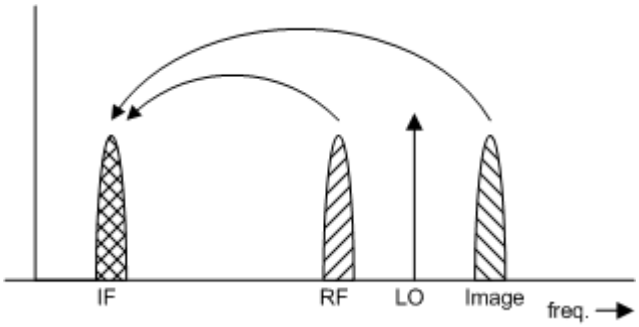
If a DUT, which equally converts the useful signal and the image to the IF frequency, is measured using the conventional y factor method or with the 2nd stage correction switched on, a measuring error of 3 dB is produced. The noise figure is displayed 3 dB lower and the gain 3 dB higher. The following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

4.2.2.1 Measurement on a single-sideband mixer



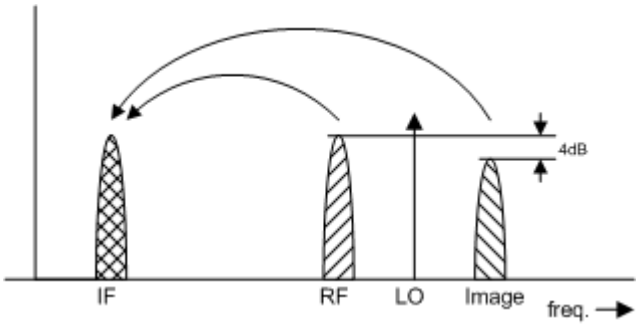
In general, a single-sideband mixer with a very high image rejection causes very few problems. The measurement is analogous to an amplifier. In this case, set the image rejection in the "Frequency Settings" dialog box to a large value (e.g. 999.99 dB).

4.2.2.2 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).

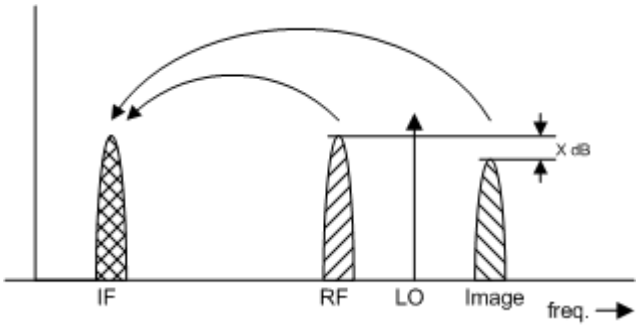
4.2.2.3 Measurement on a mixer with an average sideband suppression



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.

4.2.2.4 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

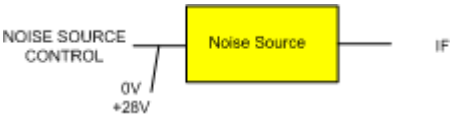


Fig. 4-4: Preparation for calibration

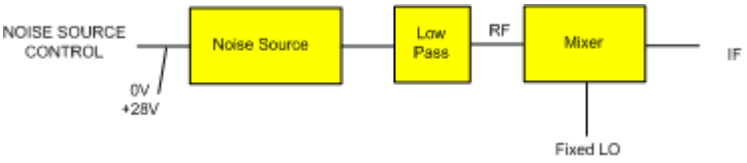


Fig. 4-5: Test setup for the main measurement

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.

4.2.2.5 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 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.

4.2.3 Fixed IF Measurements

During a "Fixed IF" measurement, a mixer can be tested using an R&S FSV at a fixed frequency, while the Local Oscillator frequency of a connected external generator sweeps the frequency list. The LO frequency is controlled by the R&S FSV-K30 option, which drives the external generator using the R&S FSV-B10 option.

Thus, this measurement requires an R&S FSV with the K30 and B10 options installed.

Tracking generator vs. external generator

In Spectrum mode, when using the B10 option, the frequencies of the analyzer and the generator are coupled by default. The generator is thus referred to as a "tracking generator". In Noise Measurements mode, on the other hand, the analyzer uses a fixed frequency while the generator sweeps the frequency list. The generator is thus simply referred to as an "external generator".

The Fixed IF measurement can calculate frequencies for downconverter or upconverter devices. For downconverter devices, the LO is set according to the formula:

LO = RF + IF

For upconverter devices, the LO is set according to the formula:

LO = abs(RF-IF)

The generator frequency actually used during the measurement is calculated by the R&S FSV-K30 option based on the LO frequencies in the frequency list. The following formula is used to calculate the generator frequency:

Generator Frequency = [(LO + Offset 1) * Factor 1 / Factor 2)] + Offset 2

The offset values and factors for the calculation are defined in the "Measurement Settings". If changes are made to the settings, the start and stop frequencies of the external generator are calculated and displayed.

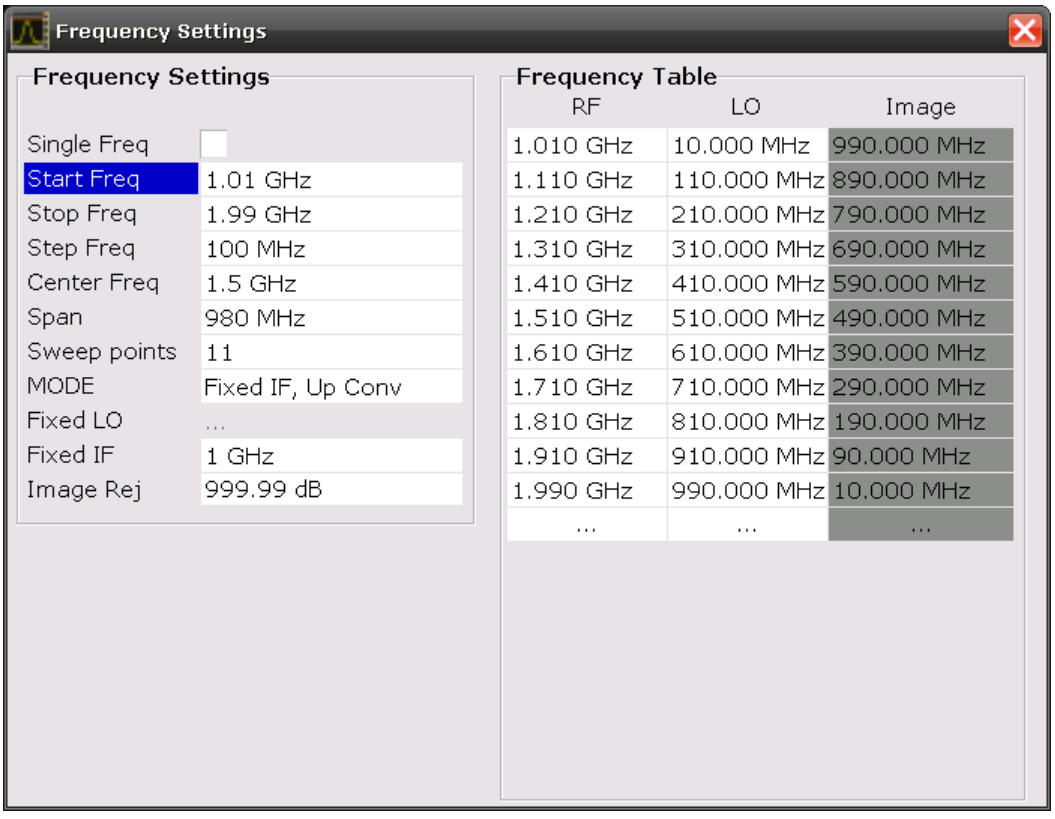
Measurement results

The measurement results can be displayed against the RF or LO frequencies, depending on the x-axis selection in the "Display Settings" (see "X-Axis" on page 58).

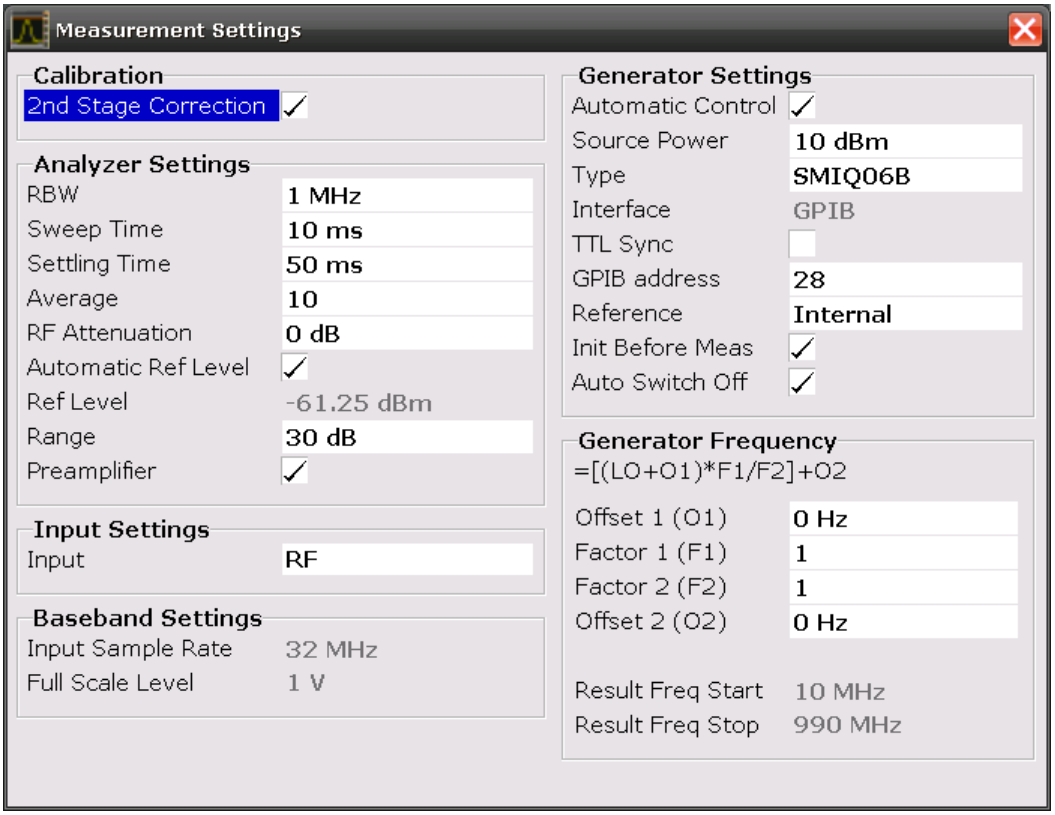
To set up a Fixed IF measurement

As opposed to the Spectrum mode, the Noise measurement mode does not provide a separate dialog box for setting up the generator. The settings are contained in the general "Frequency Settings" and "Measurement Settings" dialog boxes if the R&S FSV-B10 option is installed. For details on the settings see "Frequency Settings" on page 43 and "Meas Settings" on page 48.

1. Connect the external generator to the R&S FSV-B10 interface on the R&S FSV's rear panel.
2. In Noise measurement mode, press the "Frequency Settings" softkey to display the "Frequency Settings" dialog box.
3. In the "Frequency Settings" dialog box, select the "Mode" *Fixed IF, Up Conv* to test an upconverting mixer.
4. In the "Fixed IF" field, enter *1000000000*.
5. In the Frequency Table, define the LO frequencies for the external generator. Which frequencies the generator actually uses during the measurement is calculated according to the offset values and factors specified in Generator Settings/ Generator Frequency.



6. Press the "Meas Settings" softkey to open the "Measurement Settings" dialog box. Define the settings for the external generator as shown in the screenshot below and described in "Generator Settings/ Generator Frequency" on page 52.



7. Press the "Display Settings" softkey to open the "Graphic" dialog box.
8. In the "Noise and Gain X-Axis Settings", select *RF* or *LO* as the frequency to be displayed on the "X-Axis".
9. Press the RUN SINGLE or RUN CONT hardkey on the front panel to start a measurement.

   The measurement is performed. The results for each frequency in the frequency list are displayed in the diagram and the result table.

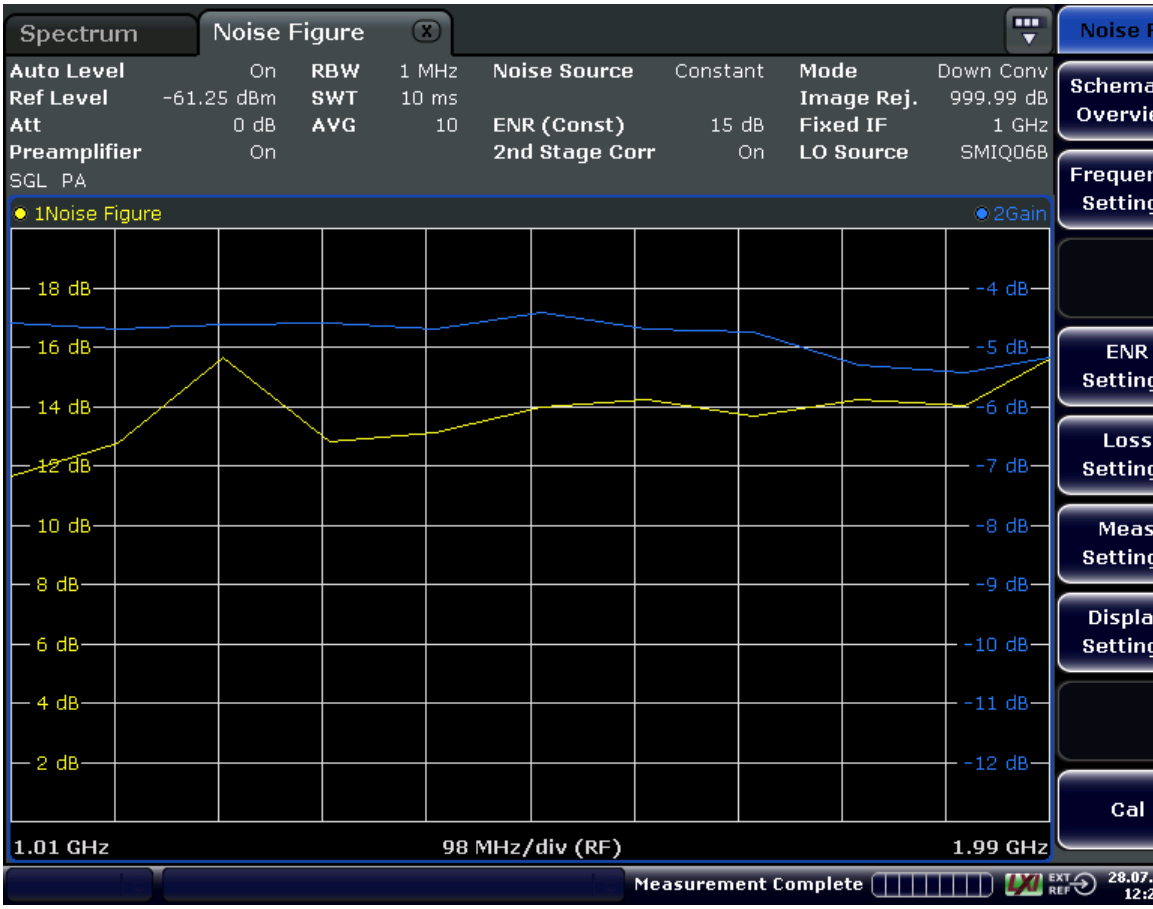


Fig. 4-6: Fixed IF measurement results displayed against RF frequencies


Spectrum
Noise Figure
Auto Level On
Ref Level -61.25 dBm
Att 0 dB
Preamplifier On
SGL PA
RBW 1 MHz
SWT 10 ms
AVG 10
Noise Source Constant
ENR (Const) 15 dB
2nd Stage Corr On
Mode Down Conv
Image Rej. 999.99 dB
Fixed IF 1 GHz
LO Source SMIQ06B
Frequency List Results
RF NF Noise Temp Gain
1.010 GHz 11.651 dB 3951.716 K -4.584 dB
1.110 GHz 12.774 dB 5203.235 K -4.698 dB
1.210 GHz 15.656 dB 10376.408 K -4.614 dB
1.310 GHz 12.825 dB 5267.311 K -4.605 dB
1.410 GHz 13.120 dB 5658.841 K -4.707 dB
1.510 GHz 13.980 dB 6961.137 K -4.414 dB
1.610 GHz 14.238 dB 7405.260 K -4.688 dB
1.710 GHz 13.689 dB 6491.551 K -4.741 dB
1.810 GHz 14.252 dB 7428.786 K -5.312 dB
1.910 GHz 14.002 dB 6997.950 K -5.430 dB
1.990 GHz 15.578 dB 10185.250 K -5.183 dB
Fixed Frequency (Meter)
Frequency 1.01 GHz
Noise Figure 11.651 dB
Gain -4.584 dB

5 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 6, "Menu and Softkey Description (R&S FSV-K30)", on page 39

Tasks

- chapter 5.1, "Editing Tables", on page 37
- chapter 5.2, "Working With Limit Lines", on page 37

5.1 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.

5.2 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.

6 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.

6.1 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.

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 6-1. The upper part of the figure shows the setup for calibration. The lower part of the figure shows the test setup for the measurement.

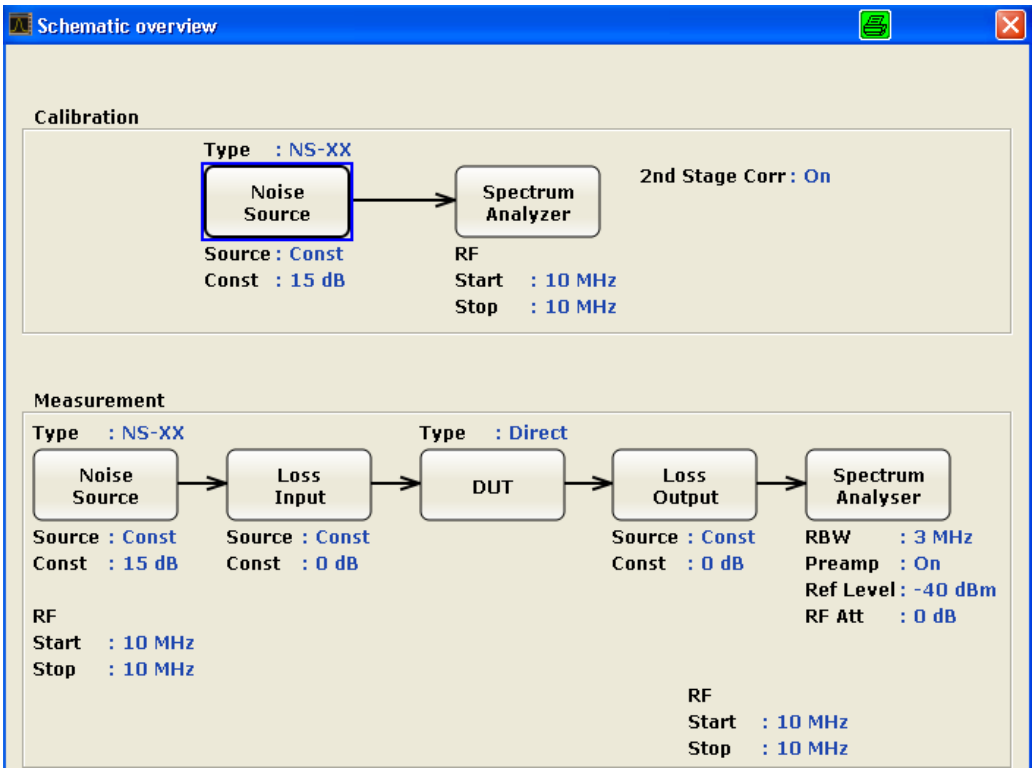


Fig. 6-1: Schematic diagram for direct measurements

- 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 6-2. The upper part of the figure shows the setup for calibration. The lower part of the figure shows the test setup for the measurement.

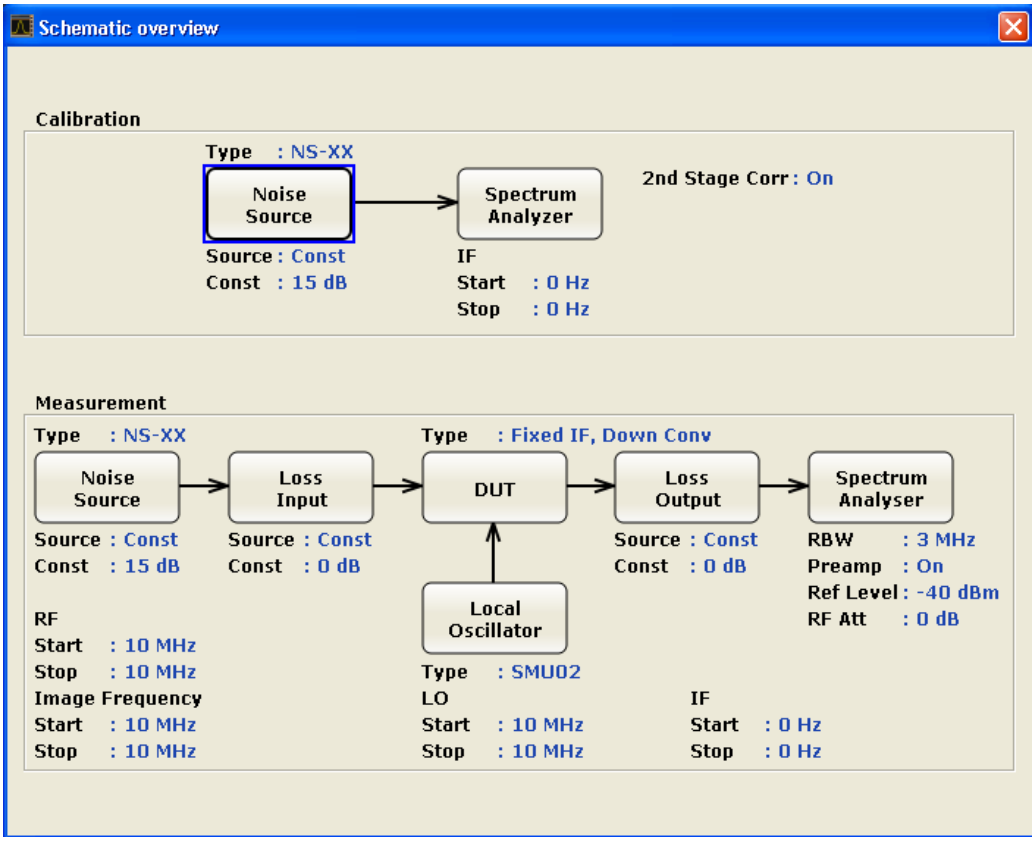
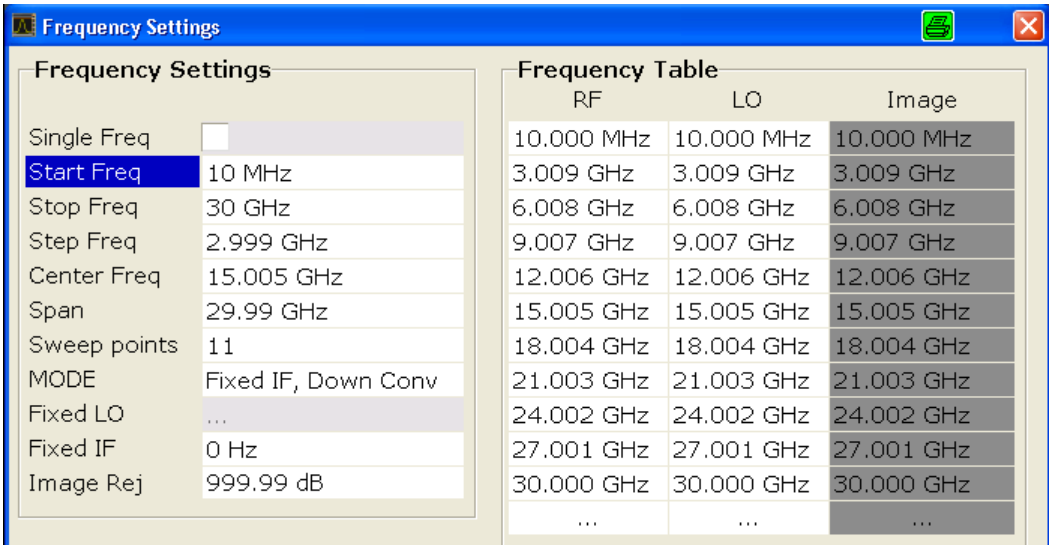


Fig. 6-2: Schematic diagram for frequency converting measurements

Note: The schematic overview now provides direct access to the most important configuration steps. Select the step for the setting you want to edit to display the corresponding dialog box.

Configuration step	Dialog box
Noise Source	"ENR Settings" on page 46
Spectrum Analyzer	"Meas Settings" on page 48
Loss Input	"Loss Settings" on page 47
Loss Output	"Loss Settings" on page 47
DUT	"Frequency Settings" on page 43
Local Oscillator	"Meas Settings" on page 48

Frequency Settings
Opens the "Frequency Settings" dialog box.



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 85
`CONFigure:FREQ:SINGle` on page 85

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 3.1, "Measurement Types", on page 11.

SCPI command:
`[SENSe:]FREQuency:STARt` on page 109

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 109

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 3.1, "Measurement Types", on page 11.

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

SCPI command:
`[SENSe:]FREQuency:STEP` on page 109

Center Freq ← Frequency Settings ← Frequency Settings
Defines the center frequency.

SCPI command:
`[SENSe:]FREQuency:CENTer` on page 108

Span ← Frequency Settings ← Frequency Settings
Specifies the frequency span.

SCPI command:
`[SENSe:]FREQuency:SPAN` on page 109

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 110

Mode ← Frequency Settings ← Frequency Settings
Specifies the measurement mode. For details on modes refer to chapter 3.2, "Measurement Modes of the Noise Figure Measurement", on page 13.

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

"Direct"	Direct measurement
"Fixed LO Upconverter"	IF = RF + LO
"Fixed LO Down-converter"	IF = |(RF - LO)|
"Digital IQ"	Digital baseband input using the optional R&S FSV-B17 interface
"Fixed LO Upconverter"	LO = abs(RF – IF) Requires R&S FSV-B10 option

"Fixed IF Down-converter"	LO = RF + IF Requires R&S FSV-B10 option

SCPI command:
[SENSe:]CONFigure:MODE:DUT on page 105
To select the type of DUT
[SENSe:]CONFigure:MODE:SYSTem:LOSCillator on page 107
To select Fixed LO or Fixed IF.

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 3.2, "Measurement Modes of the Noise Figure Measurement", on page 13.

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

SCPI command:
[SENSe:]CONFigure:MODE:SYSTem:LOSCillator:FREQuency on page 107

Fixed IF ← Frequency Settings ← Frequency Settings
Specifies the fixed IF frequency. This field is only available if a "Fixed IF" measurement mode is selected ("Mode" field). For details see chapter 4.2.3, "Fixed IF Measurements", on page 32.

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

SCPI command:
[SENSe:]CONFigure:MODE:SYSTem:IF:FREQuency on page 106

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 3.2, "Measurement Modes of the Noise Figure Measurement", on page 13.

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 101

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)

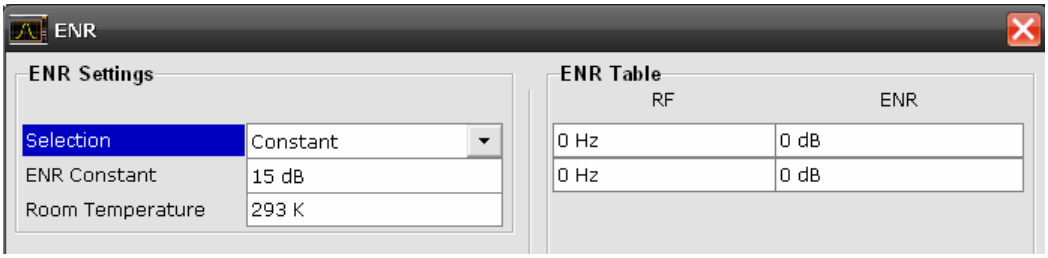
You can customize the "Frequency Table" by editing, deleting, and inserting measurement steps. This is useful in order to insert extra measurement steps near a specific frequency of interest in order to get more detailed results. If the start, stop, or step frequency is changed, the "Frequency Table" is generated afresh and all manual modifications are overwritten. To customize this table, proceed according to chapter 5.1, "Editing Tables", on page 37.

SCPI command:

[SENSe:]FREQuency:LIST:DATA on page 108

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 101

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 47). 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 R&S FSV uses interpolated values.

SCPI command:
[SENSe:]CORRection:ENR:SPOT on page 101

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 101

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.

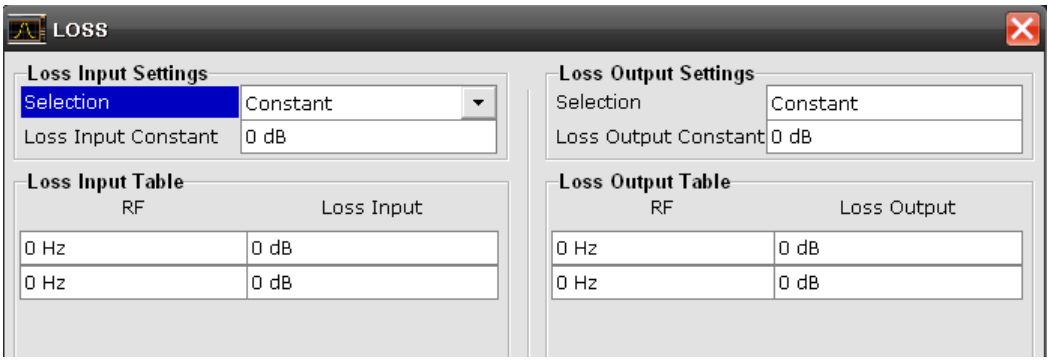
SCPI command:
[SENSe:]CORRection:TEMPerature on page 104

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 5, "Instrument Functions of Noise Figure Measurements (R&S FSV-K30)", on page 37.

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 103

[SENSe:]CORRection:LOSS:OUTPut:TABLe on page 104

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 R&S FSV uses interpolated values.

SCPI command:

[SENSe:]CORRection:LOSS:INPut:MODE on page 102

[SENSe:]CORRection:LOSS:INPut:TABLe on page 103

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 102

[SENSe:]CORRection:LOSS:OUTPut:SPOT on page 103

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 5, "Instrument Functions of Noise Figure Measurements (R&S FSV-K30)", on page 37.

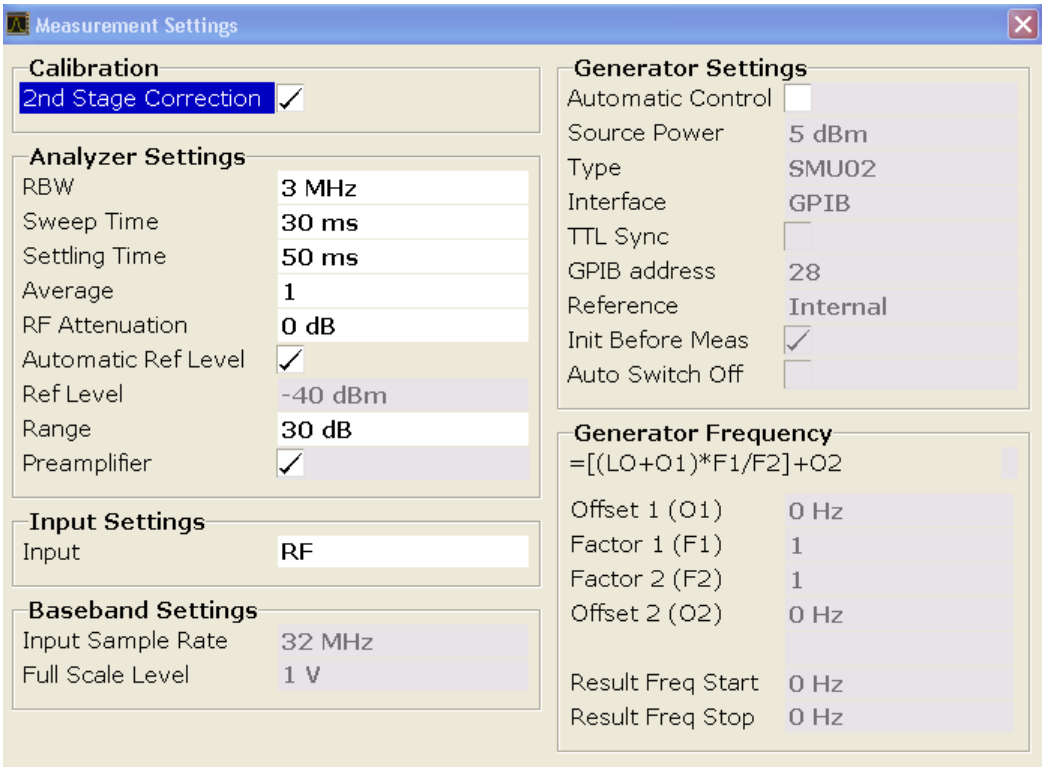
Loss tables can be saved and recalled at any time via the FILE key (for details refer to the base unit description). In addition to the data saved by the basic unit, all loss input & output data entered in the loss settings dialog box is saved.

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 3.6, "Calibration", on page 18.

2nd Stage Correction ← Calibration ← Meas Settings
Activates or deactivates the second stage correction.

For details refer also to chapter 3.6, "Calibration", on page 18.

"On" The calibration data recorded via the "Cal" softkey is used to correct the measurement results (see "Cal" on page 59). 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 100

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 105

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 110

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 118

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 110

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 96

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 51).

- 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 51).

"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 93

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 50).

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 92

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 50).

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 118

Preamp On/Off ← Analyzer Settings ← Meas Settings
Switches the preamplifier on and 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 97

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 98

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 97

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 97

Generator Settings/ Generator Frequency ← Meas Settings
This section contains external generator settings for Fixed IF measurements if the R&S FSV-B10 option is installed.

For details see chapter 4.2.3, "Fixed IF Measurements", on page 32.

Automatic Control ← Generator Settings/ Generator Frequency ← Meas Settings
Defines whether the R&S FSV-K30 controls the external generator via GPIB commands or whether the external generator is controlled by the user.

"ON" R&S FSV-K30 issues GPIB commands during measurement execution in order to control the external generator.
Required for Fixed IF measurements, since R&S FSV-K30 expects the LO frequency to be tuned to the test RF frequency automatically.

"OFF" No GPIB commands are issued to the external generator. R&S FSV-K30 assumes that the user sets up the external generator correctly. None of the other parameters in the "Generator Settings" group are available for editing when Automatic Control is set to OFF.
Only useful for "Fixed LO" measurements in which the external generator settings do not need to change during the measurement.

Note: If automatic control is deactivated, remote control of the external generator (if in use) is automatically ended.

SCPI command:
`SYSTem:CONFigure:GENerator:CONTrol:STATe` on page 119

Source Power ← Generator Settings/ Generator Frequency ← Meas Settings
The output power of the external tracking generator. The default output power is -20 dBm. The range is specified in the data sheet.

SCPI command:
`SOURce<n>:EXTernal<generator>:POWer[:LEVel]` on page 113

Type ← Generator Settings/ Generator Frequency ← Meas Settings
Generator type. See also chapter 3.10, "Overview of Generators Supported by the R&S FSV", on page 22.

SCPI command:
`SYSTem:COMMunicate:RDEVice:GENerator<generator>:TYPE` on page 117

Interface ← Generator Settings/ Generator Frequency ← Meas Settings
Type of interface connection used. The following interfaces are currently supported:

- TCP/IP
- GPIB

For details on interfaces see the "Interfaces and Protocols" section in the R&S FSV Quick Start Guide.

SCPI command:
`SYSTem:COMMunicate:RDEVice:GENerator<generator>:INTerface` on page 116

TTL Synchronization ← Generator Settings/ Generator Frequency ← Meas Settings
If available for the specified generator type, this option activates TTL synchronization for GPIB connections.

For Noise Figure measurements (K30) this setting currently has no effect.

SCPI command:
`SYSTem:COMMunicate:RDEVice:GENerator<generator>:LINK` on page 116

Address ← Generator Settings/ Generator Frequency ← Meas Settings
For LAN connections: TCP/IP address.

For GPIB connections: GPIB address.

For more information on configuring interfaces see the "Interfaces and Protocols" section in the R&S FSV Quick Start Guide.

SCPI command:
SYSTem:COMMunicate:RDEVice:GENerator<generator>:LINK on page 116

Reference ← Generator Settings/ Generator Frequency ← Meas Settings
Selects internal or external reference for the generator (default: internal).

SCPI command:
SOURce<n>:EXTernal<generator>:ROSCillator[:SOURce] on page 113

Init Before Meas ← Generator Settings/ Generator Frequency ← Meas Settings
Specifies whether an initialisation sequence of GPIB commands containing the defined generator settings is sent to an external signal generator prior to performing each measurement. Sending an initialisation sequence before each measurement ensures that the external generator is in the correct state to receive control commands during a measurement sequence. On the other hand, initialising an external signal generator before each measurement adds a time overhead to each measurement.

If enabled, the R&S FSV-K30 option initialises the selected external generator prior to starting each requested measurement and switches on the generator's RF output.

If disabled, you must initialize the generator manually using the "Init Generator" softkey in the INPUT/OUTPUT menu (see "Init Generator" on page 69).

SCPI command:
SYSTem:CONFigure:GENerator:INITialise:AUTO on page 119

Auto Switch Off ← Generator Settings/ Generator Frequency ← Meas Settings
Specifies whether a sequence of GPIB commands is sent to an external signal generator at the end of each measurement (after a single sweep or after a measurement is aborted) to switch the generator's RF output off.

If enabled, the generator's RF output is switched OFF after each measurement. The remote mode is also automatically ended after each measurement.

Otherwise, RF output must be switched off and remote mode ended manually.

Note: When the Noise measurement mode is closed, the RF output is automatically switched off and remote mode ended.

SCPI command:
SYSTem:CONFigure:GENerator:SWITch:AUTO on page 120

Offset 1 / Factor 1 / Factor 2 / Offset 2 ← Generator Settings/ Generator Frequency ← Meas Settings
The generator frequency is calculated according to the following formula:

Generator Frequency = [(LO + Offset 1) * Factor 1 / Factor 2)] + Offset 2

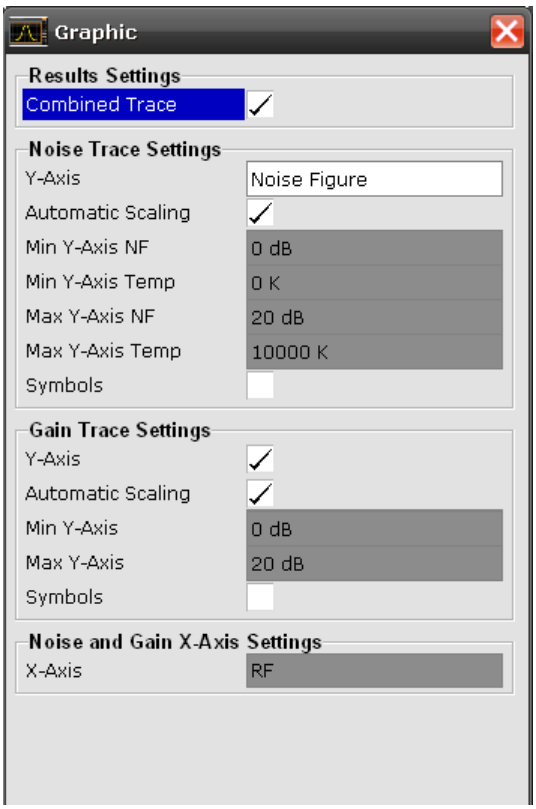
The factors and offsets can be defined to compensate for any component that may change the frequency between the generator and the device under test.

SCPI command:
Factor 1:
SOURce<n>:EXTernal<generator>:FREQuency[:FACTor]:NUMerator
on page 111
Factor 2:
SOURce<n>:EXTernal<generator>:FREQuency[:FACTor]:DENominator
on page 111
Offset 1/2:
SOURce<n>:EXTernal<generator>:FREQuency:OFFSet<m> on page 112

Result Frequency Start ← Generator Settings/ Generator Frequency ← Meas Settings
For reference only: The start frequency for the generator, calculated from the configured LO values in the "Frequency Table" and the offset values and factors in the "Generator Settings".

Result Frequency Stop ← Generator Settings/ Generator Frequency ← Meas Settings
For reference only: The stop frequency for the generator, calculated from the configured LO values in the "Frequency Table" and the offset values and factors in the "Generator Settings".

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 88

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 88
DISPlay[:WINDow<n>]:TRACe<t>[:STATe] on page 89

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 91

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 57), and the y-axis is set to "Noise Figure" (see "Y-Axis" on page 56).

SCPI command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:BOTTom on page 91
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:TOP on page 93

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 57), and the y-axis is set to "Noise Figure" (see "Y-Axis" on page 56).

SCPI command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:BOTTom on page 91
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:TOP on page 93

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 90

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 88
`DISPlay[:WINDow<n>]:TRACe<t>[:STATe]` on page 89

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 91

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 57), and the y-axis is activated (see "Y-Axis" on page 58 field).

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:BOTTom` on page 91
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:TOP` on page 93

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 90

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 90

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 43).

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 3.6, "Calibration", on page 18

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 85

6.2 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 108

Stepsize
Specifies the step size between the single measurement steps (i.e. entries in the frequency table). For details see "Step Freq" on page 44.

SCPI command:
`[SENSe:]FREQuency:STEP` on page 109

Start
Specifies the start frequency. For details see "Start Freq" on page 43.

SCPI command:
`[SENSe:]FREQuency:STARt` on page 109

Stop
Specifies the stop frequency. For details see "Stop Freq" on page 43.

SCPI command:
`[SENSe:]FREQuency:STOP` on page 109

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 45.

SCPI command:
LO: `[SENSe:]CONFigure:MODE:SYSTem:LOSCillator:FREQuency` on page 107
IF: `[SENSe:]CONFigure:MODE:SYSTem:IF:FREQuency` on page 106

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 58.

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:X[:SCALe]` on page 90

Frequency Settings
Opens the "Frequency Settings" dialog box.

For details see "Frequency Settings" on page 43.

6.3 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 109

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

SCPI command:
`[SENSe:]SWEep:POINts` on page 110

Frequency Settings
Opens the "Frequency Settings" dialog box.

For details see "Frequency Settings" on page 43.

6.4 AMPT key

This key opens the "Measurement Settings" dialog box and jumps directly to the "RF Attenuation" field (see "RF Attenuation" on page 50).

In addition, the standard "Noise" menu is displayed, see chapter 6.1, "Softkeys and Settings of the Noise Menu (R&S FSV-K30)", on page 39.

6.5 BW key

This key opens the "Measurement Settings" dialog box and jumps directly to the "RBW" field (see "RBW" on page 49).

6.6 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).

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

SCPI command:
`INITiate<n>:CONTinuous` on page 98
`CONFigure:LIST:CONTinuous` on page 86

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 3.1, "Measurement Types", on page 11.

SCPI command:
`INITiate<n>:CONTinuous` on page 98
`CONFigure:LIST:SINGle` on page 86

Cal
Performs a calibration. The calibration status of the noise figure measurement is displayed in the title bar. For more details see chapter 3.6, "Calibration", on page 18

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 85

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 55 softkey).

SCPI command:
`CONFigure:SINGle` on page 86
`[SENSe:]FREQuency[:CW|:FIXed]` on page 107

6.7 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).

Display Graph/List
Switches between graphical and table display of the measurement results (see chapter 3.4, "Result Displays", on page 15).

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 84
`FETCh:ARRay:MEMory<1…3>:NOISe:FIGure` on page 94
`FETCh:ARRay:MEMory<1…3>:NOISe:GAIN` on page 94
`FETCh:ARRay:NOISE:TEMPerature` on page 95

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 88

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 87

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 3.9, "ASCII File Export Format", on page 21.

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 63).

SCPI command:
`FORMat:DEXPort:DSEParator` on page 96

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 96

6.8 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).

The R&S FSV-K30 option now has 4 markers, each of which can be set either to the noise, the gain, or any of the traces in memory.

Marker 1/2/3/4
Activates one of four possible markers and opens an edit dialog box to enter a value for the marker to be set to. Pressing the softkey again deactivates the marker. These softkeys are only available if measurement results are displayed.

SCPI command:
`CALCulate<n>:MARKer<m>[:STATe]` on page 82
`CALCulate<n>:MARKer<m>:X` on page 83
`CALCulate<n>:MARKer<m>:Y` on page 84

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

This softkey is only available if measurement results are displayed.

SCPI command:
`CALCulate<n>:MARKer<m>:TRACe` on page 83

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 81

6.9 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).

Select Marker (No)
Opens a submenu to select and display one of 4 markers. "(No)" indicates the number of the currently active marker. Peak and Min functions apply to this marker.

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

SCPI command:
`CALCulate<n>:MARKer<m>:MAXimum[:PEAK]` on page 82

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

SCPI command:
CALCulate<n>:MARKer<m>:MINimum[:PEAK] on page 82

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

This softkey is only available if measurement results are displayed.

SCPI command:
CALCulate<n>:MARKer<m>:TRACe on page 83

6.10 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
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 79

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 80

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 76

Frequency ← New
Specifies the receive frequencies.

SCPI command:
CALCulate<n>:LIMit<k>:CONTrol[:DATA] on page 76

Limit ← New
Specifies the limits for the receive frequencies.

SCPI command:
CALCulate<n>:LIMit<k>:LOWer[:DATA] on page 77
CALCulate<n>:LIMit<k>:UPPer[:DATA] on page 80

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 79
CALCulate<n>:LIMit<k>:LOWer:STATe on page 78
CALCulate<n>:LIMit<k>:UPPer:STATe on page 81

Delete
Deletes the selected limit line.

SCPI command:
CALCulate<n>:LIMit<k>:DELete on page 77

Edit Table mode
The following functions are available if a limit line table is focussed for editing. For details see chapter 5.2, "Working With Limit Lines", on page 37 and chapter 5.1, "Editing Tables", on page 37

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.

6.11 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.

Input (AC/DC)
Toggles the RF input of the R&S FSV between AC and DC coupling.

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

SCPI command:
`INPut:COUPling` on page 96

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 R&S FSV 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 R&S FSV for digital output to a connected device ("Transmitter" Type).

RX Settings ← EXIQ
Opens the "EX-IQ-BOX Settings" dialog box to configure the R&S FSV 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 R&S FSV 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 R&S FSV 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 DigIConf 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 "DigIConf" softkey in the R&S FSV once again.

SCPI command:
Remote commands for the R&S DigIConf software always begin with `SOURce:EBOX`.
Such commands are passed on from the R&S FSV to the R&S DigIConf automatically which then configures the R&S EX-IQ-BOX via the USB connection.
All remote commands available for configuration via the R&S DigIConf software are described in the "R&S®EX-IQ-BOX Digital Interface Module R&S®DigIConf Software Operating Manual".
Example 1:
```
SOURce:EBOX:*RST
SOURce:EBOX:*IDN?
```
Result:
"Rohde&Schwarz,DigIConf,02.05.436 Build 47"
Example 2:
```
SOURce:EBOX:USER:CLOCk:REFerence:FREQuency 5MHZ
```
Defines the frequency value of the reference clock.

Init Generator
This softkey immediately initializes the external signal generator with the settings configured in the R&S FSV-K30 option (see "Generator Settings/ Generator Frequency" on page 52). It also switches the external generator's RF output on. If any of the external generator settings have changed, initialization is required before a measurement using the external generator control can be run. Alternatively, initialization can be performed automatically before each measurement (see "Init Before Meas" on page 54).

SCPI command:
`SYSTem:CONFigure:GENerator:INITialise:IMMediate` on page 119

7 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 7.1, "STATus:OPERation Register", on page 70

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 7.2, "STATus:QUEStionable Register", on page 70

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

- chapter 7.3, "STATus:QUEStionable:CORRection Register", on page 71

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.

7.1 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	CORRecting Indicates that a user calibration is in progress.

7.2 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 STATus:QUESTionable:CORRection Register).

7.3 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

8 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 8.1, "Notation", on page 72.

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

8.1 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 (optionR&S FSV-K7S)
SPECM	Spectogram 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.

8.2 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.

Note that the R&S FSV-K30 option now has 4 markers; thus, the suffix for CALCulate:MARKer<m> commands can have the values 1-4.

8.2.1 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 80). Otherwise, the commands are the same as for the base unit.

CALCulate<n>:LIMit<k>:COMMent <Comment>

This command defines a comment for the selected limit line in all windows.

Suffix:
<n> irrelevant

<k> Selects the limit line.

Parameters:
<Comment> String containing the comment. The maximum number of characters the string may contain is 40.

Example: `CALC:LIM5:COMM 'Upper limit for spectrum'`
Defines the comment for limit line 5.

CALCulate<n>:LIMit<k>:CONTrol[:DATA] <LimitLinePoints>

This command defines the horizontal definition points of a lower limit line.

Suffix:
<n> Selects the measurement window.

<k> 1...8
Selects the limit line.

Parameters:
<LimitLinePoints> Variable number of x-axis values.
Note that the number of horizontal values has to be the same as the number of vertical values set with `CALCulate<n>:LIMit<k>:LOWer[:DATA]` or `CALCulate<n>:LIMit<k>:UPPer[:DATA]`. If not, the R&S FSV either adds missing values or ignores surplus values.
*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.

CALCulate<n>:LIMit<k>:CONTrol:SHIFt <Distance>

This command moves a complete limit line horizontally.

Compared to defining an offset, this command actually changes the limit line definition points by the value you define.

Suffix:

<n> Selects the measurement window.

<k> Selects the limit line.

Parameters:

<Distance> Numeric value that defines the distance of the shift.
The unit depends on the scale of the x-axis.

Example: `CALC:LIM2:CONT:SHIF 50KHZ`
Shifts all reference values of limit line 2 by 50 kHz.

CALCulate<n>:LIMit<k>:LOWer[:DATA] <LimitLinePoints>

This command defines the vertical definition points of a lower limit line.

If the measured values are smaller than the LOWer limit line, the limit check is violated.

Suffix:

<n> irrelevant

<k> 1...8
Selects the limit line.

Parameters:

<LimitLinePoints> Variable number of x-axis values.
Note that the number of horizontal values has to be the same as the number of vertical values set with `CALCulate<n>:LIMit<k>:CONTrol[:DATA]`. If not, the R&S FSV either adds missing values or ignores surplus values.

*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.

CALCulate<n>:LIMit<k>:DELete

This command deletes a limit line.

Suffix:

<n> irrelevant

<k> Selects the limit line.

Example: `CALC:LIM1:DEL`
Deletes limit line 1.

Usage: Event

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

This command queries the result of a limit check.

Note that for SEM measurements, the limit line suffix <k> is irrelevant, as only one specific SEM limit line is checked for the currently relevant power class.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps.

Suffix:
<n> irrelevant

<k> limit line

Return values:
<Result> **0**
PASS

1
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.

Usage: Query only

CALCulate<n>:LIMit<k>:LOWer:SHIFt <Distance>

This command moves a complete lower limit line vertically.

Compared to defining an offset, this command actually changes the limit line definition points by the value you define.

Suffix:
<n> irrelevant

<k> Selects the limit line.

Parameters:
<Distance> Numeric value that defines the distance of the shift.

Example: `CALC:LIM3:LOW:SHIF 20DB`
Shifts all Y values of limit line 3 by 20 dB.

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

This command turns a lower limit line on and off.

Before you can use this command, you have to select a limit line with `CALCulate<n>:LIMit<k>:NAME`.

The limit check is activated separately with CALCulate<n>:LIMit<k>:STATe. The result of the limit check can be queried with CALCulate<n>:LIMit<k>:FAIL.

Suffix:
<n> irrelevant

<k> 1...8
Selects the limit line.

Parameters:
<State> ON | OFF

*RST: OFF

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

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

This command selects a limit line that already exists or defines a name for a new limit line.

Suffix:
<n> irrelevant

<k> 1...8 (NF: 1...6)
Selects the limit line.

Parameters:
<Name> String containing the limit line name.

*RST: REM1 to REM8 for lines 1 to 8

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

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

This command turns the limit check on and off.

To query the limit check result, use CALCulate<n>:LIMit<k>:FAIL.

Suffix:
<n> irrelevant

<k> Selects the limit line.

Parameters:
<State> ON | OFF

*RST: OFF

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

CALCulate<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>:UPPer[:DATA] <LimitLinePoints>

This command defines the vertical definition points of an upper limit line.

If the measured values exceed the UPPer limit line, the limit is violated.

Suffix:

<n> irrelevant

<k> 1...8
Selects the limit line.

Parameters:

<LimitLinePoints> Variable number of x-axis values.
Note that the number of horizontal values has to be the same as the number of vertical values set with `CALCulate<n>:LIMit<k>:CONTrol[:DATA]`. If not, the R&S FSV either adds missing values or ignores surplus values.

*RST: (LIMit:STATe 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.

CALCulate<n>:LIMit<k>:UPPer:SHIFt <Value>

This command moves a limit line by the indicated value in Y direction.

Suffix:
<n> irrelevant

<k> limit line

Parameters:
<Value> **<numeric_value>**

Example: `CALC:LIM3:UPP:SHIF 20`
Shifts all Y values of limit line 3 by 20 limit line units, e.g. dB.

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

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

This command turns a lower limit line on and off.

Before you can use this command, you have to select a limit line with `CALCulate<n>:LIMit<k>:NAME`.

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

Suffix:
<n> irrelevant

<k> 1...8
Selects the limit line.

Parameters:
<State> ON | OFF

*RST: OFF

Example: `CALC:LIM4:UPP:STAT ON`
Switches on limit line 4 (upper limit).

8.2.2 CALculate:MARker subsystem

CALCulate<n>:MARKer<m>:AOFF

This command all markers off, including delta markers and marker measurement functions.

Suffix:
<n> Selects the measurement window.

<m> depends on mode
irrelevant

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

Usage: Event

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

This command positions the marker on the current trace maximum.

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.

Suffix:
<n> Selects the measurement window.

<m> depends on mode
Selects the marker.

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

Usage: Event

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

This command positions the marker on the current trace minimum.

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> Selects the measurement window.

<m> depends on mode
Selects the marker.

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

Usage: Event

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

This command turns markers on and off.

If the corresponding marker number is currently active as a deltamarker, it is turned into a normal marker.

Suffix:
<n> Selects the measurement window.

<m> depends on mode
Selects the marker.

Parameters:

<State> ON | OFF

*RST: OFF

Example: CALC:MARK3 ON

Switches on marker 3 or switches to marker mode.

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

This command selects the trace a marker is positioned on.

The corresponding trace must have a trace mode other than "Blank".

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

Suffix:

<n> Selects the measurement window.

<m> depends on mode
Selects the marker.

Parameters:

<Trace> **NOISe | GAIN | NMEM1 | NMEM2 | NMEM3 | GMEM1 | GMEM2 | GMEM3**

NOISe: Current noise trace

GAIN: Current gain trace

NMEM1 | NMEM2 | NMEM3: noise trace stored in memory 1, 2 or 3

The memory must have been populated first using the command CONFigure:ARRay:MEMory<1…3> ONCE

GMEM1 | GMEM2 | GMEM3: gain trace stored in memory 1, 2, or 3

The memory must have been populated first using the command CONFigure:ARRay:MEMory<1…3> ONCE

Example: CALC:MARK3:TRAC 2

Assigns marker 3 to trace 2.

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

This command positions a marker on a particular coordinate on the x-axis.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<Position> Numeric value that defines the marker position on the x-axis. The unit is either Hz (frequency domain) or s (time domain) or dB (statistics).

Range: The range depends on the current x-axis range.

Example: `CALC:MARK2:X 1.7MHz`
Positions marker 2 to frequency 1.7 MHz.

CALCulate<n>:MARKer<m>:Y?

This command queries the measured value of a marker.

The corresponding marker is activated before or switched to marker mode, if necessary.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps.

Suffix:
<n> Selects the measurement window.

<m> Selects the marker.

Return values:
<Result> The measured value of the selected marker is returned.

Example:
```
INIT:CONT OFF
```
Switches to single sweep mode.
```
CALC:MARK2 ON
```
Switches marker 2.
```
INIT;*WAI
```
Starts a sweep and waits for the end.
```
CALC:MARK2:Y?
```
Outputs the measured value of marker 2.

Usage: Query only

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

The CONFigure subsystem contains commands for configuring complex measurement tasks.

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>.

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.

Usage: Event

Mode: NF

CONFigure:CORRection

This command configures for a second stage correction measurement.

Example: `CONF:CORR`
Configures to run second stage correction measure measurements.
`INIT`
Starts a new measurement, if no measurement sequence is already in progress.

Usage: Event

Mode: 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).

Example: `FREQ:STAR 20MHz`
Defines the single frequency to be measured as 20 MHz.
`CONF:FREQ:CONT`
Configures to run a single frequency measurement in continuous sweep mode.
`INIT`
Starts a new measurement, if no measurement sequence is already in progress.

Usage: Event

Mode: 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).

Example: `FREQ:STAR 20MHz`
Defines the single frequency to be measured as 20 MHz.
`CONF:FREQ:SING`
Configures to run a single frequency measurement in single sweep mode.
`INIT`
Starts a new measurement, if no measurement sequence is already in progress.

Usage: Event

Mode: NF

CONFigure:LIST:CONTinuous

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

Example: `CONF:LIST:CONT`
Configures to run a frequency list measurement in continuous sweep mode.
`INIT`
Starts a new measurement, if no measurement sequence is already in progress.

Usage: Event

Mode: NF

CONFigure:LIST:SINGle

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

Example: `CONF:LIST:SING`
Configures to run frequency list measurement in single sweep modes.
`INIT`
Starts a new measurement, if no measurement sequence is already in progress.

Usage: Event

Mode: 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 86 or `CONFigure:FREQ:SINGle`/ `CONFigure:FREQ:CONTinuous` on page 85

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.
`INIT`
Starts a new measurement, if no measurement sequence is already in progress.

Usage: Event

Mode: NF

8.4 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.

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 confirmed

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 confirmed

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 confirmed

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> *RST: -30 dBm

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

Usage: SCPI confirmed

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 confirmed

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 confirmed

Mode: NF

8.5 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.

FETCh:ARRay:MEMory<1…3>:NOISe:FIGure?
FETCh:ARRay:MEMory<1…3>:NOISe:GAIN?
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 figure, gain or 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 84)
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?
FETCh:ARRay:NOISE:GAIN?
FETCh:ARRay:NOISE:TEMPerature?

This command queries the last recorded noise figure, gain or temperature measurement results. The results are returned as an array of up to 100 elements of noise 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?
FETCh:SCALar:NOISE:GAIN?
FETCh:SCALar:NOISE:TEMPerature?

This command queries the last recorded noise figure, gain or 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 86 or `CONFigure:FREQ:SINGle`/ `CONFigure:FREQ:CONTinuous` on page 85).

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.
`FETCh:SCAL:NOISE:TEMPerature?`
Returns the last noise temperature measurement at 10 MHz.

Usage: Query only

Mode: NF

8.6 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.

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

8.7 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> *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:COUPling <CouplingType>

Toggles the RF input of the R&S FSV between AC and DC coupling.

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:

<CouplingType> AC | DC
*RST: AC

Example: `INP:COUP:DC`

Mode: A, ADEMOD, BTS, CDMA, EVDO, TDS, VSA, WCDMA

INPut:DIQ:RANGe[:UPPer] <Level>

Defines or queries the "Full Scale Level", i.e. 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 52).

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:

<Level> <numeric value>
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 or queries the sample rate of the input signal from the R&S Digital I/Q Interface (see "Input Sample Rate" on page 52).

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:

<SampleRate> 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.

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:

<State> 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
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

8.8 INITiate Subsystem

INITiate<n>:CONTinuous <State>

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

In R&S FSV-K30, the measurement is not started by this command, `INITiate:IMMediate` has to be used to start a measurement.

Suffix:

<n> irrelevant

Parameters:

<State> ON | OFF

*RST: ON

Example: `INIT:CONT OFF`
Switches the sequence to single sweep.
`INIT:CONT ON`
Switches the sequence to continuous sweep.
`INIT:IMM`
Starts a new noise figure measurement in continuous sweep mode.

Mode: all

8.9 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] <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

8.10 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.

8.10.1 Equipment Settings Commands

[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 100
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 = 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 100
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> = 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 101

```
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> = 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 101

```
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

8.10.2 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 8.10, "SENSe Subsystem (Noise Figure, R&S FSV-K30)", on page 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 3.7, "Selecting the Appropriate Filter Type", on page 18.

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

[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.

For Fixed LO or Fixed IF measurements, the `[SENSe:]CONFigure:MODE:SYSTem:LOSCillator` command is also required.

Fixed local oscillator frequencies are taken from the settings supplied by [SENSe:]CONFigure:MODE:SYSTem:LOSCillator:FREQuency on page 107.

Fixed IF frequencies are taken from the settings supplied by [SENSe:]CONFigure:MODE:SYSTem:IF:FREQuency on page 106.

Parameters:

<Type> 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&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:IF:FREQuency <Frequency>

This remote control command specifies a fixed intermediate frequency for a new frequency measurement list that requires computing.

The command does not have any immediate effect if a direct frequency list is being used which is set by the remote control command SENS:CONF:MODE:DUT AMPL (see [SENSe:]CONFigure:MODE:DUT on page 105) or a variable intermediate frequency has been specified (set by the SENS:CONF:MODE:SYST:LOSC FIX command, see [SENSe:]CONFigure:MODE:SYSTem:LOSCillator on page 107).

This command is only available if the R&S FSV-B10 option (External Generator) is installed.

Parameters:

<Frequency> Range: 0 Hz to 999.99 GHz
*RST: - 0 Hz

Example: The DUT converts the input frequency to a lower output frequency.
SENS:CONF:MODE:SYST:IF:FREQ 500KHZ
Sets the fixed intermediate frequency for a new list, yet to be created, to a value of 500 kHz.

Mode: NF

[SENSe:]CONFigure:MODE:SYSTem:LOSCillator <Mode>

This remote control command specifies whether the local oscillator is used as a fixed frequency source or a variable frequency source. The command does not have any immediate effect if a direct frequency list is being used which is set by the remote control command `SENS:CONF:MODE:DUT AMPL` (see `[SENSe:]CONFigure:MODE:DUT` on page 105).

This command is only available if the R&S FSV-B10 option (External Generator) is installed.

Parameters:

<Mode> FIXed | VARiable

FIXed
Local Oscillator is used as a fixed frequency source.

VARiable
Local Oscillator is used as a variable frequency source.

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:

<Frequency> Range: 0 Hz to 999.99 GHz
*RST: - 0 Hz

Example: `[SENSe:]CONFigure:MODE:DUT` on page 105
`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 confirmed

Mode: NF

[SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency (frequency domain) or measuring frequency (time domain).

Parameters:

<Frequency> 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`

[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:

<FrequencyList> 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
<numeric_value>,<numeric_value>, … (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:
<Span> min span to fmax

*RST: fmax
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:SPAN 10MHz`

[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)

*RST: 0
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:STAR 20MHz`

[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

*RST: fmax

f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:STOP 2000 MHz`

[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, PHN:1)

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.

[SENSe:]SWEep:POINts <NumberPoints>

This command defines the number of measurement points to be collected during one sweep.

Parameters:

<NumberPoints> Range: 2 to 100
*RST: 11

Example: `SWE:POIN 251`

[SENSe:]SWEep:TIME <Time>

This command defines the sweep time.

The range depends on the frequency span.

Parameters:

<Time> refer to data sheet

*RST: (AUTO is set to ON)

Example: `SWE:TIME 10s`

8.11 SOURce Subsystem

SOURce<n>:EXTernal<generator>:FREQuency[:FACTor]:DENominator <Value>

This command defines the denominator of the factor with which the analyzer frequency is multiplied in order to obtain the transmit frequency of the selected generator.

This command is only valid for R&S FSV option External Tracking Generator (R&S FSV-B10).

Select the multiplication factor such that the frequency range of the generator is not exceeded if the following formula is applied to the start and stop frequency of the analyzer:

$$F_{Generator} = \left| F_{Analyzer} * \frac{Numerator}{Denominator} + F_{Offset} \right|$$

Suffix:

<n> irrelevant

<generator> 1 | 2
tracking generator
For Noise Figure measurements (K30): 1 only

Parameters:

<Value> <numeric value>

*RST: 1

Example:

```
SOUR:EXT:FREQ:NUM 4"
"SOUR:EXT:FREQ:DEN 3"
```

Sets a multiplication factor of 4/3, i.e. the transmit frequency of the generator is 4/3 times the analyzer frequency.

Mode: A, NF

SOURce<n>:EXTernal<generator>:FREQuency[:FACTor]:NUMerator <Value>

This command defines the numerator of the factor with which the analyzer frequency is multiplied in order to obtain the transmit frequency of the selected generator.

This command is only valid for R&S FSV option External Tracking Generator (R&S FSV-B10).

Select the multiplication factor such that the frequency range of the generator is not exceeded if the following formula is applied to the start and stop frequency of the analyzer:

$$F_{Generator} = \left| F_{Analyzer} * \frac{Numerator}{Denomination} + F_{Offset} \right|$$

Suffix:
<n> irrelevant

<generator> 1 | 2
tracking generator
For Noise Figure measurements (K30): 1 only

Parameters:
<Value> <numeric value>

*RST: 1

Example: `SOUR:EXT:FREQ:NUM 4"`
`"SOUR:EXT:FREQ:DEN 3"`
Sets a multiplication factor of 4/3, i.e. the transmit frequency of the generator is 4/3 times the analyzer frequency.

Mode: A, NF

SOURce<n>:EXTernal<generator>:FREQuency:OFFSet<m> <Offset>

This command defines the frequency offset of the selected generator with reference to the receive frequency.

This command is only valid for R&S FSV option External Tracking Generator (R&S FSV-B10).

Suffix:
<n> irrelevant

<generator> 1 | 2
tracking generator
For Noise Figure measurements (K30): 1 only

<m> 1 | 2
offset (for Noise Figure measurements (K30) only)

Parameters:
<Offset> <numeric value>, specified in Hz, kHz, MHz or GHz, rounded to the nearest Hz

*RST: 0 Hz
Select the multiplication factor such that the frequency range of the generator is not exceeded if the following formula is applied to the start and stop frequency of the analyzer:

$F_{Generator} = \left| F_{Analyzer} * \frac{Numerator}{Denomination} + F_{Offset} \right|$

For Noise Figure measurements (R&S FSV-K30), the following formula applies:
Generator Frequency = [(LO + Offset 1) * Factor 1 / Factor 2)] + Offset 2

Example: SOUR:EXT:FREQ:OFFS 1GHZ
Sets a frequency offset of the generator transmit frequency compared to the analyzer receive frequency of 1 GHz.

Mode: A, NF

SOURce<n>:EXTernal<generator>:POWer[:LEVel] <Level>

This command sets the output power of the selected generator.

This command is only valid for R&S FSV option External Tracking Generator (R&S FSV-B10).

Suffix:
<n> irrelevant

<generator> 1 | 2
tracking generator
For Noise Figure measurements (K30): 1 only

Parameters:
<Level> <numeric value>
*RST: -20 dBm

Example: SOUR:EXT:POW -30dBm
Sets the generator level to -30 dBm

Mode: A, NF

SOURce<n>:EXTernal<generator>:ROSCillator[:SOURce] <Source>

This command controls selection of the reference oscillator for the external tracking generator (requires option R&S FSV-B10).

If the external reference oscillator is selected, the reference signal must be connected to the rear panel of the instrument.

Suffix:
<n> irrelevant

<generator> 1 | 2
tracking generator
For Noise Figure measurements (K30): 1 only

Parameters:
<Source> **INTernal**
the internal reference is used

EXTernal
the external reference is used; if none is available, an error flag is displayed in the status bar

*RST: INT

Example: SOUR:EXT:ROSC EXT
Switches to external reference oscillator

Mode: A, NF

8.12 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]?

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 confirmed

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 confirmed

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 confirmed

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:
<BitDefinition> 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 confirmed

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:
<BitDefinition> 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 confirmed

Mode: NF

8.13 SYSTem Subsystem (Noise Figure, R&S FSV-K30)

This subsystem contains a series of commands for general functions.

SYSTem:COMMunicate:GPIB:RDEVice:GENerator<generator>:ADDRess <Number>

Changes the IEC/IEEE-bus address of the external tracking generator.

This command is only available if the R&S FSV option B10 (External Tracking Generator) is installed.

Suffix:
<generator> 1 | 2
tracking generator
For Noise Figure measurements (K30): 1 only

Parameters:
<Number> Range: 0 to 30
*RST: 28

Example: `SYST:COMM:GPIB:RDEV:GEN1:ADDR 15`

Mode: A, NF

SYSTem:COMMunicate:RDEVice:GENerator<generator>:INTerface <Type>

Defines the interface used for the connection to the external tracking generator.

This command is only available if the R&S FSV option B10 (External Tracking Generator) is installed.

Suffix:
<generator> 1 | 2
tracking generator
For Noise Figure measurements (K30): 1 only

Parameters:
<Type> GPIB | TCPip
*RST: GPIB

Example: `SYST:COMM:RDEV:GEN1:INT TCP`

Mode: A, NF

SYSTem:COMMunicate:RDEVice:GENerator<generator>:LINK <Type>

This command selects the link type of the external generator if the GPIB interface is used.

The difference between the two GPIB operating modes is the execution speed. While, during GPIB operation, each frequency to be set is transmitted to the generator separately, a whole frequency list can be programmed in one go if the TTL interface is also used. Frequency switching can then be performed per TTL handshake which results in considerable speed advantages.

Notes: Only one of the two generators can be operated via the TTL interface at a time. The other generator must be configured via GPIB.

For Noise Figure measurements (K30), TTL synchronization has no effect.

This command is only available if the R&S FSV option B10 (External Tracking Generator) is installed.

Suffix:
<generator> 1 | 2
tracking generator
For Noise Figure measurements (K30): 1 only

Parameters:
<Type> GPIB | TTL

GPIB
GPIB connection without TTL synchronization (for all generators of other manufacturers and some Rohde & Schwarz devices)

TTL
GPIB connection with TTL synchronization (if available; for most Rohde&Schwarz devices)

*RST: GPIB

Example: `SYST:COMM:RDEV:GEN:LINK TTL`
Selects GPIB + TTL interface for generator operation.

Mode: A, NF

SYSTem:COMMunicate:RDEVice:GENerator<generator>:TYPE <Name>

This command selects the type of external generator. For a list of the available generator types including the associated interface, see chapter 3.10, "Overview of Generators Supported by the R&S FSV", on page 22.

If no external generator type is currently configured, the query returns "NONE".

This command is only available if the R&S FSV option B10 (External Tracking Generator) is installed.

Suffix:
<generator> 1 | 2
tracking generator
For Noise Figure measurements (K30): 1 only

Parameters:
<Name> Generator name | NONE

*RST: NONE

Example: `SYST:COMM:RDEV:GEN2:TYPE 'SME02'`
Selects SME02 as generator 2

Mode: A, NF

SYSTem:COMMunicate:TCPip:RDEVice:GENerator<generator>:ADDRess <Address>

Configures the TCP/IP address for the external tracking generator 1 or 2.

This command is only available if the R&S FSV option B10 (External Tracking Generator) is installed.

Suffix:
<generator> 1 | 2
tracking generator
For Noise Figure measurements (K30): 1 only

Parameters:
<Address> TCP/IP address between 0.0.0.0 and 0.255.255.255
*RST: 0.0.0.0

Example: `SYST:COMM:TCP:RDEV:GEN1:ADDR 130.094.122.195`

Mode: A

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:
<Gain> 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 spcifies 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:
<Time> 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

SYSTem:CONFigure:GENerator:CONTrol:STATe <State>

This remote control command specifies whether the setup of the external generator is to be automatically controlled by the R&S FSV-K30 option (via GPIB) or manually by the user.

Parameters:

<State> ON | OFF

ON
Setup controlled by the tracking generator.

OFF
Setup controlled manually by the user.

*RST: OFF

Example: `SYST:CONF:GEN:CONT:STAT ON`
The R&S FSV-K30 option completely controls the setting of the external signal generator.

Mode: NF

SYSTem:CONFigure:GENerator:INITialise:IMMediate

This remote control command immediately initializes the external signal generator with the settings configured in the R&S FSV-K30 option (reference, power level , etc.). It also switches the external generator's RF output on. This has to be done before a measurement using the external generator control can be run if any of the external generator settings have changed, unless the auto-initialisation feature is enabled (see `SYSTem:CONFigure:GENerator:INITialise:AUTO` on page 119).

Example: `SYST:CONF:GEN:INIT:IMM`
The R&S FSV-K30 option initialises the selected signal generator.

Usage: Event

Mode: NF

SYSTem:CONFigure:GENerator:INITialise:AUTO <State>

This remote control command specifies whether an initialisation sequence of GPIB commands is sent to an external signal generator prior to performing each measurement. Sending an initialisation sequence before each measurement ensures that the signal generator is in the correct state to receive control commands during a measurement sequence. On the other hand, initialising an external signal generator before each measurement adds a time overhead to each measurement.

Parameters:

<State> ON | OFF

ON
The R&S FSV-K30 option initialises the selected signal generator prior to starting each requested measurement.

OFF
No initialization is performed.

*RST: OFF

Example: `SYST:CONF:GEN:INIT:AUTO ON`
The R&S FSV-K30 option initialises the selected signal generator prior to starting each requested measurement.

Mode: NF

SYSTem:CONFigure:GENerator:SWITch:AUTO <State>

This remote control command specifies whether a sequence of GPIB commands is sent to an external signal generator at the end of each measurement (after a single sweep or after a measurement is aborted) to switch the generator's RF output off and end remote control.

Parameters:

<State> ON | OFF

ON
The generator's RF output is switched OFF after each measurement and remote control is ended.

OFF
The generator's RF output is NOT switched off after each measurement; remote control remains active.

*RST: OFF

Example: `SYST:CONF:GEN:SWIT:AUTO ON`
The R&S FSV-K30 option switches the generator's RF output OFF after each measurement and ends remote control.

Usage: Event

Mode: NF

9 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 of 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.

List of Commands

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