R&S®NRX
Power Meter
User Manual

1178556602

User Manual

Version 04

ROHDE&SCHWARZ

This manual describes the R&S®NRX (1424.7005.02) with firmware version FW 02.00 and later.
In addition to the base unit, the following options are described:

- R&S®NRX-B1 (1424.7805.02)
- R&S®NRX-B4 (1424.8901.02)
- R&S®NRX-B8 (1424.8301.02)
- R&S®NRX-B9 (1424.8601.02)
- R&S®NRX-K2 (1424.9208.02)
- R&S®NRX-K4 (1424.9308.02)

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1178.5566.02 | Version 04 | R&S®NRX

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

Safety Instructions
Instrucciones de seguridad
Sicherheitshinweise
Consignes de sécurité

⚠ WARNING

Risk of injury and instrument damage

The instrument must be used in an appropriate manner to prevent electric shock, fire, personal injury or instrument damage.

- Do not open the instrument casing.
- Read and observe the "Basic Safety Instructions" delivered as printed brochure with the instrument.
- Read and observe the safety instructions in the following sections. Note that the data sheet may specify additional operating conditions.
- Keep the "Basic Safety Instructions" and the product documentation in a safe place and pass them on to the subsequent users.

⚠ ADVERTENCIA

Riesgo de lesiones y daños en el instrumento

El instrumento se debe usar de manera adecuada para prevenir descargas eléctricas, incendios, lesiones o daños materiales.

- No abrir la carcasa del instrumento.
- Lea y cumpla las "Instrucciones de seguridad elementales" suministradas con el instrumento como folleto impreso.
- Lea y cumpla las instrucciones de seguridad incluidas en las siguientes secciones. Se debe tener en cuenta que las especificaciones técnicas pueden contener condiciones adicionales para su uso.
- Guarde bien las instrucciones de seguridad elementales, así como la documentación del producto, y entréguelas a usuarios posteriores.

⚠ WARNUNG

Gefahr von Verletzungen und Schäden am Gerät

Betreiben Sie das Gerät immer ordnungsgemäß, um elektrischen Schlag, Brand, Verletzungen von Personen oder Geräteschäden zu verhindern.

- Öffnen Sie das Gerätegehäuse nicht.
- Lesen und beachten Sie die "Grundlegenden Sicherheitshinweise", die als gedruckte Broschüre dem Gerät beiliegen.
- Lesen und beachten Sie die Sicherheitshinweise in den folgenden Abschnitten; möglicherweise enthält das Datenblatt weitere Hinweise zu speziellen Betriebsbedingungen.
- Bewahren Sie die "Grundlegenden Sicherheitshinweise" und die Produktdokumentation gut auf und geben Sie diese an weitere Benutzer des Produkts weiter.

⚠ AVERTISSEMENT

Risque de blessures et d'endommagement de l'appareil

L'appareil doit être utilisé conformément aux prescriptions afin d'éviter les électrocutions, incendies, dommages corporels et matériels.

- N'ouvrez pas le boîtier de l'appareil.
- Lisez et respectez les "consignes de sécurité fondamentales" fournies avec l’appareil sous forme de brochure imprimée.
- Lisez et respectez les instructions de sécurité dans les sections suivantes. Il ne faut pas oublier que la fiche technique peut indiquer des conditions d’exploitation supplémentaires.
- Gardez les consignes de sécurité fondamentales et la documentation produit dans un lieu sûr et transmettez ces documents aux autres utilisateurs.

Contents

1 Preface

This chapter provides safety related information and an introduction to the R&S NRX.

1.1 For Your Safety

The R&S NRX is designated for use in industrial, administrative, and laboratory environments. Use the R&S NRX only for its designated purpose. Observe the safety and usage instructions documented in the user manual, as well as operating conditions and performance limits stated in the data sheet.

The product documentation helps you to use the R&S NRX safely and efficiently. Keep the product documentation in a safe place and pass it on to the subsequent users.

Safety information is part of the product documentation. It warns you about the potential dangers and gives instructions how to prevent personal injury or damage caused by dangerous situations. Safety information is provided as follows:

- In the "Basic Safety Instructions", safety issues are grouped according to subjects. For example, one subject is electrical safety. The "Basic Safety Instructions" are delivered with the R&S NRX in different languages in print.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation. Always read the safety instructions carefully. Make sure to comply fully with them. Do not take risks and do not underestimate the potential danger of small details such as a damaged power cable.

1.2 Documentation Overview

This section provides an overview of the R&S NRX user documentation. Unless specified otherwise, you find the documents on the R&S NRX product page at:

www.rohde-schwarz.com/manual/NRX

1.2.1 Getting Started Manual

Introduces the R&S NRX and describes how to set up and start working with the product. A printed version is delivered with the instrument.

1.2.2 User Manuals and Help

Contains the description of all instrument modes and functions. It also provides an introduction to remote control, a complete description of the remote control commands with programming examples, and information on maintenance, instrument interfaces and error messages. Includes the contents of the getting started manual .

1.2.3 Tutorials

Tutorials offer guided examples and demonstrations on operating the R&S NRX. They are provided on the product page of the internet.

1.2.4 Basic Safety Instructions

Contains safety instructions, operating conditions and further important information. The printed document is delivered with the instrument.

1.2.5 Data Sheets and Brochures

The data sheet contains the technical specifications of the R&S NRX. It also lists the firmware applications and their order numbers, and optional accessories.

The brochure provides an overview of the instrument and deals with the specific characteristics.

See www.rohde-schwarz.com/brochure-datasheet/NRX

1.2.6 Release Notes and Open Source Acknowledgment (OSA)

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

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

See www.rohde-schwarz.com/firmware/NRX

1.2.7 Application Notes, Application Cards, White Papers, etc.

These documents deal with special applications or background information on particular topics.

See www.rohde-schwarz.com/application/NRX

1.3 Key Features

The R&S NRX offers the following key features:

- Simple touchscreen operation on a 5" color touchscreen
- Straightforward numerical and graphical display of measured values
- Expandable to up to four measurement channels
- Frequency-range from DC to 110 GHz (sensor-dependent)

2 Instrument Tour

2.1 Front Panel Tour

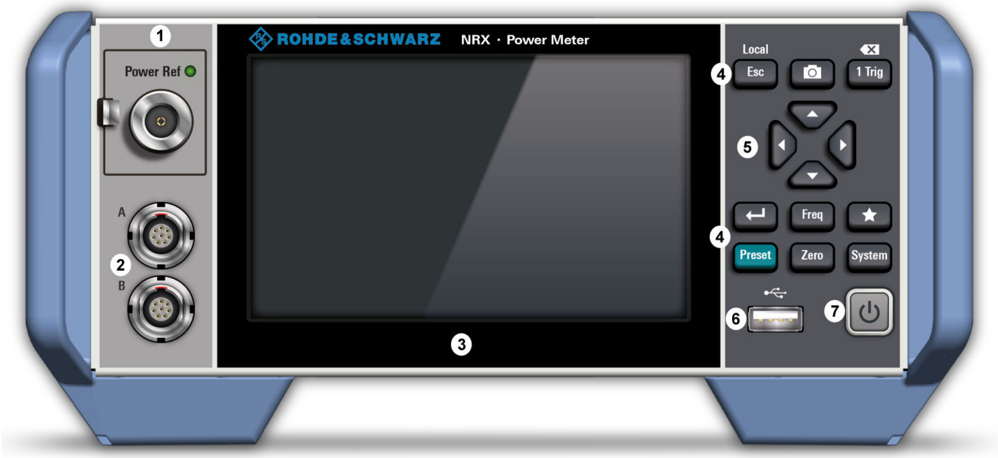


Figure 2-1: Front View of R&S NRX

1 = Module bay for optional connectors, see Chapter 2.1.2, "Module Bay", on page 14.
2 = Sensor connectors A and B, see Chapter 2.1.1, "Sensor Connector A and B", on page 13.
3 = Touchscreen, see Chapter 2.1.3, "Touchscreen", on page 14.
4 = Keys, see Chapter 2.1.4, "Keys", on page 14.
5 = Cursor keys, see "Cursor keys" on page 16.
6 = USB host interface, see Chapter 2.1.5, "USB Host Interface", on page 16.
7 = On/standby key, see Chapter 2.1.6, "On/Standby Key", on page 17.

2.1.1 Sensor Connector A and B

See (2) in Figure 2-1.

Sensor connectors A and B are used to connect the R&S NRP power sensors and the R&S NRQ6. For details on the supported power sensors, see the data sheet.

The complete functional range, including external trigger and reference clock for the synchronization of connected sensors, is provided by these connectors.

Further information:

- Chapter 3.8.1, "R&S NRPxxS/A/T and R&S NRQ6", on page 24
- Chapter 3.8.2, "R&S NRP-Zxx", on page 25

2.1.2 Module Bay

See (1) in Figure 2-1.

There are two options that fit in this bay. If you have both options, you can exchange them. If no option is installed, the module bay is closed by a cover.

- sensor interface for R&S NRT (R&S NRX-B9)
  Provides an optional power sensor connector to connect an R&S NRT-Zxx power sensor. For supported power sensors, see the data sheet.
- sensor check source (R&S NRX-B1)
  Used as a power reference for testing the connected power sensors.

Further information:

- Chapter 3.8.3, "R&S NRT-Zxx", on page 25

2.1.3 Touchscreen

See (3) in Figure 2-1.

The R&S NRX displays results in panes. Depending on the measurement mode, values are displayed digitally or graphically.

False triggers of the touch panel in the presence of static electricity

If an object (e.g. a human finger) that is charged with static electricity is brought near the touch panel, false triggers can occur.

This behavior is caused by the principle of operation of a PCAP (projected capacitive) touch panel.

Further information:

- "Using the touchscreen" on page 26

2.1.4 Keys

See (4) in Figure 2-1.

[Esc] / Local

If you press shortly:
- Changes to the next-higher hierarchy level.
- Escapes from the entry mode in text boxes and lists.
- Closes dialogs and menus without losing any entries that have been made.
- Switches from remote control mode (all controls disabled) to manual operation.

If you press and hold:
- Goes to the start dialog that shows an overview of the current measurements.
  See Chapter 4.1.1, "Start Dialog", on page 26.

Further information:
- "Going back to a higher hierarchy level" on page 26
- Chapter 4.2.2, "Returning to Manual Operation (LOCAL)", on page 36

Screenshot

Creates a screenshot of the current display.

See Chapter 4.1.8, "Creating and Saving Screenshots", on page 34.

Remote command:
`SYSTem:HCOPy` on page 329

[1Trig] / Delete

- Controls the measurements depending on the trigger mode:
  - For all trigger modes except "Single", starts and stops the measurement.
  - For the "Single" trigger mode, enables and triggers the measurement.

  Changes of the trigger state apply to all measurements.
  See also "Trigger Mode" on page 49.
- Resets the auxiliary values that provide additional information about the measured values.
  See also "Auxiliary Values" on page 44.
- Deletes numbers or text in a field so that you can enter a new value.

Enter

- Confirms entries in text fields, dialogs and selections in lists.
- Shows a frame around the control in focus. You can change the focus using the Cursor keys.

[Freq]

Sets the carrier frequency of the applied signal. This value is used for frequency-response correction of the measurement result.

Remote command:
`[SENSe<Sensor>:]FREQuency[:CW]` on page 258

Favorites

Reserved for future use.

[Preset]

Pressing [Preset] opens the "Save / Recall / Preset" dialog.

See Chapter 9, "Instrument Settings - Save, Recall, Preset", on page 97.

If you press [Preset] again, the function "Preset" starts.

- Sets the R&S NRX to its default setting. Default settings are sensor specific.
- Sets the R&S NRX to a setting selected from the recall list.

[Zero]

Pressing [Zero] opens the "Zeroing Sensors" dialog.

If you press [Zero] again, "Zero All Sensors" starts.

- Starts the zero calibration.
- Displays zeroing status.
- Displays sensor status.

[System]

Opens the "System Overview" dialog.

See Chapter 11, "System Settings", on page 101.

Cursor keys

See (5) in Figure 2-1.

The cursor keys are context-sensitive. The control in focus is indicated by a focus frame. Use the cursor keys as follows:

- Selecting a menu.
- Selecting the active pane.
- Selecting an element from a list.
- Moving the cursor in text boxes.
- Changing the value of an entry in a text box.

2.1.5 USB Host Interface

See (6) in Figure 2-1.

USB 2.0 (universal serial bus) interface of the type A (host USB). Used to connect external devices like a keyboard, mouse, or memory stick. See Chapter 3.7, "Connecting USB and External Devices", on page 24.

2.1.6 On/Standby Key

See (7) in Figure 2-1.

The on/standby key toggles the R&S NRX between standby and ready state.

The following states are possible:

- Off (key is not illuminated)
  The AC power switch on the back of the R&S NRX is switched off. The R&S NRX is disconnected from the AC power supply.
- Ready (green)
  The R&S NRX is ready for operation.
- Standby (red)
  The power supply has the operating voltage supplied to it. Thus, the R&S NRX is still power-supplied.

For operating details, see Chapter 3.6, "Switching On or Off", on page 23.

2.2 Rear Panel Tour

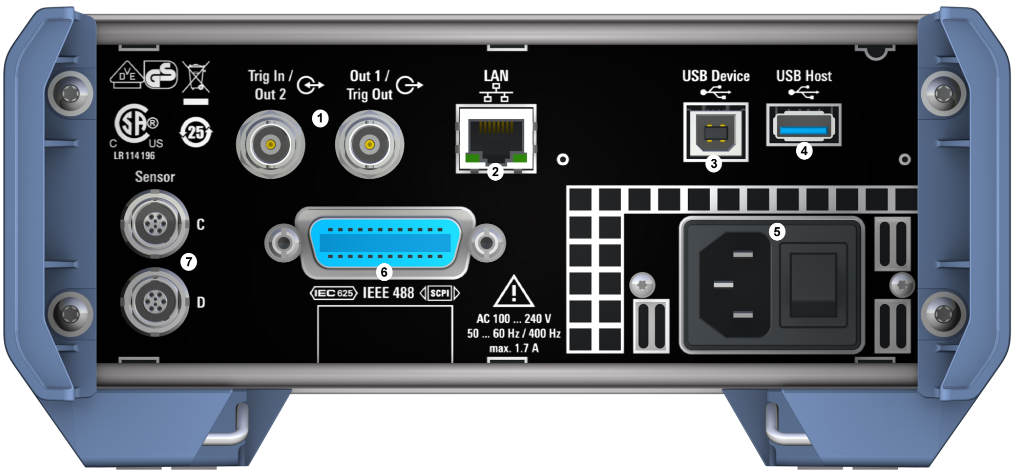


Figure 2-2: RearView of R&S NRX

1 = Trig In / Out 2 and Out 1 / Trig Out connectors, see Chapter 2.2.1, "Trig In / Out 2 and Out 1 / Trig Out Connectors", on page 18.
2 = Ethernet interface, see Chapter 2.2.2, "Ethernet Interface", on page 18.
3 = USB device interface, see Chapter 2.2.3, "USB Device Interface", on page 18.
4 = USB host interface, see Chapter 2.2.4, "USB Host Interface", on page 18.
5 = AC supply and power switch, see Chapter 2.2.5, "AC Supply and Power Switch", on page 18.
6 = IEC 625/IEEE 488 interface, optional, see Chapter 2.2.6, "IEC 625/IEEE 488 Interface", on page 19.
7 = Sensor connectors C and D (optional), used to connect R&S power sensors, see Chapter 2.2.7, "Sensor Connectors C and D", on page 19.

2.2.1 Trig In / Out 2 and Out 1 / Trig Out Connectors

See (1) in Figure 2-2.

The Out 1 / Trig Out BNC connectors supply an analog signal with a voltage between 0 V and 2.5 V. It can be used to output a voltage that is proportional to the measured value (e.g. for level regulation) or a digital signal for limit monitoring.

The Trig In / Out 2 BNC connectors can be used either as an external trigger input with a switchable impedance (10 kΩ or 50 Ω) or as a second analog output.

By default, the Trig In / Out 2 and Out 1 / Trig Out connectors are disabled.

Further information:

- Chapter 11.1.3, "Input/Output Settings (I/O)", on page 108

2.2.2 Ethernet Interface

See (2) in Figure 2-2.

The Ethernet connector is an RJ45 socket for remote controlling the R&S NRX via a network.

2.2.3 USB Device Interface

See (3) in Figure 2-2.

USB 2.0 (universal serial bus) interface of the type B (receptacle). Used to connect the R&S NRX to a computer for USB remote control.

2.2.4 USB Host Interface

See (4) in Figure 2-2.

See Chapter 2.1.5, "USB Host Interface", on page 16.

2.2.5 AC Supply and Power Switch

See (5) in Figure 2-2.

When the R&S NRX is connected to the AC supply, it automatically sets itself to the correct range for the applied voltage. The range is printed on the type label. There is no need to set the voltage manually.

For more details, see Chapter 3.5, "Connecting to the AC Power Supply", on page 23.

2.2.6 IEC 625/IEEE 488 Interface

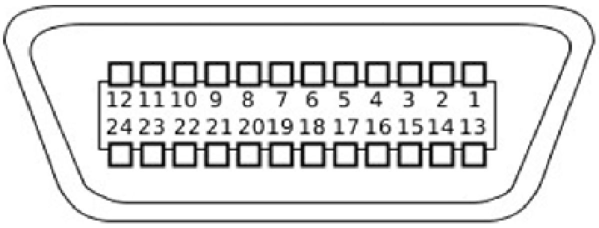
See (6) in Figure 2-2.

Requires GPIB/IEEE488 interface (R&S NRX-B8).

IEC bus (IEEE 488) interface for remote control of the R&S NRX. Used to connect a controller to remote control the R&S NRX. Use a shielded cable for the connection.

Characteristics of the IEC bus (IEEE 488) interface:

- 8-bit parallel data transfer
- Bidirectional data transfer
- Three-wire handshake
- High data transfer rate
- Maximum length of connecting cables 15 m (single connection 2 m)



2.2.7 Sensor Connectors C and D

See (7) Figure 2-2.

Requires 3rd and 4th R&S NRP sensor connector (R&S NRX-B4).

For more details, see Chapter 2.1.1, "Sensor Connector A and B", on page 13.

3 Preparing for Use

3.1 Unpacking and Checking

Check the equipment for completeness using the delivery note and the accessory lists for the various items. Check the R&S NRX for any damage. If there is damage, immediately contact the carrier who delivered the R&S NRX. Make sure not to discard the box and packing material.

Packing material

Retain the original packing material. If the instrument needs to be transported or shipped later, you can use the material to protect the control elements and connectors.

3.1.1 Accessory List

The R&S NRX comes with the following accessories:

- Printed getting started manual
- Multilingual safety brochure
- Additive data sheet ref. China ROHS
- Country-specific power cable

3.2 Operating Conditions

Specific operating conditions are required to ensure accurate measurements and to avoid damage to the R&S NRX and connected devices. Before switching on the R&S NRX, observe the information on appropriate operating conditions provided in the basic safety instructions and the data sheet of the R&S NRX.

In particular, ensure the following:

- The R&S NRX is dry and shows no sign of condensation.
- The ambient temperature does not exceed the range specified in the data sheet.
- Signal levels at the input connectors are all within the specified ranges.

- Signal outputs are connected correctly and are not overloaded.

3.3 Important Aspects for Test Setup

Preventing electrostatic discharge (ESD)

Electrostatic discharge is most likely to occur when you connect or disconnect a DUT or test fixture to the instrument's test ports.

► **NOTICE!** Risk of electrostatic discharge (ESD). Electrostatic discharge (ESD) can damage the electronic components of the R&S NRX and the device under test (DUT).

Ground yourself to avoid electrostatic discharge (ESD) damage:

- Use a wrist strap and cord to connect yourself to the ground.
- Use a conductive floor mat and heel strap combination.

EMI impact on measurement results

Electromagnetic interference (EMI) may affect the measurement results.

To suppress generated electromagnetic interference (EMI):

- Use suitable shielded cables of high quality. For example, use double-shielded RF and LAN cables.
- Always terminate open cable ends.
- Note the EMC classification in the data sheet.
- Do not use USB connecting cables exceeding 5 m.

3.4 Placing on a Bench Top

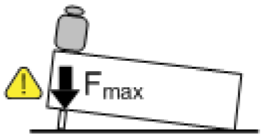
Place the R&S NRX on a stable and level surface. The R&S NRX can be used in horizontal position, standing on its feet, or with the support feet on the bottom extended. Do not place anything on top of the R&S NRX, if the R&S NRX is not in a level position.

WARNING

Risk of injury if feet are folded out

The feet can fold in if they are not folded out completely or if the instrument is shifted. Collapsing feet can cause injury or damage the instrument.

- Fold the feet completely in or out to ensure stability of the instrument. Never shift the instrument when the feet are folded out.
- When the feet are folded out, do not work under the instrument or place anything underneath.
- The feet can break if they are overloaded. The overall load on the folded-out feet must not exceed 500 N.



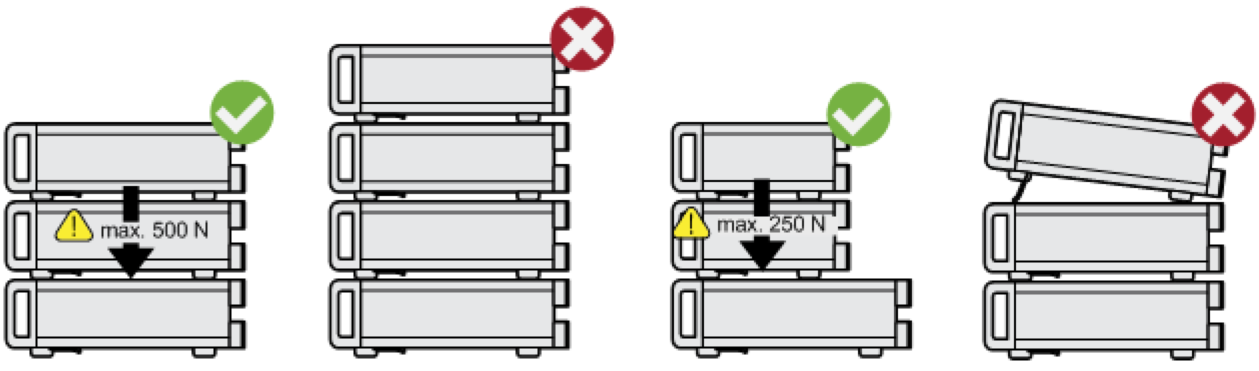
WARNING

Risk of injury when stacking instruments

A stack of instruments can tilt over and cause injury if not stacked correctly. Furthermore, the instruments at the bottom of the stack can be damaged due to the load imposed by the instruments on top.

Observe the following instructions when stacking instruments:

- Never stack more than three instruments. If you need to stack more than three instruments, install them in a rack.
- The overall load imposed on the lowest instrument must not exceed 500 N.
- It is best if all instruments have the same dimensions (width and length).
  If you need to stack smaller instruments on the top, the overall load imposed on the lowest instrument must not exceed 250 N.
- If the instruments have foldable feet, fold them in completely.



3.5 Connecting to the AC Power Supply

The R&S NRX can be used with different AC power voltages and adapts itself automatically to them. Adjusting the R&S NRX to a particular AC supply voltage is therefore not required. Refer to the data sheet for the requirements of voltage and frequency.

WARNING

Shock hazard

Observe the basic safety instructions at the beginning of this manual, especially the instructions on electrical safety.

Take care that the AC voltage lies within the limits printed on the AC power connector of the R&S NRX and listed in the data sheet.

The power switch can be set to two positions:

- [0]: The instrument is disconnected from the mains.
- [I]: The instrument is power-supplied. It is either ready for operation (STANDBY) or in operating mode.

► Connect the R&S NRX to the AC power supply, using the power cable that is supplied.

  The R&S NRX complies with safety class EN61010-1. The power supply of the R&S NRX must be connected to a socket with protective conductor.

Further information:

- Chapter 2.2.5, "AC Supply and Power Switch", on page 18

3.6 Switching On or Off

The possible instrument states are described in Chapter 2.1.6, "On/Standby Key", on page 17.

To switch on the R&S NRX

1. To turn on the power, press the AC power switch at the rear to position [I] (On).
   After power-up, the R&S NRX is in standby or ready state, depending on the position of the on/standby key.
2. If the R&S NRX is in standby state, press the on/standby key.
   The R&S NRX initiates its startup procedure. It boots the operating system and starts the instrument firmware.
   See Chapter 4.1.1, "Start Dialog", on page 26.
   If the previous session was terminated regularly, the R&S NRX uses the settings from the last session.

3. If you want to return to a defined initial state, perform a preset.
   See "Preset" on page 98.

To switch off the R&S NRX

1. Press the [on/standby] key.

   The R&S NRX saves its current settings for reuse in the next session and changes into the standby state.
2. To power down the R&S NRX completely, set the AC power switch to position [0] (Off).

Further information:

- Chapter 9, "Instrument Settings - Save, Recall, Preset", on page 97
- Chapter 2.1.6, "On/Standby Key", on page 17

3.7 Connecting USB and External Devices

Using the USB interfaces, you can directly connect USB devices to the R&S NRX. This number can be increased as necessary by using USB hubs.

Due to the large number of available USB devices, there is almost no limit to the possible expansions. In the following, USB devices that can be useful are listed.

- Memory stick for easy transfer of data to/from a computer (e.g. firmware updates).
- Mouse if you prefer this way of operation over a touchscreen.

3.8 Connecting Power Sensors

The R&S NRX supports a wide range of R&S power sensors. See the data sheet for detailed information.

Depending on the power sensor, two different sensor connector types are available.

3.8.1 R&S NRPxxS/A/T and R&S NRQ6

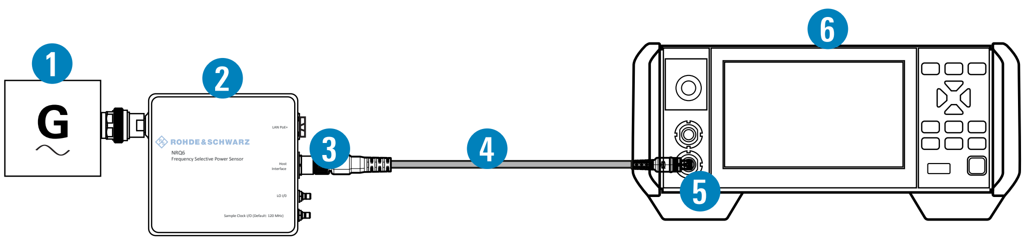


Figure 3-1: Setup with an R&S power sensor (example)

1 = Signal source
2 = R&S power sensor
3 = Host Interface connector
4 = R&S NRP-ZK8
5 = Sensor connector of the R&S NRX
6 = R&S NRX

Use an R&S NRP-ZK8 cable to connect an R&S power sensor to the R&S NRX. If you use an R&S NRP-ZK6 cable, the reference clock and trigger are not supported.

1. 8-pin female connector of R&S NRP-ZK8:
   a) Insert the screw-lock cable connector into the host interface of the R&S power sensor.
   b) Tighten the union nut manually.
2. 8-pin male connector of R&S NRP-ZK8:
   a) Insert this connector into one of the sensor ports of the R&S NRX.
3. Connect the RF connector of the R&S power sensor to the signal source. For details, see the user manual of the R&S power sensor.

   Note: Incorrectly connecting/disconnecting an R&S power sensor can damage the power sensor or lead to erroneous results.

3.8.2 R&S NRP-Zxx

Connect the cable of the R&S NRP-Zxx power sensor to the one of the sensor connectors of the R&S NRX.

3.8.3 R&S NRT-Zxx

Requires the sensor interface for R&S NRT (R&S NRX-B9).

Connect the R&S NRT-Zxx power sensor between source and load.

4 Operating Concepts

4.1 Manual Operation

Using the graphical user interface of the R&S NRX and the keys on the front panel, you can easily configure the settings and measure in the provided measurement modes.

Using the touchscreen

A touchscreen allows you to interact with the software using various finger gestures on the screen. The basic gestures supported by the software and most applications are described here. Further actions using the same gestures may be possible.

Tap = touch the screen quickly, usually on a specific element. You can tap most elements on the screen to access the settings belonging to that element (topic).

In graphics, use the following gestures:

- *Pan* = put your finger(s) on the touchscreen and move them while keeping contact. Thus, you can bring offscreen extensions of the graphic into view.
- *Pinch* = move two fingers toward each other to change the zoom.

Going back to a higher hierarchy level

The [Esc] key is the essential control element to navigate back, for example after you have entered a dialog by tapping an element.

► Press the [Esc] key shortly to change to the next-higher hierarchy level.

► Keep the [Esc] key pressed to go to the highest hierarchy level, the start dialog.

4.1.1 Start Dialog

After successful booting, the R&S NRX displays the start dialog.

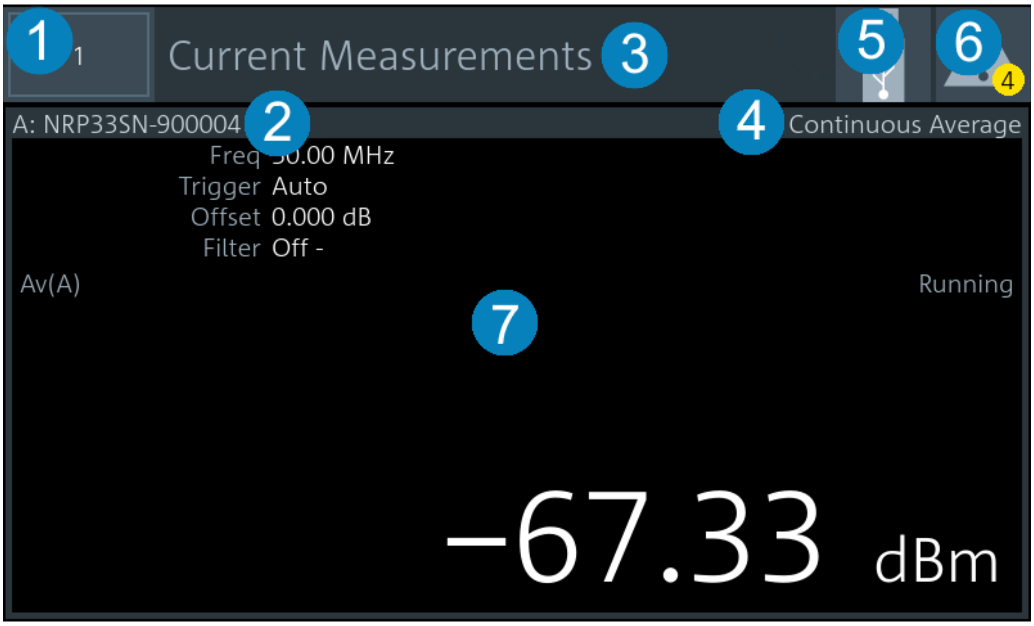


Figure 4-1: Start dialog (example for setup with one power sensor)

1 = Miniature display layout. See Chapter 4.1.5, "Selecting the Display Layout", on page 31.
2 = Connected sensors
3 = Title
4 = Measurement mode
5 = Status information. See Chapter 4.1.3, "Status Information", on page 29.
6 = Notification center status, see Chapter 4.1.4, "Notification Center", on page 30.
7 = Measurement pane

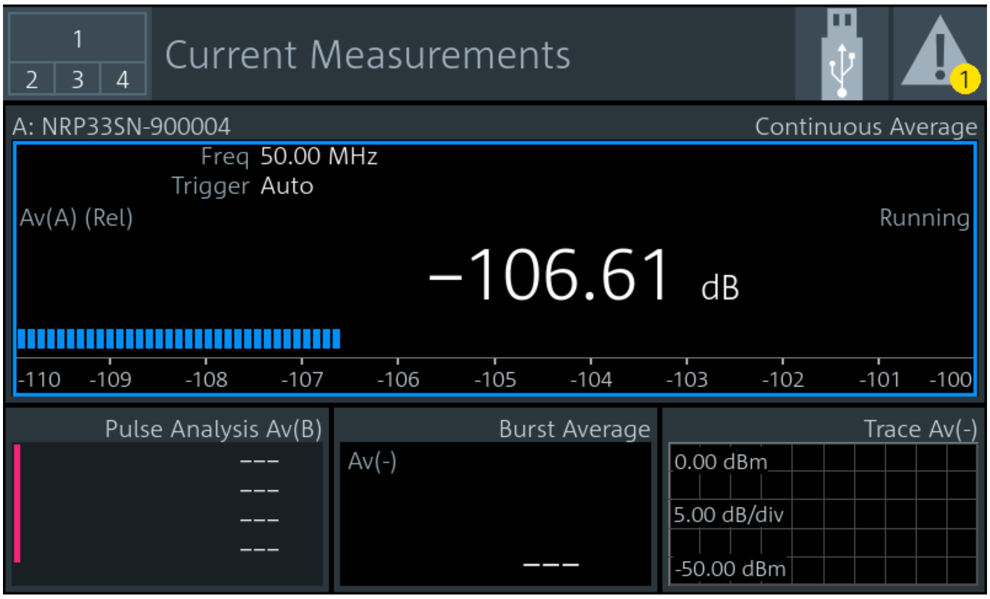
In the measurement pane, the settings, results and status of the current measurements are displayed. The layout depends on the selected display layout. See Chapter 4.1.5, "Selecting the Display Layout", on page 31.

4.1.2 Main Measurement Dialog

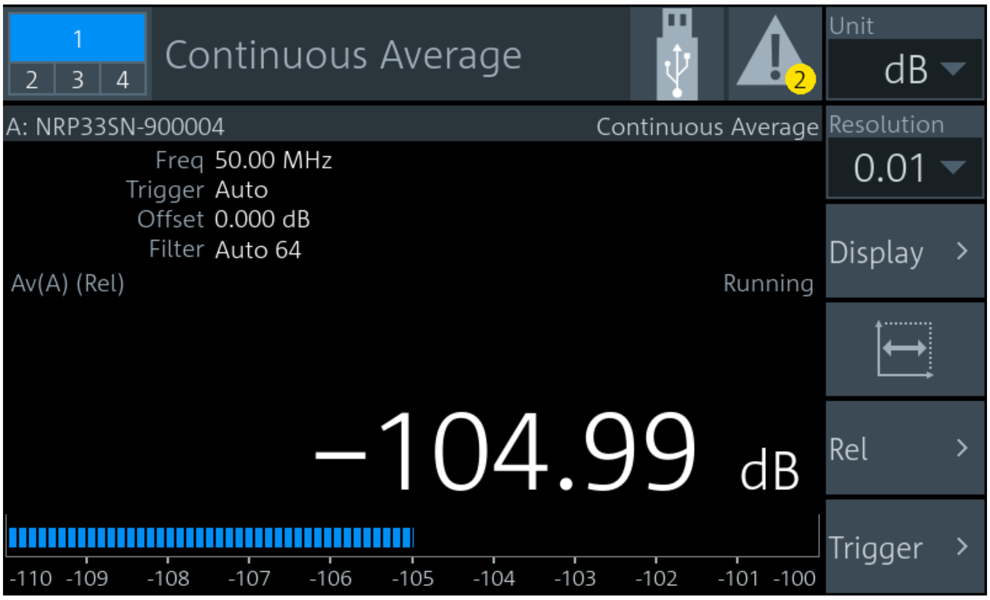
From the start dialog, you can access the measurements.

To access a measurement

► In the start dialog, tap the pane of the measurement you want to access. In this example, pane 1.



The selected measurement is displayed in full screen. Its number is highlighted in the miniature display layout in the upper left corner.



Layout of the main measurement dialog

The operating philosophy in the main measurement dialog is independent of the measurement type. The dialog is divided into touch areas that lead to different settings.

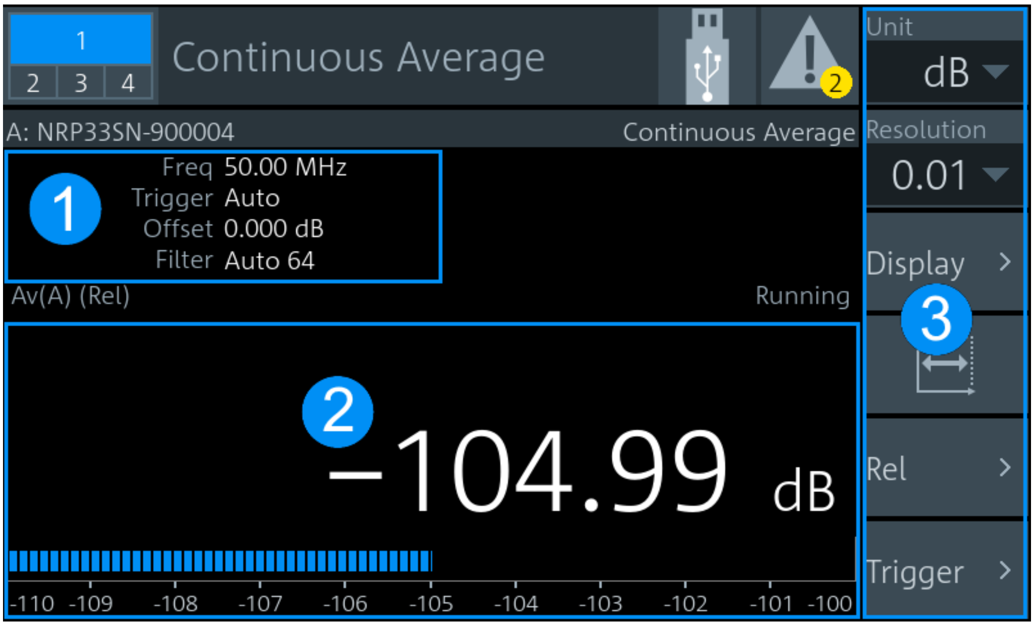


Figure 4-2: Layout of the main measurement dialog (example)

1 = Settings displayed in the measurement pane
2 = Measurement value displayed in the measurement pane
3 = Navigation pane

► Tap the *displayed measurement value or graphic*, area (2) in Figure 4-2, to change the measurement type, assign a sensor, access the sensor settings, ...

  The "Measurement Settings" dialog is displayed.
  See Chapter 6.3, "Measurement Settings Dialog", on page 53.

► Tap the *displayed settings*, area (1) in Figure 4-2, to access the sensor settings.

  The "Primary Sensor" dialog is displayed.
  See Chapter 8, "Sensor Configuration", on page 78.

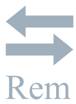
► Tap an *element in the navigation pane*, area (3) in Figure 4-2, to configure the trigger, the presentation of the measurement result and further measurement-specific settings.
  See Chapter 6, "Configuration for All Measurement Types", on page 42.

Tapping other areas in the measurement pane can open further dialogs, but these dialogs are measurement-specific and there is no general rule that applies to all measurements. For example, in the continuous average measurement, tapping the upper right corner opens the "Limit Monitor" dialog.

4.1.3 Status Information

The status information is displayed in the upper right corner, left from the notification center. See Figure 4-1.

Table 4-1: Status symbols

Symbol	Description	Further information
	Memory stick is connected and ready for use.	Chapter 3.7, "Connecting USB and External Devices", on page 24
	Memory stick is connected and initialization is in progress. When the moving green dot vanishes, the memory stick is ready for use.	
	R&S NRX is in remote control.	Chapter 4.2.2, "Returning to Manual Operation (LOCAL)", on page 36
	LLO means local lockout. R&S NRX is in remote control. Manual operation is completely disabled.	
	Identification and initialization of a connected power sensor is in progress.	

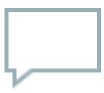
4.1.4 Notification Center

The notification center collects all information, warning and error messages during the operation of the R&S NRX. Its status is displayed in the upper right corner:

- The displayed symbol belongs to the most severe message. For example, if one error and 5 notices are present, the symbol of the error message is displayed. The symbols used are explained in Table 4-2.
- The number of all messages is displayed in the color of the most severe message.

See (6) in Figure 4-1.

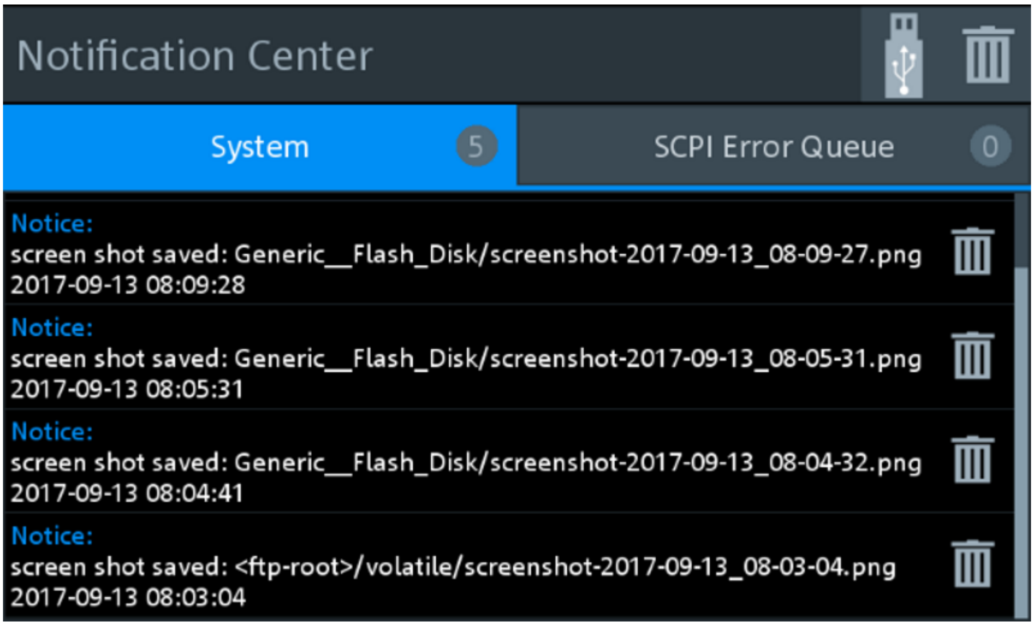
Table 4-2: Notification symbols

Symbol	Description
	No message is available.
	Only one or more notices are present.

Symbol	Description
	At least one warning message is present. Yellow is the assigned color.
	At least one error message is present. Red is the assigned color.

To display the messages

► Tap the notification symbol in the upper left corner.



The "Notification Center" dialog has two tabs:

- "System"
  All messages concerning the instrument are listed.
- "SCPI Error Queue"
  Messages related to the remote command functionality are displayed.

To delete notices no longer needed

► If you want to delete a specific notice, tap the bin symbol next to the notice.

► If you want to delete all notices, tap the bin symbol in the right corner.

4.1.5 Selecting the Display Layout

You can split the measurement display into panes. A maximum number of 4 panes is possible, one for each measurement.

To change the display layout

1. Press and hold [Esc] until the start dialog is displayed.
2. Tap the miniature display layout in the upper left corner.

3. Select how many measurement panes you want to display.
   For example, if you select 3 panes, the measurement display looks as follows:

Figure 4-3: Three measurement panes

Remote command:

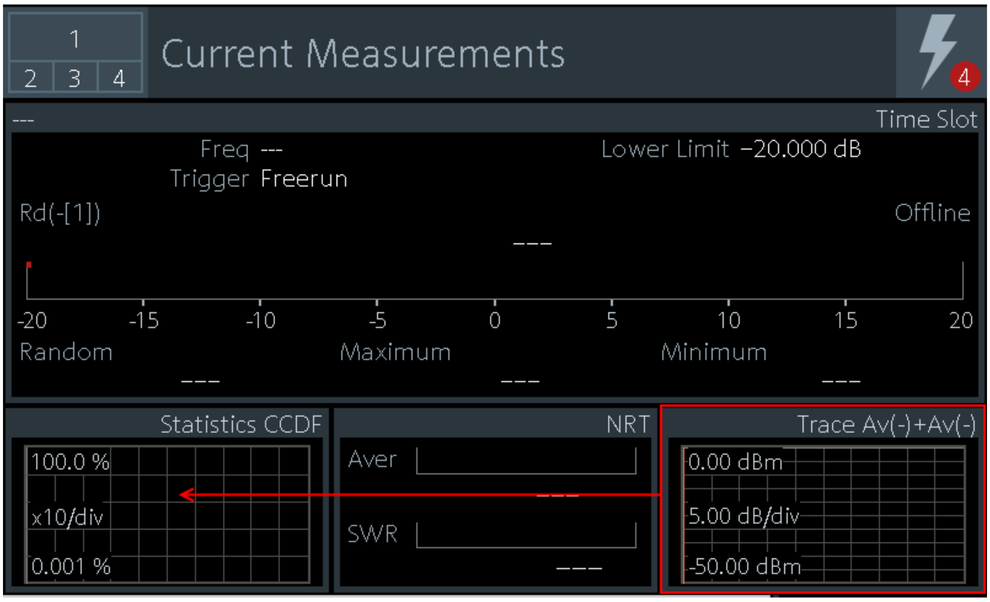
- DISPlay:LAYout on page 146

4.1.6 Swapping Measurement Panes

You can swap the position of measurement panes using drag and drop. The numbering of the panes is not changed.

To change the position of a measurement pane

► Touch & hold a measurement pane and drag it into the new position. In this example, pane 4.



In the "Select Display Layout" dialog, you can see that the positions of pane 2 and pane 4 are exchanged, but the numbering of the panes is unchanged.

Remote command:
- DISPlay[:WINDow<Window>]:POSition on page 147

4.1.7 Editing Parameters

► Tap a parameter to change its value.

Depending on the selected parameter, a numeric or an alphanumeric editor is displayed.

The numeric editor shows for each parameter the specific value range (min, max).

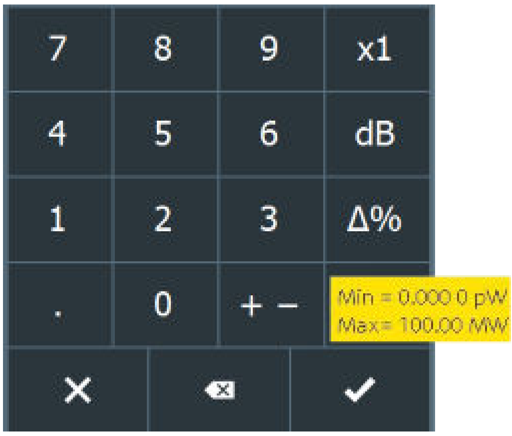


Figure 4-4: Numeric editor

Use the alphanumeric editor as a standard keyboard.

Figure 4-5: Alphanumeric editor

4.1.8 Creating and Saving Screenshots

You can create a screenshot of the current display, for example to save graphical measurement results.

► Press the [Screenshot] key on the front panel.

The R&S NRX saves the screenshot in PNG format.
If a memory stick is connected, the PNG is saved on the memory stick.
Otherwise, the PNG is saved in the volatile directory of the FTP directory. You can download the PNG using FTP.
In the "Notification Center", a "Notice" message shows the file path and name.

Further information:

- Chapter 3.7, "Connecting USB and External Devices", on page 24
- Chapter 2.1.5, "USB Host Interface", on page 16

4.2 Remote Control

The R&S NRX is equipped with various interfaces for connecting it to a controller for remote control:

- IEC/IEEE bus interface (standard equipment) in line with the standards IEC 60625.1 (IEEE 488.1) and IEC 60625.2 (IEEE 488.2)
- Gigabit Ethernet interface
- USB 2.0 interface for remote control and firmware update

Connectors are installed at the rear of the R&S NRX. See Chapter 2, "Instrument Tour", on page 13.

The interfaces support the SCPI (Standard Commands for Programmable Instruments) standard, version 1999.0 of May 1999. The SCPI standard is based on the IEEE 488.2 standard. It defines a standardized command language for controlling measuring and test instruments with functions beyond the scope of the IEEE 488.2 standard.

For a detailed description of the remote commands, see Chapter 13, "Remote Control Commands", on page 132.

4.2.1 Switching to Remote Control (REMOTE)

Prerequisites

- A link is established between the controller and the R&S NRX.
- The R&S NRX is configured correctly.

After power-up, the R&S NRX is always in manual control mode, "LOCAL". When the R&S NRX receives a SCPI command, it switches to remote control irrespective of the selected interface.

4.2.2 Returning to Manual Operation (LOCAL)

If the R&S NRX is in remote control, you can display settings using the front-panel keys and menus, but you cannot change settings. To do that, you have to return to manual operation.

The R&S NRX remains in remote control until you perform one of the following actions. Make sure that the R&S NRX is free for you to use.

► Press the [Esc/Local] key. See "[Esc] / Local" on page 14.
  If the manual operation was completely disabled by the `&LLO` command (local lockout) and the [Esc/Local] key does not work, switch the R&S NRX off and on again.

► Send the `&GTL` command (go to local).

► Tap the symbol on the touchscreen.
  See Chapter 4.1.3, "Status Information", on page 29.

5 Measurement Basics

In a measurement, the R&S NRX uses all sensor-dependent measurement functions and displays the results. Thus, you can configure both the measurement and the sensor. The R&S NRX saves all settings.

5.1 Parallel Measurements

An R&S NRX without enhancements supports the configuration of one power sensor for one measurement type. If you want to configure more than one power sensor simultaneously or run different measurement types in parallel, you can extend both to a maximum of 4 with the following options:

- second measurement channel (R&S NRX-K2)
- 3rd and 4th measurement channel (R&S NRX-K4)

For details on ordering information, refer to the brochure of the R&S NRP power meter family.

You can configure your display to accommodate the number of measurements you want to watch simultaneously, see Chapter 4.1.5, "Selecting the Display Layout", on page 31.

5.2 Sensor Assignment and Memory

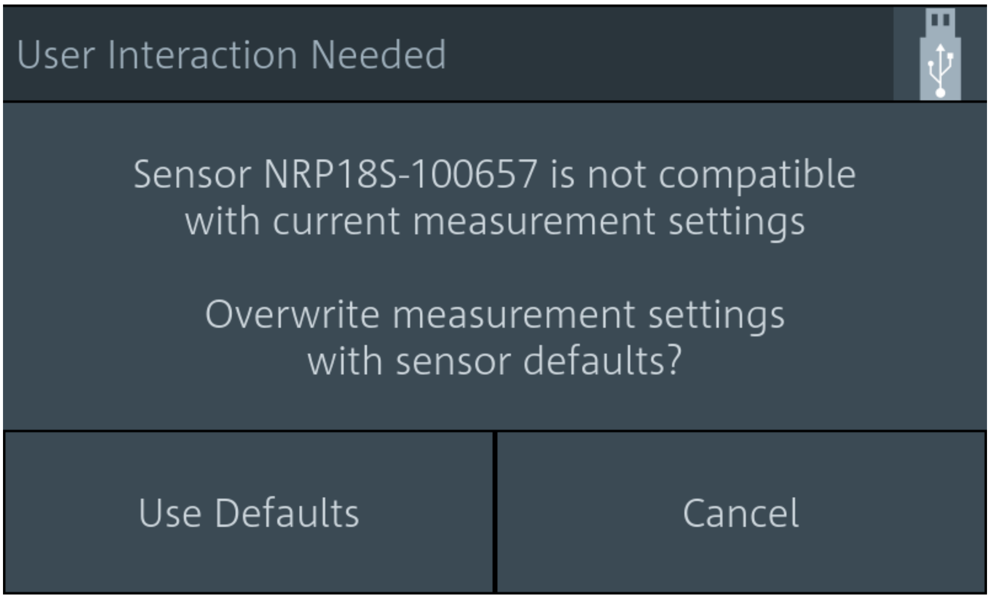
When you connect an R&S power sensor to the R&S NRX, the R&S NRX tries to recognize the sensor. The sensor recognition is based on the sensor type and the serial number of the power sensor.

The following scenarios are possible:

- Sensor type has never been connected before.
  The R&S NRX uses its settings for the measurement.
- Sensor type has been connected before.
  The R&S NRX assigns the sensor to the measurement type it was assigned before. The port where the sensor is connected is of no concern. You do not have to use the same port for the same sensor type.
  See "Example: Using different ports for the same sensor type" on page 38.
- Sensor type is different to the sensor type that was previously assigned to the measurement. Decide whether you want to use the settings of the sensor.
  – "Use Default"

Uses the sensor settings. For details, see the user manual of the sensor.

– "Cancel"
Keeps the measurement settings and does not assign the sensor to the measurement.



If conflicting settings occur when connecting a sensor, the R&S NRX shows where the problematic setting is located. See Chapter 5.5, "Settings Conflict", on page 40.

Example: Using different ports for the same sensor type

1. Connect an R&S NRQ6 to port A.
2. Perform a trace measurement.
3. Remove the R&S NRQ6 and connect it to port B.

   The R&S NRX recognizes the sensor type and assigns the R&S NRQ6 to the same measurement.

Example: Using two sensors of the same type

1. Connect the first R&S NRP-Z81 to port A.
2. Connect the second R&S NRP-Z81 to port B.
3. Swap ports.

   The R&S NRX distinguishes sensors of the same type due to their unique serial number and assigns them to the same measurement as before.

5.3 Performing a Measurement

This measurement description is designed to give you a first impression. For further information, see the description of the measurements, their results and their settings:

- Chapter 6, "Configuration for All Measurement Types", on page 42
- Chapter 7, "Measurement Types and Result Displays", on page 57
- Chapter 8, "Sensor Configuration", on page 78

Setup

1. Connect one or more R&S power sensors to the R&S NRX. See Chapter 3.8, "Connecting Power Sensors", on page 24.
   How many R&S power sensors you can connect depends on the options of your R&S NRX. See Chapter 5.1, "Parallel Measurements", on page 37.
2. Connect each R&S power sensor to a DUT (signal source). See the user manual of the R&S power sensor for information on topics that need your special attention.

Starting a measurement

1. Preset the R&S NRX and the connected R&S power sensors.
   a) Press the [Preset] key.
   b) Tap "Preset".

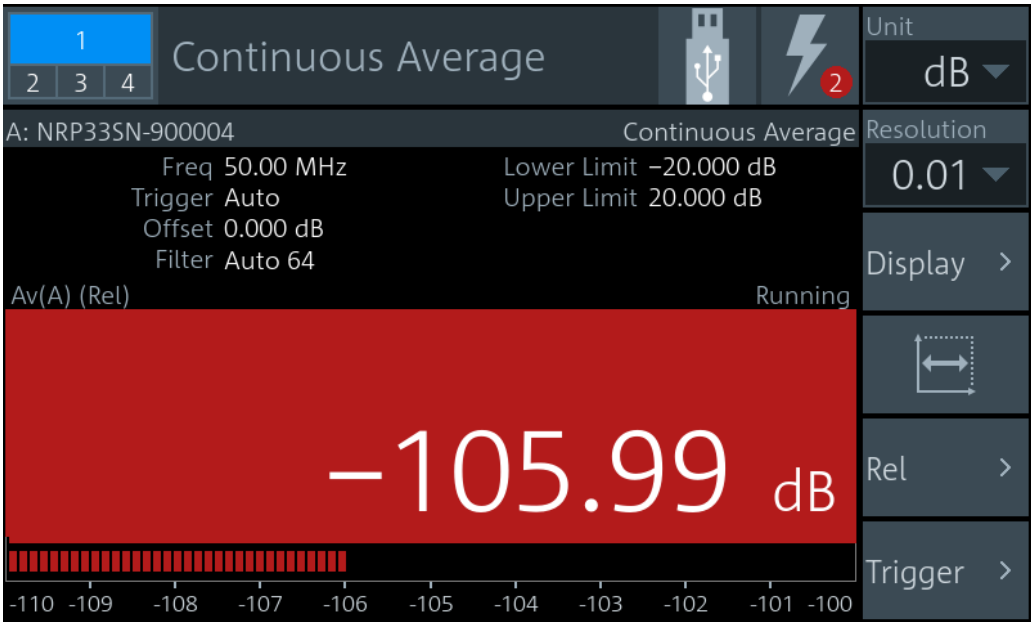
   See also Chapter 9, "Instrument Settings - Save, Recall, Preset", on page 97.
2. Execute zeroing:
   Note: Turn off all measurement signals before zeroing. An active measurement signal during zeroing causes an error.
   a) Switch off the power of the signal source.
   b) Press the [Zero] key.
   c) Tap "Zero All Sensors".

   See also Chapter 10, "Zeroing Sensors", on page 99.
3. Configure the measurement.
   a) Open the "Measurement Settings" dialog, as described in Chapter 4.1.2, "Main Measurement Dialog", on page 27.
   b) Select the "Measurement Type", for example "Continuous Average".
   c) Tap "Quick Setup" > "Auto Set".
4. Switch on the signal source.

   The measurement starts, and the result is displayed in dBm.
5. If necessary, perform further settings.

5.4 Limit Violation

If a measured value violates the set limits, it is highlighted in red.



5.5 Settings Conflict

A settings conflict can occur for the following reasons:

- The sensor assigned to the measurement does not support a set value.
  If it is a numeric value, the suitable range for the sensor is given in the tooltip.
- The sensor assigned to the measurement does not support the measurement type.
- Other contradictory settings, for example the lower limit value is higher than the upper limit value.

Contradictory settings are allowed so that you are not hampered in your workflow. But they cause an error message in the notification center. Furthermore, the contradictory setting is highlighted and the control elements in the hierarchies above that are leading to this setting are highlighted, too. Thus, you can follow the problem across the hierarchies to solve the settings conflict. The only control element that is not highlighted due to a settings conflict is the measurement value. The measurement value is only highlighted in red when it is violating the set limits, as shown in Chapter 5.4, "Limit Violation", on page 40.

Example: The sensor does not support the measurement type

The notification center indicates an error, but the no control element is highlighted.

The error message reports a settings conflict.

Solving the error

1. Tap the *displayed measurement value or graphic*. See also Figure 4-2.

   The "Measurement Settings" dialog is displayed.
   The "Measurement Type" is highlighted.

2. Select another measurement type that the sensor supports, or assign another sensor.

A setting that differs from the preset value is also indicated across the hierarchies by a pencil symbol, if the visualization is enabled. See "Visualize Non-Preset State" on page 124.

6 Configuration for All Measurement Types

The main measurement dialog offers access to all measurement settings. The layout of the dialog and how to open is are described in Chapter 4.1.2, "Main Measurement Dialog", on page 27.

In the navigation pane, you can directly set the unit and the resolution for numeric results. These settings are also available under "Display".

The settings available for all measurements are described in the following, while measurement-specific settings are described in Chapter 7, "Measurement Types and Result Displays", on page 57.

6.1 Display Settings

Access: Main measurement dialog > "Display"

The available display settings depend on the measurement type and whether the result display is numeric or graphical:

- Resolution and unit of a measurement
- Graphical or numerical display of measured values
- Scaling parameters for graphical display

The Statistics measurement has no "Display" settings, but you can scale the display. See "Scaling" on page 71.

Resolution
Configures the resolution of the measurement. For logarithmic power values (dB, dBm or dBµV), the number of decimal places is set directly. For linear power values (W, ∆%, 1), the number of decimal places depends on the selected resolution and the magnitude of the result.

"1 dB | 0.1 dB | 0.01 dB | 0.001 dB "	Sets the resolution to a specific value.

Remote command:
`CALCulate<Measurement>:RESolution` on page 146

Unit
Specifies the unit of the display. The available units depend on the Channel Calculation Function.

"dBm"	Power in dBm
"dBµV"	Power in dBµV
"W"	Power in W
"dB"	Quotient of the power values as dB
"Δ%"	Difference between the power values in W, given in %. 0 % means that the powers in both channels are equal.
"x1"	Quotient of the power values (non-logarithmic)

Remote command:
`UNIT<Measurement>:POWer[:VALue]` on page 152
`UNIT<Measurement>:POWer:RATio` on page 151

Forward Unit
Available for NRT

Specifies the unit of measurement in forward direction. See "Unit" on page 43.

Remote command:
`UNIT<Measurement>:POWer[:VALue]` on page 152
`UNIT<Measurement>:POWer:RATio` on page 151

Display Format
Specifies the display format of the measured values.

"Scalar Digital"	Available for Continuous Average, Burst Average, Pulse Analysis, Time Gate, Time Slot, NRT Numeric format
"Scalar Analog"	Available for Continuous Average, Burst Average, Pulse Analysis, Time Gate, Time Slot, NRT Marker on a scale

"Graphical" Available for Time Gate, Time Slot
Measured values are plotted over time.

Remote command:
`CALCulate<Measurement>:DMODe` on page 145

Auxiliary Values
Not available for the graphic displays of Trace, Time Gate, Time Slot, Statistics.

Determines which additional information about the measured values is shown in the display. If you press [1 Trig / Delete], you reset the auxiliary values.

"None" No additional values are measured.

"Extremes" Displays the maximum, the minimum and the max-min values since the search for extreme values has been started. With logarithmic units, the peak-to-peak value equals the quotient of the measured values converted into linear units.

"Statistics" Displays the longterm mean, the standard deviation and the total number of measurement results that have been evaluated since the search for statistic values has been started.

Remote command:
`CALCulate<Measurement>:AVALue` on page 143

Scaling
Specifies the scaling of the display. The available parameters depend on the following settings:

- Measurement Type.
- Display Format

Scale Lower Limit ← Scaling
Available for Continuous Average, Burst Average, Time Gate, Time Slot if Display Format is set to "Scalar Analog".

Specifies the lower limit of the display.

Remote command:
`CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA]:CCDF` on page 161
`CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA]:RATio:RCOefficient` on page 162
`CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA]:RATio:RFRatio` on page 162
`CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA]:RATio:RLOSs` on page 162
`CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA]:RATio:SWR` on page 163
`CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA]:RATio[:VALue]` on page 163
`CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA][:POWer]` on page 164

Scale Upper Limit ← Scaling
Available for Continuous Average, Burst Average, Time Gate, Time Slot if Display Format is set to "Scalar Analog".

Specifies the upper limit of the display.

Remote command:
`CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA]:CCDF` on page 164
`CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA]:RATio:RCOefficient` on page 164
`CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA]:RATio:RFRatio` on page 165
`CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA]:RATio:RLOSs` on page 165
`CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA]:RATio:SWR` on page 165
`CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA]:RATio[:VALue]` on page 166
`CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA][:POWer]` on page 166

Start Time ← Scaling
Available for Trace, Pulse Analysis, Time Gate, Time Slot if Display Format is set to "Graphical".

Defines the position of the left screen edge relative to the delayed trigger. The value can be negative so that signal components are displayed before the trigger event.

Remote command:
`CALCulate<Measurement>:TRACe:X[:SCALe]:LEFT` on page 147

Time / Div ← Scaling
Available for Trace, Pulse Analysis, Time Gate, Time Slot if Display Format is set to "Graphical".

Sets the time resolution of the results window. The time per division is one tenth of the Trace Length.

Trace Length ← Scaling
Available for Trace, Pulse Analysis, Time Gate, Time Slot if Display Format is set to "Graphical".

Sets the duration of the trace.

Remote command:
`CALCulate<Measurement>:TRACe:X[:SCALe]:LENGth` on page 148

Power Reference ← Scaling
Available for Trace, Pulse Analysis, Time Gate, Time Slot

Sets the power reference value. The reference value is assigned to the top line of the grid.

Remote command:
CALCulate<Measurement>:TRACe:Y[:SCALe]:TOP:DB on page 150
CALCulate<Measurement>:TRACe:Y[:SCALe]:TOP:DBM on page 150
CALCulate<Measurement>:TRACe:Y[:SCALe]:TOP:DBUV on page 150
CALCulate<Measurement>:TRACe:Y[:SCALe]:TOP:DPCT on page 151
CALCulate<Measurement>:TRACe:Y[:SCALe]:TOP:ONE on page 151
CALCulate<Measurement>:TRACe:Y[:SCALe]:TOP:WATT on page 151

Power / Div ← Scaling
Available for Trace, Pulse Analysis, Time Gate, Time Slot

Sets the vertical scaling. The power per division is one tenth of the Power Span.

The combination of Power Reference and this parameter define the vertical orientation of the trace.

Power Span ← Scaling
Available for Trace, Pulse Analysis, Time Gate, Time Slot

Sets the power level range.

Remote command:
CALCulate<Measurement>:TRACe:Y[:SCALe]:SPAN:DB on page 148
CALCulate<Measurement>:TRACe:Y[:SCALe]:SPAN:DBM on page 148
CALCulate<Measurement>:TRACe:Y[:SCALe]:SPAN:DBUV on page 149
CALCulate<Measurement>:TRACe:Y[:SCALe]:SPAN:DPCT on page 149
CALCulate<Measurement>:TRACe:Y[:SCALe]:SPAN:ONE on page 149
CALCulate<Measurement>:TRACe:Y[:SCALe]:SPAN:WATT on page 149

Unit ← Scaling
Sets the unit of the power axis.

Max Hold
If enabled, displays the highest value measured for each point (pixel) of the selected display type.

Remote command:
CALCulate<Measurement>:HOLD[:STATe] on page 145

Max Hold Function
For all measurement functions, the R&S NRX stores the maximum and minimum values and the calculated differences between these values.

The selected setting applies to both power and reflection indication. You can change between maximum, minimum or difference display at any time.

"Max"	Maximum value
"Min"	Minimum value
"Max − Min"	Difference between maximum and minimum value

Remote command:
CALCulate<Measurement>:HOLD:FUNCtion on page 145

Limit Monitor
Available for Continuous Average, Burst Average, Time Gate, Time Slot, NRT

For each window with digital or digital/analog result display, you can set an upper and a lower limit.

Lower Limit State ← Limit Monitor
Enables or disables a lower limit.

Remote command:
CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer:STATe on page 155

Lower Limit ← Limit Monitor
Defines a lower limit.

Remote command:
CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA]:CCDF on page 156
CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA]:RATio:RCOefficient on page 156
CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA]:RATio:RFRatio on page 157
CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA]:RATio:RLOSs on page 157
CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA]:RATio:SWR on page 158
CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA]:RATio[:VALue] on page 158
CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA][:POWer] on page 158

Upper Limit State ← Limit Monitor
Enables or disables an upper limit.

Remote command:
CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer:STATe on page 156

Upper Limit ← Limit Monitor
Defines an upper limit.

Remote command:
CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA]:CCDF on page 159
CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA]:RATio:RCOefficient on page 159
CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA]:RATio:RFRatio on page 159
CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA]:RATio:RLOSs on page 160

CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA]:RATio:SWR on page 160
CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA]:RATio[:VALue] on page 161
CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA][:POWer] on page 161

Forward Lower Limit State, Reflection Lower Limit State ← Limit Monitor
Available for NRT.

Enables or disables the monitoring function for the lower limit.

Remote command:
CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer:STATe on page 155

Forward Lower Limit, Reflection Lower Limit ← Limit Monitor
Available for NRT.

Defines the value for the lower limit.

Remote command:
CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA]

Forward Upper Limit State, Reflection Upper Limit State ← Limit Monitor
Available for NRT.

Enables or disables the monitoring function for the upper limit.

Remote command:
CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer:STATe on page 156

Forward Upper Limit, Reflection Upper Limit ← Limit Monitor
Available for NRT.

Defines the value for the upper limit.

Remote command:
CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA]

6.2 Trigger Settings

Access: Main measurement dialog > "Trigger"

Trigger Mode
Controls the trigger execution depending on the settings under "Primary Sensor Trigger Source, Secondary Sensor Trigger Source" on page 49.

"Normal"	Continuous triggering with regular trigger events.
"Freerun"	Enables a continuous measurement. The power sensor executes one measurement cycle after the other.
"Single"	Available for Trace and Statistics. Disables continuous triggering so that only one trigger event at a time is executed. To enable triggering again, press [1Trig].
"Auto"	Available for Trace and Statistics. Automatically starts a measurement if no trigger event has occurred after 300 ms.

Remote command:
`TRIGger<undef>:ALL:MODE` on page 170
`TRIGger<Measurement>:MODE` on page 170

Primary Sensor Trigger Source, Secondary Sensor Trigger Source
Sets the source for the trigger event.

Remote command:
`TRIGger<undef>:ALL:SOURce` on page 173
`TRIGger<Measurement>[:CHANnel<Channel>]:SOURce` on page 173

Internal ← Primary Sensor Trigger Source, Secondary Sensor Trigger Source
Uses the input signal as trigger signal.

Internal A ← Primary Sensor Trigger Source, Secondary Sensor Trigger Source
Receives the trigger signal from the trigger master. The trigger master is the sensor connected to port A. See "Trigger Master State" on page 52.

Internal B ← Primary Sensor Trigger Source, Secondary Sensor Trigger Source
Receives the trigger signal from the trigger master. The trigger master is the sensor connected to port B. See "Trigger Master State" on page 52.

Internal C ← Primary Sensor Trigger Source, Secondary Sensor Trigger Source
Receives the trigger signal from the trigger master. The trigger master is the sensor connected to port C. See "Trigger Master State" on page 52.

Internal D ← Primary Sensor Trigger Source, Secondary Sensor Trigger Source
Receives the trigger signal from the trigger master. The trigger master is the sensor connected to port D. See "Trigger Master State" on page 52.

External ← Primary Sensor Trigger Source, Secondary Sensor Trigger Source
Uses the external trigger signal that is supplied at the Trig In / Out 2 connector, see Chapter 2.2.1, "Trig In / Out 2 and Out 1 / Trig Out Connectors", on page 18.

External 2 ← Primary Sensor Trigger Source, Secondary Sensor Trigger Source
Only available for power sensors with a trigger input/output.

Uses the external trigger signal that is supplied at the trigger input/output of the power sensor.

Sensor Check Source ← Primary Sensor Trigger Source, Secondary Sensor Trigger Source
Requires the sensor check source (R&S NRX-B1) option.

If enabled, the sensor check source (R&S NRX-B1) sends trigger signals using the internal trigger bus. See "Sensor Check Source tab" on page 111.

Bus ← Primary Sensor Trigger Source, Secondary Sensor Trigger Source
Waits for a trigger event. Press [1Trig] to trigger the measurement.

Depending on the sensor type, the trigger is executed by the trigger bus or by remote command, `*TRG` or `TRIGger<Measurement>[:IMMediate]`

See the user manual of the power sensor for details.

Hold ← Primary Sensor Trigger Source, Secondary Sensor Trigger Source
Waits for a trigger event. Press [1Trig] to trigger the measurement.

Depending on the sensor type, the trigger is executed by the trigger bus or by remote command, `TRIGger<Measurement>[:IMMediate]`

See the user manual of the power sensor for details.

Primary Sensor Trigger Level, Secondary Sensor Trigger Level
Sets the trigger threshold for internal triggering derived from the test signal.

The trigger level is displayed as dotted red line. The trigger time is displayed as small rhomb on the trigger level line.

Remote command:
`TRIGger<undef>:ALL:LEVel` on page 169
`TRIGger<Measurement>[:CHANnel<Channel>]:LEVel` on page 169

Primary Sensor Trigger Advanced, Secondary Sensor Trigger Advanced
Groups further trigger settings.

Source ← Primary Sensor Trigger Advanced, Secondary Sensor Trigger Advanced
See "Primary Sensor Trigger Source, Secondary Sensor Trigger Source" on page 49.

Slope ← Primary Sensor Trigger Advanced, Secondary Sensor Trigger Advanced
Determines which edge of the envelope power, with internal triggering, or increasing voltage, with external triggering, is used for triggering.

"Positive"	Rising edge
"Negative"	Falling edge

Remote command:
`TRIGger<undef>:ALL:SLOPe` on page 170
`TRIGger<Measurement>[:CHANnel<Channel>]:SLOPe` on page 170

Level ← Primary Sensor Trigger Advanced, Secondary Sensor Trigger Advanced
See "Primary Sensor Trigger Level, Secondary Sensor Trigger Level" on page 50-

Delay ← Primary Sensor Trigger Advanced, Secondary Sensor Trigger Advanced
Sets the delay between the trigger event and the beginning of the actual measurement.

Remote command:
`TRIGger<undef>:ALL:DELay[:VALue]` on page 176
`TRIGger<Measurement>[:CHANnel<Channel>]:DELay[:VALue]` on page 176

Dropout ← Primary Sensor Trigger Advanced, Secondary Sensor Trigger Advanced
If the trigger level has been underrun with internal triggering, it is sometimes useful to wait some time (drop-out time) before retriggering. The measurement of unwanted signal components can thus be suppressed. This setting parameter is used with pulsed GSM signals, for example, if only specific timeslots are to be measured.

Remote command:
`TRIGger<undef>:ALL:DTIMe` on page 172
`TRIGger<Measurement>[:CHANnel<Channel>]:DTIMe` on page 172

Holdoff ← Primary Sensor Trigger Advanced, Secondary Sensor Trigger Advanced
Sets the hold-off time, a period after a trigger event during which all trigger events are ignored.

Remote command:
`TRIGger<undef>:ALL:HOLDoff` on page 169
`TRIGger<Measurement>[:CHANnel<Channel>]:HOLDoff` on page 169

Hysteresis ← Primary Sensor Trigger Advanced, Secondary Sensor Trigger Advanced

Sets the hysteresis. A trigger event occurs, if the trigger level:

- Falls below the set value on a rising slope.
- Rises above the set value on a falling slope.

Thus, you can use this setting to eliminate the effects of noise in the signal for the edge detector of the trigger system.

Remote command:
`TRIGger<undef>:ALL:HYSTeresis` on page 169
`TRIGger<Measurement>[:CHANnel<Channel>]:HYSTeresis` on page 169

Specific Trigger

Not available for each sensor type. Groups the specific trigger settings.

Jitter Suppression ← Specific Trigger

Defines the method how to cope with the misalignment between the trigger event and the sample point.

"Compensate" Compensation means resampling of trace result. This method is only possible for bandwidths ≤ 80 MHz.

"Measure" Does not perform resampling, but stores the measured trigger jitter. This method is not possible for bandwidths > 80 MHz if using an internal trigger condition.

Remote command:
`[SENSe<Sensor>:]INTernal:TRIGger:JITTer:METHod` on page 168
`TRIGger<Measurement>[:CHANnel<Channel>]:JITTer:METHod` on page 175

Trigger Master State ← Specific Trigger

Enables or disables the trigger master mode of the sensor. If enabled, the power sensor outputs a digital trigger signal in sync with its own trigger event. The trigger signal is output at the port selected under "Trigger Master Port" on page 52.

The trigger master has to use its internal trigger source. Set the trigger source for the trigger slaves to "Internal [A to D]", where [A to D] is the port to which the trigger master is connected. The trigger signal generated by the trigger master is routed to the R&S NRX and from there it is distributed to the trigger slaves and, if Trigger Out is set to "Sensor [A to D]", to the trigger output.

Remote command:
`TRIGger<Measurement>[:CHANnel<Channel>]:MASTer[:STATe]` on page 174

Trigger Master Port ← Specific Trigger

Sets the port where the trigger master sensor outputs a digital trigger signal.

Remote command:
`TRIGger<Measurement>[:CHANnel<Channel>]:MASTer:PORT` on page 175

Trigger Synchronize State ← Specific Trigger

Usually used if "On" is set under "Trigger Master State" on page 52.

If enabled, blocks the external trigger bus as long as the sensor remains in the measurement state. Thus, ensures that a new measurement is only started after all sensors have completed their measurements.

Make sure that the number of repetitions is the same for all sensors involved in the measurement. Otherwise, the trigger bus is blocked by any sensor that has completed its measurements before the others and has returned to the idle state.

Remote command:
`TRIGger<Measurement>[:CHANnel<Channel>]:SYNChronize[:STATe]`
on page 174

Trigger Synchronize Port ← Specific Trigger
Sets the internal or external connection for the sync output of the sensor. For more information, see "Trigger Synchronize State" on page 52.

Remote command:
`TRIGger<Measurement>[:CHANnel<Channel>]:SYNChronize:PORT`
on page 174

Trigger 2 I/O Impedance ← Specific Trigger
Only available for power sensors with a trigger input/output.

Sets the termination resistance of the external trigger signal that is supplied at the trigger input/output of the power sensor. Choose a setting that fits the impedance of the trigger source to minimize reflections on the trigger signals.

Remote command:
`TRIGger<Measurement>[:CHANnel<Channel>]:EXTernal<Port>:IMPedance`
on page 176

6.3 Measurement Settings Dialog

Access: In the main measurement dialog, tap the *displayed measurement value or graphic*. See also "Layout of the main measurement dialog" on page 28.

In this dialog, you select the measurement type and the channel calculation function. Based on the selected measurement and function, you can assign one or two sensors. The assigned sensors are called primary sensor and secondary sensor.

The functions described here apply to the Continuous Average, Burst Average, Trace, Pulse Analysis, Time Gate, Time Slot measurements. For the Statistics and NRT measurements, see:

- Statistics: Chapter 7.7.1, "Measurement Settings Dialog", on page 69
- NRT: Chapter 7.8.1, "Measurement Main Configuration Dialog", on page 74

Configure the assigned sensors using Quick Setup or the configuration dialogs, described in Chapter 8, "Sensor Configuration", on page 78.

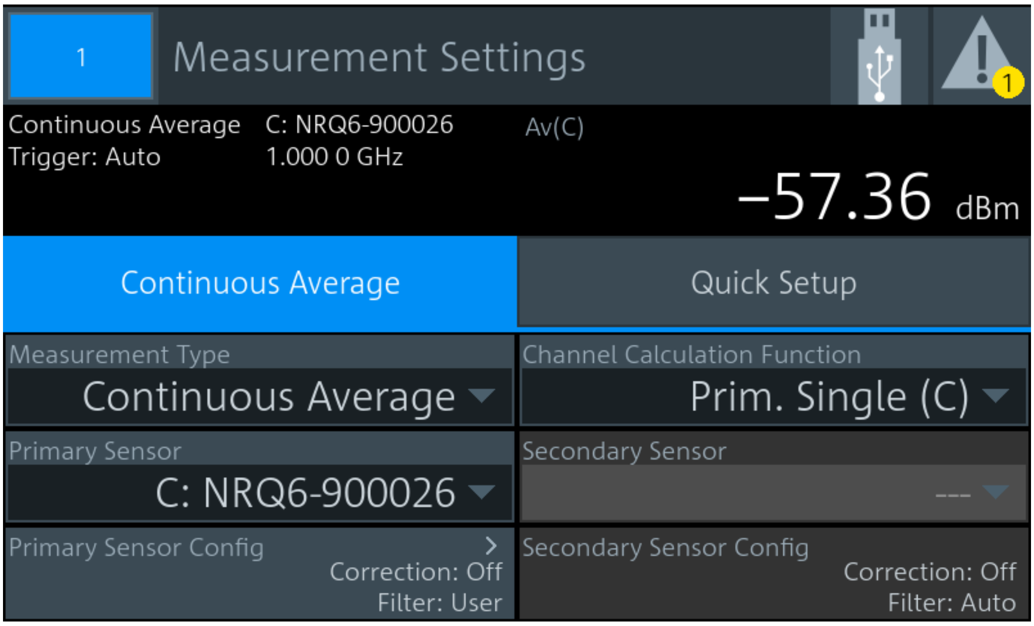


Figure 6-1: Example: Continuous Average

Measurement Type

Sets the measurement type.

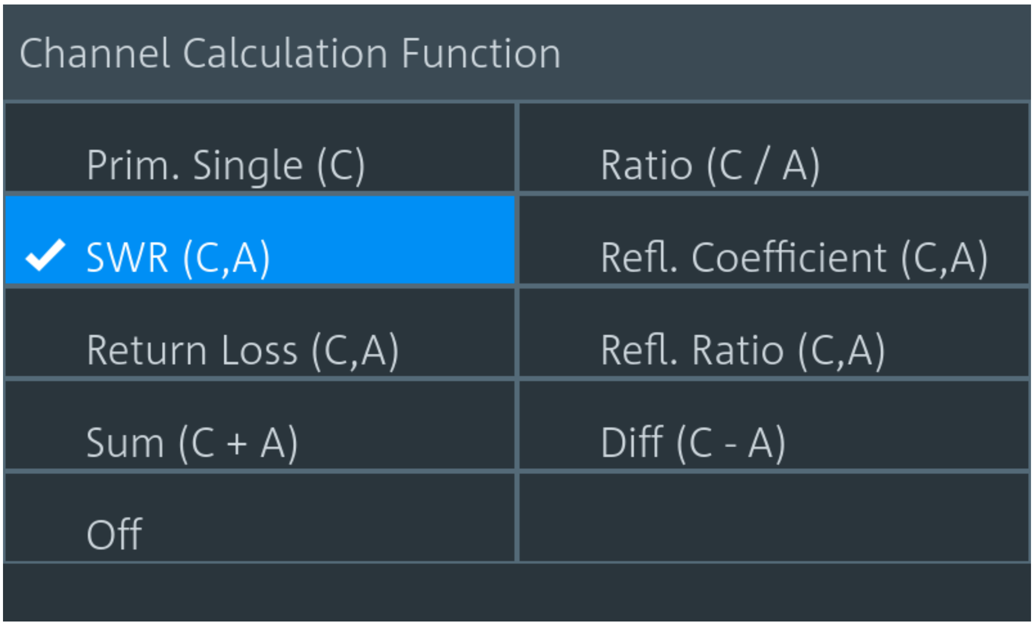
Remote command:
`CALCulate<Measurement>:TYPE` on page 177

Channel Calculation Function

Available for Continuous Average, Burst Average, Trace, Pulse Analysis, Time Gate, Time Slot

You can combine the measured values from the primary and secondary sensor using a mathematical function. The primary and secondary sensors are assigned under Primary Sensor, Secondary Sensor.

Apart from the "Prim. Single" function, all functions require values measured by two sensors.



The letters in brackets indicate the port to which the primary or secondary sensor is connected. In this example, the primary sensor is connected to port C, and the secondary sensor is connected to port A.

Remote command:
CALCulate<Measurement>:MATH[:EXPRession] on page 227
CALCulate<Measurement>:MATH[:EXPRession]:CATalog? on page 228

Primary Sensor, Secondary Sensor

Available for Continuous Average, Burst Average, Trace, Pulse Analysis, Time Gate, Time Slot

Assigns the primary or secondary sensor. You can choose any of the sensors that are connected to a sensor port of the R&S NRX. The port letter, to which the sensor is connected, is displayed in front of the hostname of the sensor.

Example: C: NRP33SN-104711; C is the port, NRP33SN-104711 is the sensor name.

If "Prim. Single" is set under Channel Calculation Function, the secondary sensor is disabled.

Remote command:
CALCulate<Measurement>[:CHANnel<Channel>]:SENSe:INDex on page 180
[SENSe<Sensor>:]CATalog? on page 181
[SENSe<Sensor>:]LIST? on page 181

Primary Sensor Config, Secondary Sensor Config

Available for Continuous Average, Burst Average, Trace, Pulse Analysis, Time Gate, Time Slot

For configurating the primary and secondary sensors, assigned under Primary Sensor, Secondary Sensor.

See Chapter 8, "Sensor Configuration", on page 78.

Quick Setup
Available for Continuous Average, Burst Average, Trace, Pulse Analysis, Time Gate, Time Slot

Groups the settings for a quick sensor configuration. Alternatively, you can use Primary Sensor Config, Secondary Sensor Config.

Parameter Set ← Quick Setup
Sets an existing parameter set to configure the sensor.

Auto Set ← Quick Setup
Configures the sensor automatically.

7 Measurement Types and Result Displays

The different measurement types and their specific configuration settings are described in the following. For settings available for all measurements, refer to Chapter 6, "Configuration for All Measurement Types", on page 42.

7.1 Continuous Average

The continuous average measurement type is the preferred measurement method if the measurement is not to be, or cannot be, synchronized with a specific signal event. This is the only available measurement mode for thermal power sensors because they are too slow for the other measurement modes.

7.1.1 Continuous Average Settings

Access: "Measurement Settings" > "Measurement Type" > "Continuous Average" > [Esc] > "Rel" > "Relative Measurements"

Reference Value
Available if Relative Measurements is set to "On" or "Set".

Sets the reference value.

Relative Measurements
Allows you to relate measured power to a reference value. Whether the power is measured by one power sensor or whether it is a combined value measured by two power sensors is set by "Channel Calculation Function" on page 54.

Off	Displays the absolute power or power ratio.
On	Displays the relative power or power ratio. As reference value, the value specified under Reference Value is used.
Set	Assigns the current measurement result as reference value and displays the relative power.

7.2 Bust Average

The burst average measurement type is the simplest way of measuring the average burst power. It is available with multipath power sensors and wideband power sensors. When this type is selected, the sensor itself detects the start and end of the burst; no external trigger signal is required.

The Dropout parameter for detecting the falling edge and the parameters of the Trigger Settings are different ways of providing a stable measurement.

By using the "Exclude from Start, Exclude from End" on page 81 parameters, you can exclude the start and end of bursts from the measurement. This omits signal overshoots from measurements, for example.

7.2.1 Relative Measurements Settings

Access: "Measurement Settings" > "Measurement Type" > "Burst Average" > [Esc] > "Rel" > "Relative Measurements"

Reference Value
See "Reference Value" on page 57.

Relative Measurements
See "Relative Measurements" on page 57.

7.3 Trace

The trace measurement type is used to the display the time characteristic of the envelope power. The number of measurement points and the measurement time is defined. The length of an individual measurement is determined from the ratio of total time and the defined number of measurement points

7.3.1 Trace Settings

Access: Tap in the measurement area of the display > "Measurement Settings" > Select Measurement Type: "Trace" > tap in the measurement area of the display > "Marker" > "M1 - M4" > "Trace Marker"

Pos / Scaling
Defines if the the cursor keys position or scale the displayed curve(s).

Access: Trace > Marker > M1 - M4 > Trace Marker

Pos	The cursor keys shift the curve(s) in horizontal and vertical direction
Scaling	The cursor keys expand and compress the curve(s).

Autoscale
Allows automatic scaling of power axis.

Info
Displays the following configuration settings of a trace.

- Function
- Filter
- Offset
- Trigger

Marker
Selects one of the four available markers.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MARKer<Undef>:SELection` on page 195

Marker Mode ← Marker
Sets the mode for the selected marker.

"Off"	The selected marker is not used.
"Ruler"	Draws a line at the power or time position of the marker.
"Measure"	Measures power (ratio) or time (difference).

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:MODE` on page 188

Position Mode ← Marker
Sets the position mode. This mode decide the basis of the marker position.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:MODE`
on page 188

Position ← Marker
Sets the position of the marker according to the position mode.

Remote command:
DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:POWer:DBM on page 190
DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:POWer:DBUV on page 191
DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:POWer:WATT on page 193
DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:POWer:RATio:DB on page 191
DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:POWer:RATio:DPCT on page 192
DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:POWer:RATio:O on page 192
DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:RELative:POWer:DB on page 193
DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:RELative:POWer:DPCT on page 193
DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:RELative:POWer:O on page 194
DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:RELative:POWer:WATT on page 194
DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:TIME on page 189
DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:RELative:TIME on page 185

Data Source ← Marker
Specifies one of the two traces as data source.

Note: Only usable when for "Marker Mode" the value "Measure" is selected.

Reference Marker ← Marker
Sets one the available markers as reference.

Remote command:
DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:REFerence on page 194

Measurement Mode ← Marker
Sets the measurement mode.

Note: Only usable when for "Marker Mode" the value "Measure" is selected.

"Trace Value "	Measures the power of the trace.
"Power Ratio to Ref"	Measures the power ratio to the power value of the reference marker.
"Time Diff to Ref"	Measures the time difference to the time position of the reference marker.
"Average Power to Ref"	Measures the average power on selected trace between time positions of the marker and its reference marker.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:FUNCtion` on page 190

7.4 Pulse Analysis

The pulse analysis measurement type is used for automatic analysis of pulsed signals. The measurement is either performed over the visible portion of the trace (entire screen width), or within the active gate of the selected trace (waveform).

7.4.1 Pulse Analysis Settings

Access: Tap in the measurement area of the display > "Measurement Settings" > Select Measurement Type: "Pulse Analysis" > tap in the measurement area of the display > "T1 - T2"

Time
The pulse time parameters to be displayed in the info panel are selected on the "Time" tab.

Pulse Width ← Time
Indication of pulse duration.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:PULSe:DURation[:STATe]` on page 204

Pulse Period ← Time
Indication of the time the pulse signal needs to complete one cycle.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:PULSe:PERiod[:STATe]` on page 204

Duty Cycle ← Time
Indication of the duty cycle of the measured power.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:PULSe:DCYCle[:STATe]` on page 204

Pulse Off Time ← Time
Indication of the gap between two pulses.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:PULSe:SEParation[:STATe]` on page 205

Rise / Fall Time ← Time
Indication of the times the signal requires to change from the power off to power on state.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:TRANsition:POSitive:DURation[:STATe]` on page 206
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:TRANsition:NEGative:DURation[:STATe]` on page 205

Start /Stop Time ← Time
Indication of the start / stop point of the first power pulse within the analysis window, i.e. the time when the signal passes through the medial reference power level with rising or falling edge, referenced to the delayed trigger event.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:TRANsition:POSitive:OCCurrence[:STATe]` on page 206
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:TRANsition:NEGative:OCCurrence[:STATe]` on page 206

Power
The pulse power parameters to be displayed in the info panel are selected on the "Power" tab.

Pulse Top / Pulse Base ← Power
Indication of the power of the pulse top / base, defined in the Pulse Measurements / Config tab.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:PULSe:TOP[:STATe]` on page 204
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:PULSe:BASE[:STATe]` on page 203

Trace Peak ← Power
Indication of the maximum power measured within the analysis window.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:MAXimum[:STATe]` on page 202

Trace Average ← Power
Indication of the average power of the signal. The visible trace length must exceed one cycle of the waveform. The gate length is arbitrary.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:AVG[:STATe]` on page 202

Trace Min ← Power
Indication of the minimum power measured within the analysis window.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:MINimum[:STATe]` on page 203

Pos. / Neg. Overshoot ← Power
Indication of the the relative amount of positive / negative overshoot. The indicated value depends on the "Reference Levels relate to" (Power / Voltage) setting in the pulse measurement "Config" menu.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:TRANsition:POSitive:OVERshoot[:STATe]` on page 207
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:TRANsition:NEGative:OVERshoot[:STATe]` on page 206

Configuration
The "Configuration" tab contains the threshold parameters to define the high, mid and low reference levels which are used to determine the pulse timing. All values are specified in percent of the pulse amplitude, either expressed in terms of power (Watt) or voltage (Volt).

Reference Levels relate to ← Configuration
Selects how the threshold parameters are to be interpreted, either voltage related or power related. Changing from a power based definition to a voltage based definition and vice versa affects the analysis, because different points of the waveform are analyzed.

The following table gives the % settings related to power and the dB figures if the same results are to be obtained as with a typical 10/50/90 definition in terms of voltage. The log values are shown for comparison only.

Reference Level	Voltage related (%V)	Power related (%W)	Log. scale (dB)
Low Ref.	10	1	−20
Ref.	50	25	−6
High Ref. 90 81 -0.9	90	81	−0.9

The voltage related definition represents the normal case for analyzing the pulse parameters.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:RRELation` on page 205

Algorithm ← Configuration
Selects the analysis algorithm for detecting the pulse top and the pulse base power of a pulsed signal. From these two power levels the reference levels are derived.

"Histogram" Computes the pulse top/base power by analyzing the histogram of the trace data. The pulse top level is taken on the mean value of all points representing the pulse top. Similarly the pulse base is determined from the points representing the pulse base.

Note: This algorithm is recommended for analyzing most of the pulse signals.

"Integration" Computes the pulse top power by fitting a rectangle pulse of same energy into the pulse signal as a reference.

Note: This algorithm is recommended for pulse signals with modulation or when the pulse energy must be taken into account, e.g. when comparing the measurement result with that of a thermal power sensor.

"Peak" Assigns the pulse peak power to the pulse top level.

Remote command:
`CALCulate<Measurement>:TRACe:MEASurement:ALGorithm` on page 197

High Reference Level ← Configuration
The "High Reference Level" defines the end of the rising edge and the start of the falling edge of the pulse, needed for measurement of the rise / fall time.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:PULSe:HREFerence[:STATe]` on page 203

Reference Level ← Configuration
This reference level is used to define the pulse width, pulse start time and pulse stop time.

Low Reference Level ← Configuration
The "Low Reference Level" defines the start of the rising edge and the end of the falling edge of the pulse, needed for measurement of the rise / fall time.

Remote command:
`DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:PULSe:LREFerence[:STATe]` on page 203

Reset to Defaults ← Configuration
Presets all parameters in the Pulse Measurement / Configuration tab (10% / 50% / 90%, power related).

7.5 Time Gate

The time gate measurement type is used to measure the average power in arbitrarily chosen time intervals (gates). The time resolution is determined by the sampling rate of the sensor. Up to four different gates can be defined, although measurement can be performed only in one of them at a time.

Wideband power sensors can additionally define an exclusion interval within the gate (Fence). A midamble of the signal can thus be excluded from the measurement.

7.5.1 Gate Configuration

Access: Tap in the measurement area of the display > "Measurement Settings" > Select Measurement Type: "Time Gates" > tap in the measurement area of the display > "Gate" > "Gate Configuration"

Current Timegate
Selects the gate to be configured.

Note: In remote-control, the gate to be configured is selected by the `TGATe` suffix.

Remote command:
`CALCulate<Measurement>[:POWer]:TGATe<Undef>[:AVG]:SELection` on page 209

Start / Length of Gate
Entry of start time and length of the gate.

Remote command:
`CALCulate<Measurement>[:POWer]:TGATe<Gate>[:AVG]:TIME` on page 208
`CALCulate<Measurement>[:POWer]:TGATe<Gate>[:AVG]:OFFSet[:TIME]` on page 208

Fence
Activates the "Fence" function.

Within the measurement period, a "fence", i.e. an exclusion interval, can be set. The fence is defined by its start time and its length. The start time refers to the start of the gate.

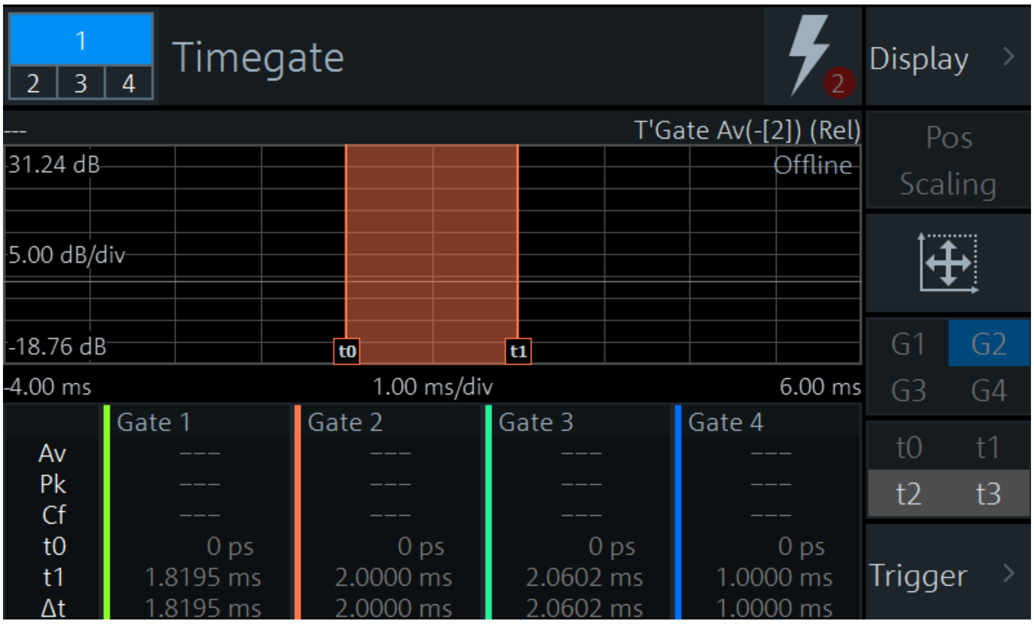
Remote command:
`CALCulate<Measurement>[:POWer]:TGATe<Gate>[:AVG][:EXCLude]:MID[:STATe]` on page 209

Start / Length of Fence
Sets the start time and the length of the fence.

Remote command:
`CALCulate<Measurement>[:POWer]:TGATe<Gate>[:AVG][:EXCLude]:MID:TIME` on page 209
`CALCulate<Measurement>[:POWer]:TGATe<Gate>[:AVG][:EXCLude]:MID:OFFSet[:TIME]` on page 208

7.5.2 Time Gate Graphical Display

Access: "Measurement Settings" > "Measurement Type" > "Time Gate" > [Esc] > "Display" >"Display Format" > "Graphical"



Here, you can configure the time gates graphically. The display shows a single trace measurement of the primary sensor.

Display
Opens the "Display" dialog. See Chapter 6.1, "Display Settings", on page 42.

Pos, Scaling
Available if "t0, t1, t2, t3" on page 67 is disabled.

Scales or moves the graph.

G1, G2, G3, G4
Selects the gate that you want to be modify.

t0, t1, t2, t3
Available if "Pos, Scaling" on page 67 is disabled.

Modifies a specific time gate border.

Trigger
Opens the "Trigger" dialog. See Chapter 6.2, "Trigger Settings", on page 48.

7.6 Timeslot

The average power values of timeslots can be measured with the timeslot measurement type. The time resolution is determined by the sampling rate of the sensor. This measurement type is available in multipath power sensors and wideband power sensors.

This measurement type can be used only if all timeslots of the TDMA signal are equal in length. A period to be excluded from the measurement can be defined at the beginning and end of each timeslot by using the "Excluded from Start/End" parameters. Wideband power sensors can additionally define an exclusion interval in between, i.e. a "Fence". A midamble of the signal can thus be excluded from the measurement.

7.6.1 Timeslot Configuration

Access: Tap in the measurement area of the display > "Measurement Settings" > select "Measurement Type": "Time Slot" > tap in the measurement area of the display > "Slots" > "Timeslot Configuration"

Slots
Defines the number of subsequent timeslots within a frame, i.e. a period of the signal.

Nominal Width
Defines the length of a timeslot.

Example:

If measurements are performed on TDMA signals (GSM/EDGE, PDC, NADC, PHS etc.), the nominal timeslot length must be entered here, i.e. the frame length divided by the number of timeslots.

Table 7-1: GSM signal

Frame length:	4.615 ms
No. timeslots:	8
Nominal width:	4.615 / 8 ms = 576.875 µs

Exclude from Start / End

Defines the intervals at the start or end of the timeslot which are excluded from the measurement. Measurement can thus be restricted to the relevant part of a timeslot.

Fence

Activates the "Fence" function.

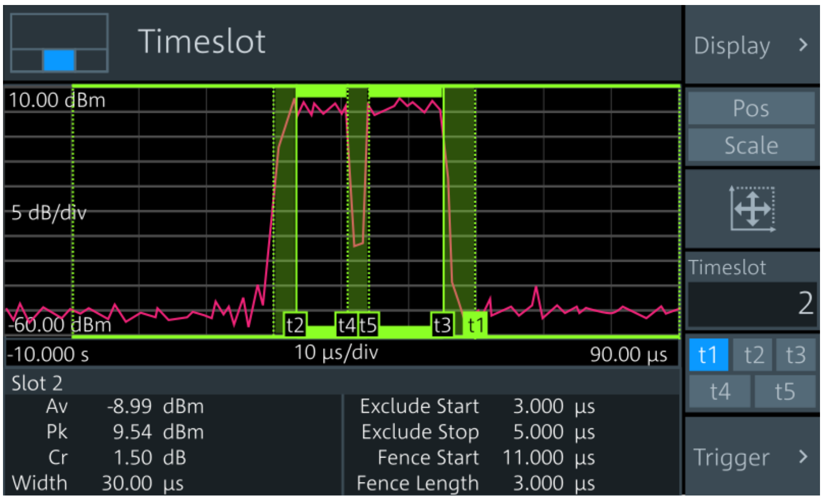
Within the measurement period, a "fence", i.e. an exclusion interval, can be set. The fence is defined by its start time and its length.

Start / Length of Fence

Sets the start time and length of the fence. The start time refers to the start of the time-slot.

7.6.2 Timeslot Graphical Display

Access: "Measurement Settings" > "Measurement Type" > "Time Slot" > [Esc] > "Display" > "Display Format" > "Graphical"



Here, you can configure the time gates graphically. The display shows a single trace measurement of the primary sensor.

Display

Opens the "Display" dialog. See Chapter 6.1, "Display Settings", on page 42.

Pos / Scaling
Available if "t1, t2, t3, t4, t5" on page 69 is disabled.

Scales or moves the graph.

Timeslot
Selects the timeslot that you want to be modify.

t1, t2, t3, t4, t5
Available if "Pos / Scaling" on page 69 is disabled.

Modifies a specific timeslot border.

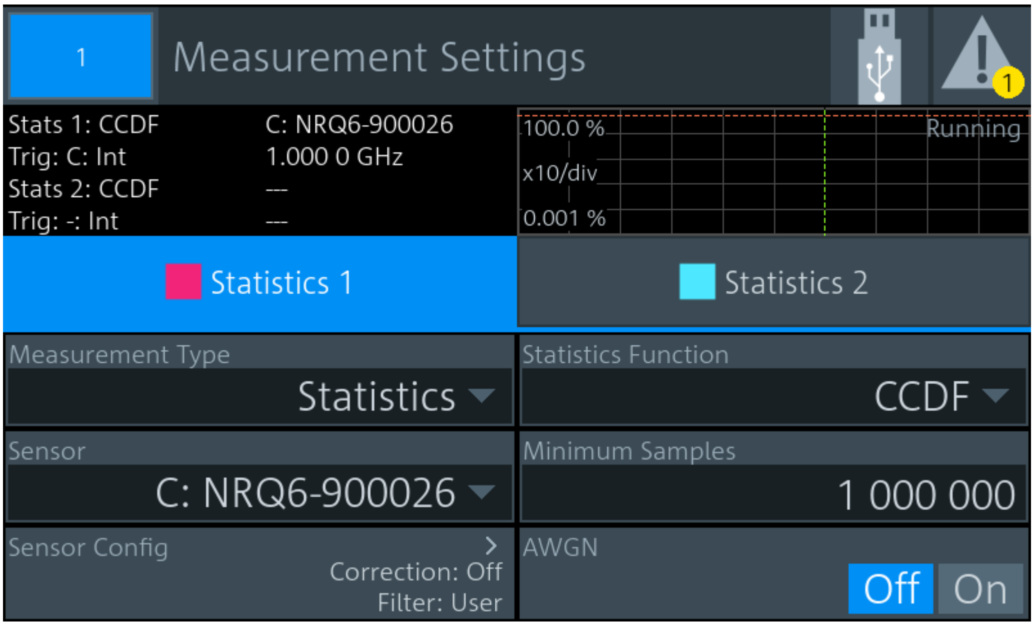
Trigger
Opens the "Trigger" dialog. See Chapter 6.2, "Trigger Settings", on page 48.

7.7 Statistics

The statistics measurement type allows you to analyze statistically the envelope power as CCDF, CDF or PDF. The measurement either covers one of the four gates or, if not synchronized with the signal, a user-selectable time interval. The measurement is repeated until the desired number of samples is attained.

7.7.1 Measurement Settings Dialog

Access: In the main measurement dialog, tap the *displayed measurement value or graphic*. See also "Layout of the main measurement dialog" on page 28.



Measurement Type
See "Measurement Type" on page 54.

Statistics Function
Sets the function of the statistics measurement.

"CCDF" Complementary cumulative distribution function
Displays the probability of the envelope power being higher than the corresponding x-axis power value. Linear or logarithmic scale is available.

"CDF" Cumulative distribution function
Displays the probability of the envelope power being lower than the corresponding x-axis power value. Linear or logarithmic scale is available.

"PDF" Probability density function
Displays a normalized distribution density of the envelope power. The measurement result is dimensionless and – in contrast to a non-normalized "PDF" – is independent of the magnitude of the average power value (Av). Integrating the normalized "PDF" over power provides the average power value (Av).
Only linear scale is available.

Remote command:
`MEASure<Measurement>:STATistics:CCDF?` on page 218
`MEASure<Measurement>:STATistics:PDF?` on page 218

Sensor
Assigns the power sensor to the statistics measurement. See "Primary Sensor, Secondary Sensor" on page 55.

Minimum Samples
Sets the minimum number of samples.

Remote command:
`CALCulate<Measurement>:STATistics:SAMPles[:MINimum]` on page 215

Sensor Config
Opens the sensor configuration dialog. See Chapter 8, "Sensor Configuration", on page 78.

AWGN
Offers a second trace - either from a second sensor or from an internal AWGN (Additional White Gaussian Noise) source - which can be used as reference trace.

Remote command:
CALCulate<Measurement>[:CHANnel<Channel>]:STATistics:AWGN[:STATe] on page 215

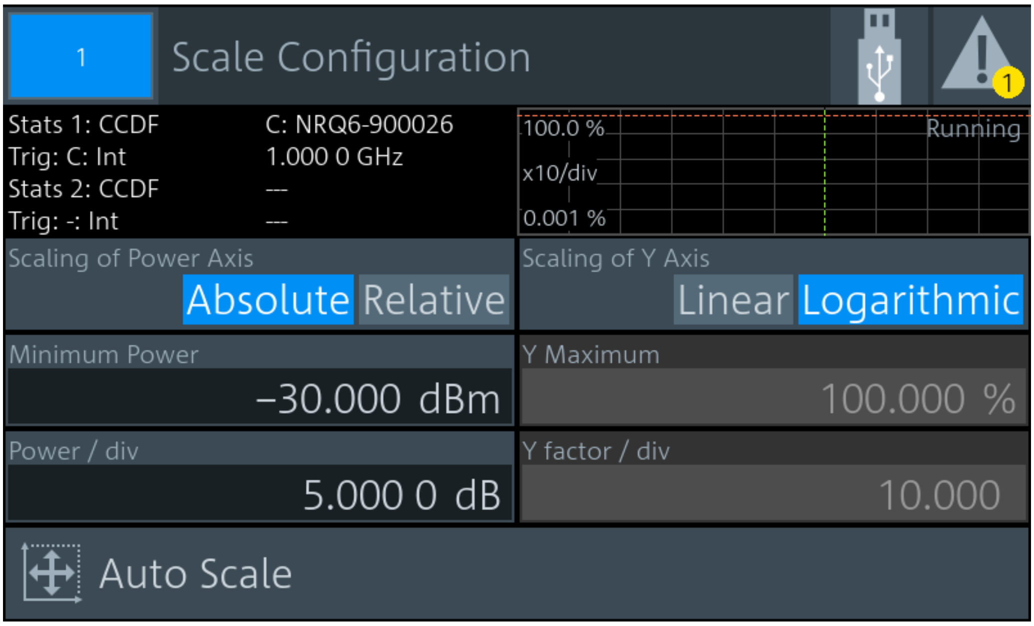
7.7.2 Statistics Settings

Access: "Measurement Settings" > "Measurement Type" >"Statistics" > [Esc]

Graph, Table
Switches between graphical or tabular view of a statistics measurement.

Scaling
Opens the "Scale Configuration" dialog.

Scale Configuration dialog ← Scaling



Scaling of Power Axis ← Scale Configuration dialog ← Scaling

Sets relative or absolute scaling for the x-axis.

"Absolute" Scales the x-axis in terms of absolute power (dBm).

"Relative" Normalizes the x-axis for average power (dB).

Remote command:
`CALCulate<Measurement>:STATistics[:SCALe]:X:MODE` on page 219

Minimum Power ← Scale Configuration dialog ← Scaling

Defines the minimum value of the power scale as reference.

Remote command:
`CALCulate<Measurement>:STATistics[:SCALe]:X:RLEVel[:ABSolute]` on page 220
`CALCulate<Measurement>:STATistics[:SCALe]:X:RLEVel:RELative` on page 220

Power / div ← Scale Configuration dialog ← Scaling

Defines the scaling of the power axis.

Remote command:
`CALCulate<Measurement>:STATistics[:SCALe]:X:RANGe` on page 219

Scaling of Y Axis ← Scale Configuration dialog ← Scaling

Sets the scaling mode of the y-axis.

"Linear" Sets linear scale of measurement result.

"Logarithmic" Sets logarithmic scale of measurement result.

Remote command:
`CALCulate<Measurement>:STATistics[:SCALe]:Y:SPACing` on page 221

Y Maximum ← Scale Configuration dialog ← Scaling
Enters the maximum value of the y-axis.

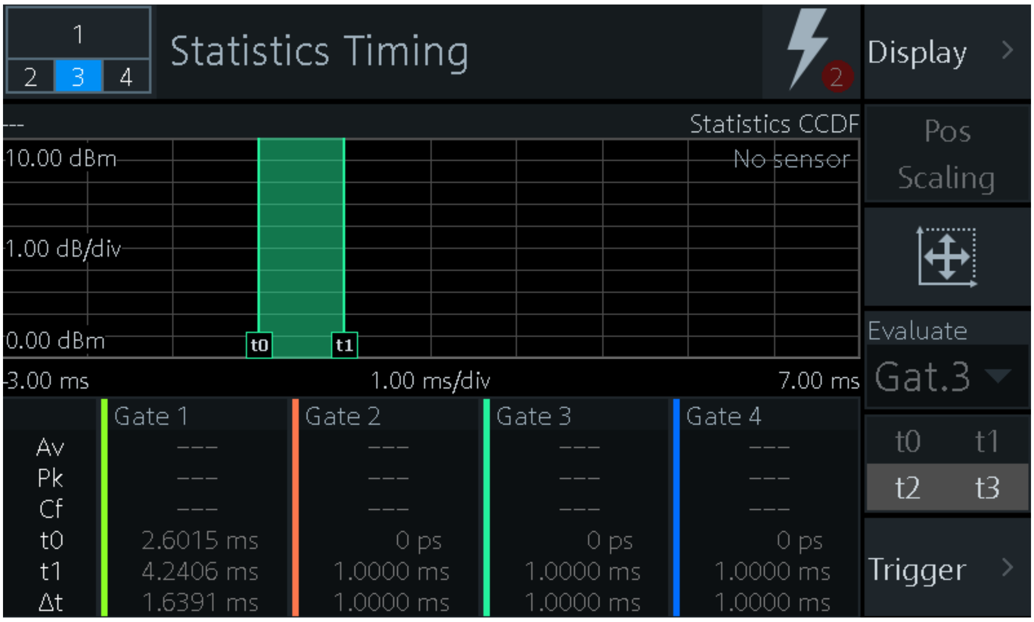
Remote command:
CALCulate<Measurement>:STATistics:PDF[:SCALe]:Y:TOP on page 221
CALCulate<Measurement>:STATistics[:CDF][:SCALe]:Y[:LINear]:TOP
on page 221

Y factor / div ← Scale Configuration dialog ← Scaling
Defines the scaling of the y-axis.

Remote command:
CALCulate<Measurement>:STATistics:PDF[:SCALe]:Y:PDIVision
on page 220
CALCulate<Measurement>:STATistics[:CDF][:SCALe]:Y[:LINear]:
PDIVision on page 221

Evaluate
Opens the "Statistics Timing" dialog.

Statistics Timing dialog ← Evaluate



Display ← Statistics Timing dialog ← Evaluate
Opens the "Display" dialog. See Chapter 6.1, "Display Settings", on page 42.

Pos, Scaling ← Statistics Timing dialog ← Evaluate
Available if t1, t2, t3 is disabled.

Scales or moves the graph.

G1, G2, G3, G4 ← Statistics Timing dialog ← Evaluate
Selects the gate that you want to be modify.

Remote command:
CALCulate<Measurement>:STATistics:TGATe:SELection on page 215

t1, t2, t3 ← Statistics Timing dialog ← Evaluate
Available if Pos, Scaling is disabled.

Modifies a specific time gate border.

Remote command:
[SENSe<Sensor>:]STATistics:TIME on page 217
[SENSe<Sensor>:]STATistics:OFFSet[:TIME] on page 216
[SENSe<Sensor>:]STATistics[:EXCLude]:MID:TIME on page 216
[SENSe<Sensor>:]STATistics[:EXCLude]:MID:OFFSet[:TIME] on page 216

Trigger
Opens the "Trigger" dialog. See Chapter 6.2, "Trigger Settings", on page 48.

7.8 NRT

Requirements:

- sensor interface for R&S NRT (R&S NRX-B9), see Chapter 2.1.2, "Module Bay", on page 14.
- R&S NRT-Zxx directional power sensors

Used for power reflection measurements with the R&S NRT-Zxx directional power sensors. The R&S NRX displays the forward and reverse power simultaneously. The forward power is the power flux from the source to the load. The ratio of forward and reverse power is a measure for the matching of the load, expressed as standing wave ratio (SWR), return loss or reflection coefficient.

7.8.1 Measurement Main Configuration Dialog

Access: "Measurement Settings" > "Measurement Type" > "NRT" > "Measurement Main Configuration"

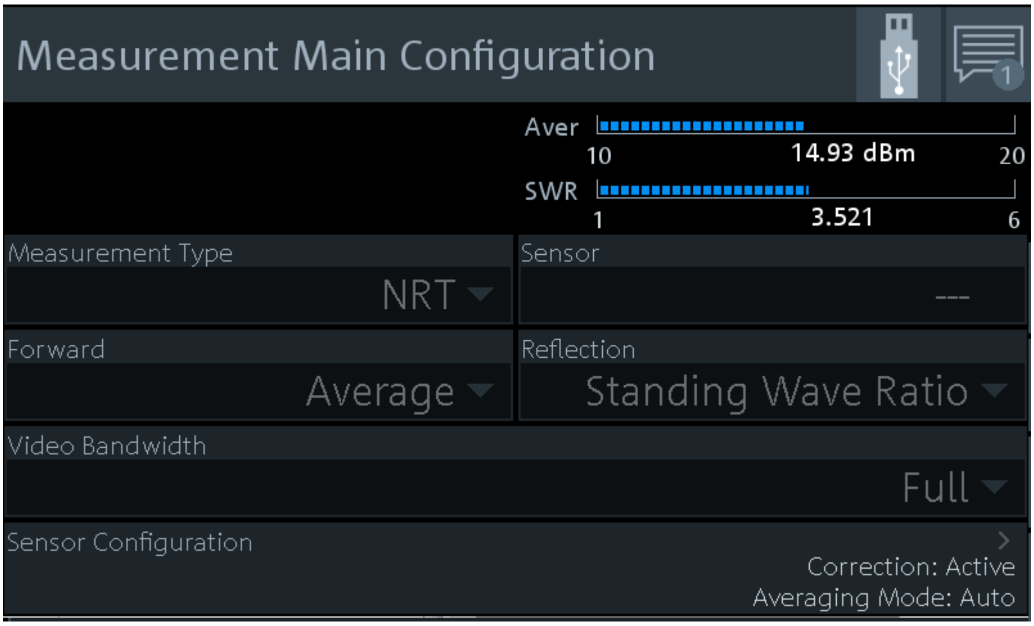


Figure 7-1: Measurement Main Configuration

Measurement Type

See "Measurement Type" on page 54.

Sensor

Assigns the power sensor to the NRT measurement. See "Primary Sensor, Secondary Sensor" on page 55.

Forward

Measurement of power in the direction from source to the load.

"Average" Average power

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:FEED`
`"POWer:FORWard:AVERage"`

"CCDF" Information about the probability of the peak envelope power exceeding a preset threshold. It is, for example, suitable for assessing the power distribution of spread-spectrum signals (CDMA or similar). The video bandwidth can be selected.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:FEED`
`"POWer:FORWard:CCDFunction"`

"Peak Envelope Power" Periodically recurring peak value of the carrier power at maximum modulation. The PEP is an important parameter for describing the modulation characteristics of transmitter output stages. The level difference between PEP and AVG can be between 0 dB (CW signal) and some 10 dB (radar bursts).

Remote command:
CALCulate<Measurement>[:CHANnel<Channel>]:FEED "POWer:FORWard:PEP"

"Absorption Average" Difference between forward and reverse power.

Remote command:
CALCulate<Measurement>[:CHANnel<Channel>]:FEED "POWer:ABSorption:AVERage"

"Crest Factor" Level difference between the PEP value and the average power in dB. It allows thus to recognize larger modulation distortions.

Remote command:
CALCulate<Measurement>[:CHANnel<Channel>]:FEED "POWer:CFACtor"

"Absorption PEP" Difference between forward and reverse power (PEP).

Remote command:
CALCulate<Measurement>[:CHANnel<Channel>]:FEED "POWer:ABSorption:PEP"

"Burst Average" Used for pulsed RF signal to define the average carrier power within the burst. The average burst is equal to the PEP (Peak Envelope Power) value if the burst is unmodulated and has no overshoots. The R&S NRX measures the average burst power by multiplying the average power with the ratio of burst period to burst width. The two burst parameters must either be user-defined or the ratio is automatically determined by the R&S NRX. Manual entry of the parameters is possible any time.

Remote command:
CALCulate<Measurement>[:CHANnel<Channel>]:FEED "POWer:FORWard:AVERage:BURSt"

"Absorption Burst" Difference between forward and reverse power (burst).

Remote command:
CALCulate<Measurement>[:CHANnel<Channel>]:FEED "POWer:ABSorption:AVERage:BURSt"

Reflection
Measurement of power in the direction from load to the source.

The ratio of forward and reverse power is a measure for the matching of the load.

"Reverse Power" Reverse power in W or dBm.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:FEED "POWer:REVerse"`

"Standing Wave Ratio" Ratio of forward and reverse power.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:FEED "POWer:SWRatio"`

"Return Loss" Ratio of forward and reverse power in dB.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:FEED "POWer:RLOSs"`

"Reflection Coefficient" Ratio of forward and reverse power. Value range: 0 to 1.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:FEED "POWer:RCOefficient"`

"Reflection Ratio" Ratio of forward and reverse power. Value range: 0 % to 100 %.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:FEED "POWer:RFRatio"`

"OFF" Disabled.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:FEED "POWer:OFF"`

Video Bandwidth

For measuring the peak envelope power, the video bandwidth used for measuring the detected RF signal has to be specified.

"4 kHz" The bandwidth of the sensor is set to 4 kHz.

"200 kHz" The bandwidth of the sensor is set to 200 kHz.

"Full" The maximum bandwidth of the sensor is used.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:NRT:VBWidth[:VALue]` on page 292

Sensor Configuration

See Chapter 8.5, "For NRT Measurement Type", on page 90.

8 Sensor Configuration

Access: "Measurement Settings" > "Primary Sensor Config" or "Secondary Sensor Config"

You can define two sensor configurations in parallel: a primary and a secondary sensor configuration. To these configurations, you can assign a sensor that is connected to one of the sensor ports of the R&S NRX. These sensors are called primary sensor and secondary sensor.

Further information:

- "Primary Sensor, Secondary Sensor" on page 55

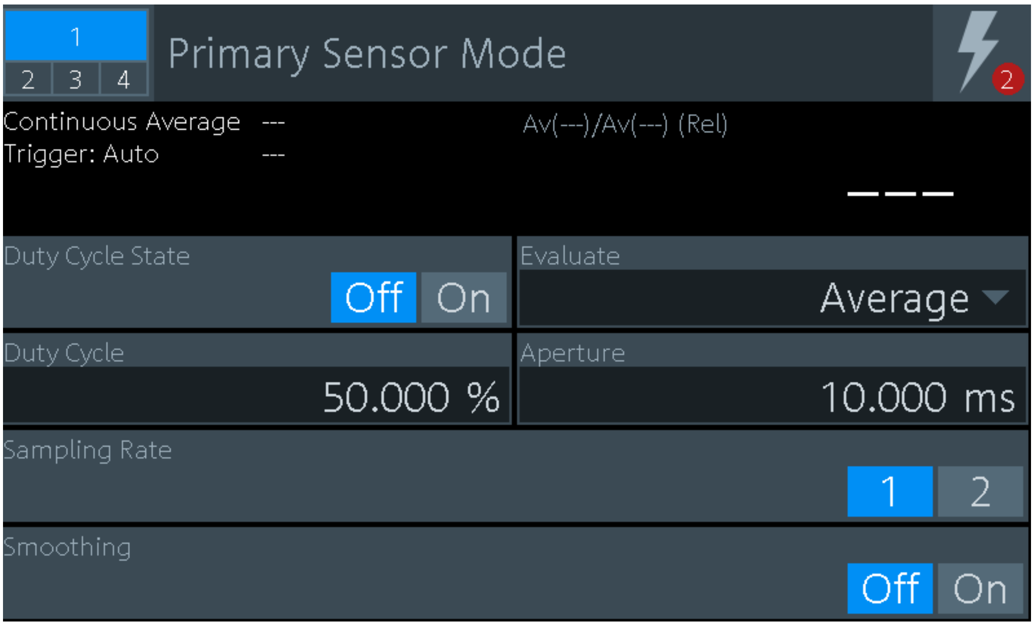
8.1 Mode Settings

Access:

"Measurement Settings" > "Primary Sensor Config" > "Mode" > "Primary Sensor Mode"

"Measurement Settings" > "Secondary Sensor Config" > "Mode" > "Secondary Sensor Mode"

Available for all measurement types.



Duty Cycle State

Available for Continuous Average

Enables or disables the duty cycle correction.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:CORRection:DCYCle:STATe` on page 261
`[SENSe<Sensor>:]CORRection:DCYCle:STATe` on page 261

Duty Cycle

Available for Continuous Average

Using the duty cycle correction, the average power of RF bursts is calculated from the average power of the whole signal. Essentially, the average power of the whole signal is divided by the set duty cycle.

If thermal power sensors or multipath power sensors are used, this procedure is the only way to determine the power of pulsed signals.

If multipath power sensors are used, this method must be employed if the bursts are so short that their power cannot be measured in the "Burst Average" or "Timegate" modes.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:CORRection:DCYCle[:VALue]` on page 260
`[SENSe<Sensor>:]CORRection:DCYCle[:VALue]` on page 260

Evaluate

All measurement types

Select the type of display. Since each display point (pixel) represents a time interval and thus usually many samples, wideband power sensors allow you to select what is to be displayed.

"Average" Average power value, resulting in a flicker-free display and smooth trace.
Note: Average is fixed for all multipath power sensors.

"Random" Power of a randomly selected sample, i.e. a realistic display with signal details.

"Peak" Highest power measured (peak power).

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:FEED` on page 261

Aperture

Available for Continuous Average, Statistics

Defines the aperture time (size of the acquisition interval). In the manual operating mode, the sensor-specific default setting combined with active smoothing (see "Smoothing" on page 80) is usually adequate. A different setting may be required if the result exhibits fluctuations due to modulation.

If the modulation frequency is known, the best results can be achieved with the aperture time set exactly to an integer multiple of the modulation period and smoothing switched off. If possible, choose the multiple such that the resulting aperture time is about as high as its sensor-specific default value.

If the modulation frequency is not known or not constant, or if a spread-spectrum modulation technique is used, smoothing should be switched on. With smoothing on, about five periods are enough to reduce fluctuations caused by modulation to an acceptable level. With more than nine periods, the fluctuations are imperceptible. With smoothing off, the situation is much less favorable as instead of just five periods as many as 300 are required; the fluctuations only completely disappear with more than 3000 periods.

It is not useful to select the aperture time longer than required, since it increases the noise component of the power sensor.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>][:POWer][:AVG]:APERture[:VALue]` on page 262
`[SENSe<Sensor>:][POWer:][AVG:]APERture[:VALue]` on page 263
`CALCulate<Measurement>:STATistics:APERture` on page 266

Sampling Rate

Available for Continuous Average

Sets the sampling rate. With multipath power sensors, the sampling rate can be set to two different values to prevent aliasing effects for particular types of modulation signal. Aliasing can occur because the sampling frequency is located within the video bandwidth, which means that spectral components near the sampling frequency can cause beating effects. With changing the sampling rate, the beating effects usually disappear.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:SAMPling` on page 265
`[SENSe<Sensor>:]SAMPling` on page 266

Smoothing

Available for Continuous Average

To reduce result fluctuations caused by modulation, this parameter should always be activated if the aperture time cannot be exactly adjusted to the modulation period. If the aperture time is only 5 to 9 times larger than a modulation period, the display fluctuations are sufficiently reduced. With smoothing off, 300 to 3000 periods would be required to obtain the same effect ("Aperture" on page 80).

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>][:POWer][:AVG]:SMOothing[:STATe]` on page 263
`[SENSe<Sensor>:][POWer:][AVG:]SMOothing:STATe` on page 263

Equivalent Time Sampling

Available for Trace, Pulse Analysis

Activates or deactivates the equivalent sampling mode, which allows for high resolution measurements.

Remote command:

`[SENSe<Sensor>:]TRACe:ESAMpling:AUTO` on page 266

Dropout Tolerance

Available for Burst Average

Defines the end of the burst. If power keeps low for at least this time, the end of the burst is assumed. Modulation-specific power drops that are shorter than the set value are ignored.

Remote command:

`CALCulate<Measurement>[:CHANnel<Channel>][:POWer]:BURSt:DTOLerance` on page 264

`[SENSe<Sensor>:][POWer:]BURSt:DTOLerance` on page 264

Exclude from Start, Exclude from End

Available for Burst Average

The start and end of bursts can be excluded from the measurement. This means that signal overshoots can be omitted from measurements, for example.

Remote command:

`CALCulate<Measurement>[:CHANnel<Channel>]:BURSt:TIMing:EXCLude:STARt` on page 265

`CALCulate<Measurement>[:CHANnel<Channel>]:BURSt:TIMing:EXCLude:STOP` on page 265

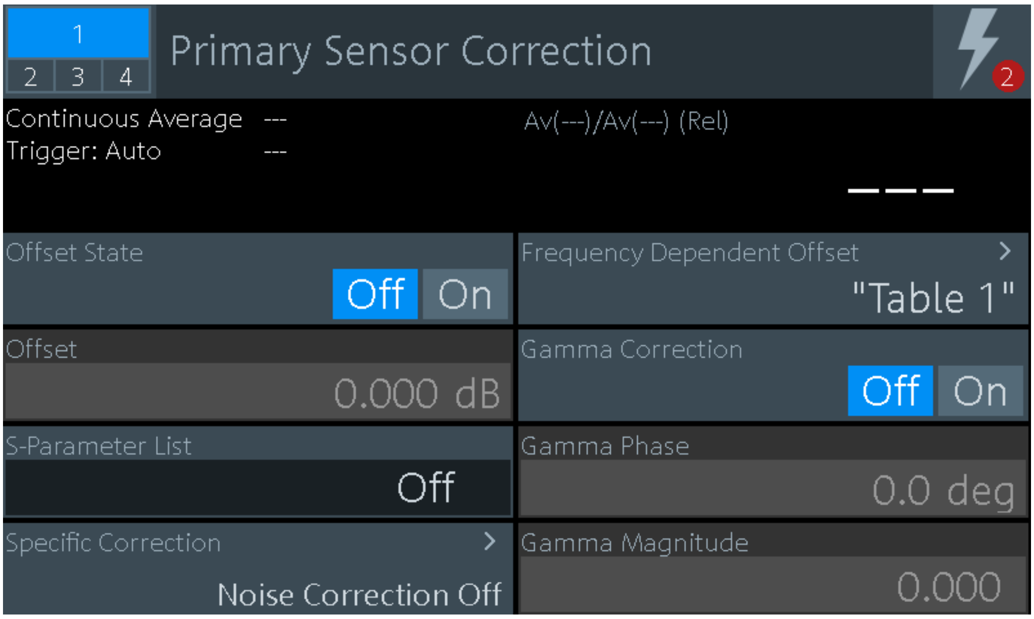
8.2 Correction Settings

Access:

"Measurement Settings" > "Primary Sensor Config" > "Correction" > "Primary Sensor Correction"

"Measurement Settings" > "Secondary Sensor Config" > "Correction" > "Secondary Sensor Correction"

Available for all measurement types.



Offset State

Enables or disables the offset.

Uses dB offsets to effect an increase or decrease in the measurement result which is not level-dependent. This way, the input power of any attenuator, directional coupler or amplifier that is connected at the sensor input (output) can be displayed.

Remote command:

CALCulate<Measurement>[:CHANnel<Channel>]:CORRection:OFFSet:STATe on page 268
[SENSe<Sensor>:]CORRection:OFFSet:STATe on page 268

Offset

Sets the offset for compensating external signal losses or gains, for example by attenuator or amplifiers. Positive values are for correcting losses and negative values for gains.

Sets a fixed offset. For frequency-dependent corrections, use Primary Sensor Offsets, Secondary Sensor Offsets dialogs. Both types of correction can be made simultaneously.

Remote command:

`CALCulate<Measurement>[:CHANnel<Channel>]:CORRection:OFFSet[:MAGNitude]` on page 267

`[SENSe<Sensor>:]CORRection:OFFSet[:VALue]` on page 267

S-Parameter List

Enables or disables the S-parameter data set stored in the sensor for a two-port that is connected to the sensor input (output).

Used for correcting the effects of a two-port connected at the sensor input (output) in terms of its S-parameters. The S-parameters of the two-port must be stored in the sensor. For details, see the user manual of your R&S power sensor.

Remote command:

`[SENSe<Sensor>:]CORRection:SPDevice:STATe` on page 271

`[SENSe<Sensor>:]CORRection:SPDevice:SELect` on page 271

`[SENSe<Sensor>:]CORRection:SPDevice:LIST?` on page 271

Frequency Dependent Offset

Opens the Primary Sensor Offsets, Secondary Sensor Offsets dialogs.

Primary Sensor Offsets, Secondary Sensor Offsets dialogs ← Frequency Dependent Offset

Configures the sensor offsets.

Frequency dependent offset active ← Primary Sensor Offsets, Secondary Sensor Offsets dialogs ← Frequency Dependent Offset

Enables or disables the frequency-dependent offset correction specified in the selected table.

Remote command:

`CALCulate<Measurement>[:CHANnel<Channel>]:CORRection:OFFSet:TABLe[:STATe]` on page 268

Frequency dependent offset table ← Primary Sensor Offsets, Secondary Sensor Offsets dialogs ← Frequency Dependent Offset

Selects one of the available offset tables.

Remote command:

`CALCulate<Measurement>[:CHANnel<Channel>]:CORRection:OFFSet:TABLe:INDex` on page 268

Edit table name ← Primary Sensor Offsets, Secondary Sensor Offsets dialogs ← Frequency Dependent Offset
Edits the table name according to your requirements.

Edit table "<table name>" ← Primary Sensor Offsets, Secondary Sensor Offsets dialogs ← Frequency Dependent Offset
Edits the content of the selected table.

Export file name ← Primary Sensor Offsets, Secondary Sensor Offsets dialogs ← Frequency Dependent Offset
Edits the file name for export.

Export table to file ← Primary Sensor Offsets, Secondary Sensor Offsets dialogs ← Frequency Dependent Offset
Exports the currently selected table to the specified export file.

Import file name ← Primary Sensor Offsets, Secondary Sensor Offsets dialogs ← Frequency Dependent Offset
Selects the file name for import.

Import table from file ← Primary Sensor Offsets, Secondary Sensor Offsets dialogs ← Frequency Dependent Offset
Imports the table from the currently selected file.

Gamma Correction
Enables or disables gamma correction in order to achieve higher measurement accuracy.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:SGAMma:CORRection:STATe` on page 269

Gamma Phase
Sets the phase angle of the source reflection coefficient gamma in degrees.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:SGAMma:PHASe` on page 269

Gamma Magnitude
Sets the magnitude of the source reflection coefficient gamma.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:SGAMma[:MAGNitude]`
on page 270

8.3 Filter Settings

Access:

"Measurement Settings" > "Primary Sensor Config" > "Filter" > "Primary Sensor Filter"

"Measurement Settings" > "Secondary Sensor Config" > "Filter" > "Secondary Sensor Filter"

Available for all measurement types.

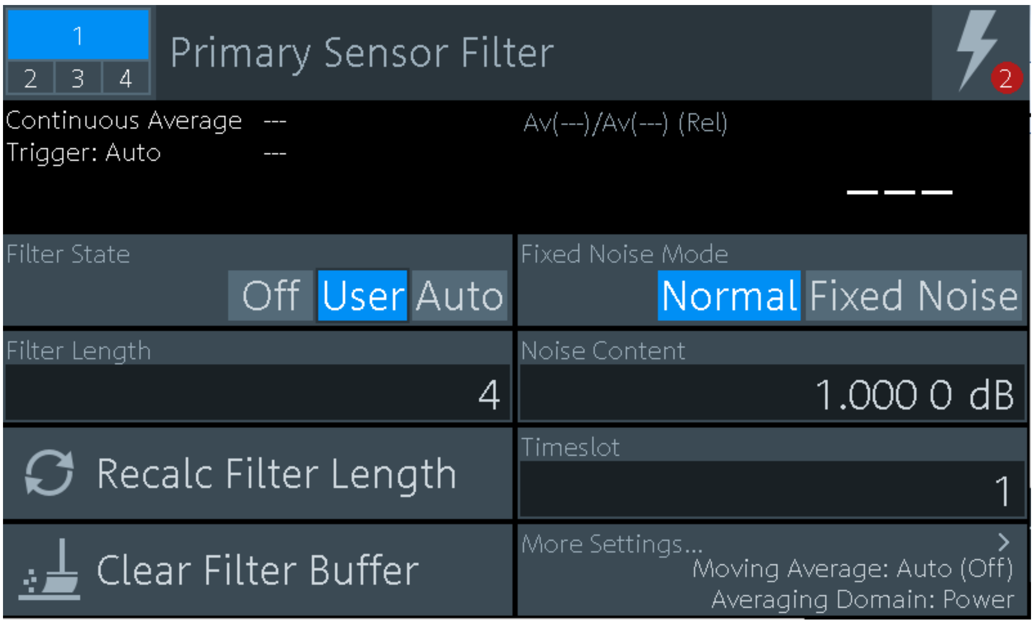
The filter is used to reduce fluctuations in the measurement result to the extent wanted. Such fluctuations can be caused by inherent noise of the measuring instrument, modulation of the measurement signal or beats from the superposition of adjacent carriers. A more stable display has to be traded off against longer measurement times. In manual mode, “longer measurement” does not mean that it takes longer to display a new result, but rather that it takes longer for the result to settle when the power changes.

All average power values are obtained from a three-stage averaging process. First, a mean value is formed for the acquisition interval either by weighted or unweighted summation of samples.

A second measurement with reversed polarity of the detector output signal is then performed to suppress offset voltages and 1/f noise of the amplifier. A first result is formed by subtracting the second measured value from the first measured value. The sequence of two consecutive measurements is repeated N times.

The average value, which is obtained from the individual measurement results, is output. The number N is the averaging number (AvgNo). To obtain a high output data rate, averaging in manual mode is performed continuously, i.e. a new result is fed into the averaging filter after two acquisitions have been evaluated.

The oldest result is taken out of the averaging filter and a new average value is calculated. The averaging number can be selected automatically or it can be manually set to a fixed value. As a starting point, automatic filtering should always be used. If the automatically selected filter setting proves to be not adequate, the averaging number can be in(de)creased manually.



Filter State

All measurement types

Sets the filter automatically or user-defined.

Remote command:

`CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt:AUTO[:STATe]` on page 273

`[SENSe<Sensor>:]AVERage:COUNt:AUTO[:STATe]` on page 273

`CALCulate<Measurement>[:CHANnel<Channel>]:TRACe:AVERage[:STATe]` on page 278

`[SENSe<Sensor>:]TRACe:AVERage[:STATe]` on page 279

Filter Length

All measurement types

Sets the filter length i.e. the number of readings to be averaged for one measured value. The higher the count, the lower the noise and the longer it takes to obtain a measured value.

If Filter State is set to "Auto", this parameter is read-only.

Remote command:

`CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt[:VALue]` on page 273

`[SENSe<Sensor>:]AVERage:COUNt[:VALue]` on page 274

`CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt:ENUM` on page 277

`[SENSe<Sensor>:]AVERage:COUNt:ENUM` on page 277

`CALCulate<Measurement>[:CHANnel<Channel>]:TRACe:AVERage:COUNt[:VALue]` on page 279

`[SENSe<Sensor>:]TRACe:AVERage:COUNt` on page 279

Recalc Filter Length

Available for Continuous Average, Burst Average, Time Gate

If enabled, determines the average count automatically from the level of the input signal.

Remote command:

`CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt:AUTO[:STATe]` on page 273

`[SENSe<Sensor>:]AVERage:COUNt:AUTO[:STATe]` on page 273

Fixed Noise Mode
Available for Continuous Average, Burst Average, Time Gate

Sets the autofilter.

"Normal" The averaging number so that the sensors intrinsic noise (2 standard deviations) does not exceed the specified "Noise Content" on page 87.

"Fixed Noise" Limits the averaging number as specified in Maximum Settling Time to avoid very long settling times.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:TYPE` on page 281
`[SENSe<Sensor>:]AVERage:COUNt:AUTO:TYPE` on page 277

Noise Content
Available for Continuous Average, Burst Average, Time Gate if Fixed Noise Mode is set to "Normal".

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt:AUTO:NSRatio` on page 275
`[SENSe<Sensor>:]AVERage:COUNt:AUTO:NSRatio` on page 275

Maximum Settling Time
Available for Continuous Average, Burst Average, Time Gate if Fixed Noise Mode is set to "Fixed Noise".

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt:AUTO:MTIMe` on page 274
`[SENSe<Sensor>:]AVERage:COUNt:AUTO:MTIMe` on page 274

Timeslot
Available for Continuous Average, Burst Average, Time Gate

Specifies the timeslot from which the autofilter setting, i.e. the averaging number, is derived for measurements in the "Timeslot" mode.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt:AUTO:SLOT` on page 276
`[SENSe<Sensor>:]AVERage:COUNt:AUTO:SLOT` on page 276

Clear Filter Buffer
Available for Continuous Average, Burst Average, Time Gate

Clears the filter buffer.

Remote command:
`[SENSe<Sensor>:]AVERage:RESet` on page 279

Moving Average
Available for Continuous Average, Burst Average, Trace, Pulse Analysis, Time Slot, Statistics

If enabled, outputs intermediate values to facilitate early detection of changes in the measured quantity. In the settled state, that means when the number of measurements specified by the average count has been performed, a moving average is output.

Remote command:
CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:TCONtrol:AUTO on page 278
[SENSe<Sensor>:]AVERage:TCONtrol on page 278
CALCulate<Measurement>[:CHANnel<Channel>]:TRACe:AVERage:TCONtrol:AUTO on page 280
[SENSe<Sensor>:]TRACe:AVERage:TCONtrol on page 280

Averaging Domain
Availability depends on the sensor type.

Sets the averaging method.

"Power"	Power averaging
"Video"	Logarithmic averaging
"Linear"	Voltage averaging

Remote command:
[SENSe<Sensor>:]AVERage:TYPE on page 281
CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:TYPE on page 281

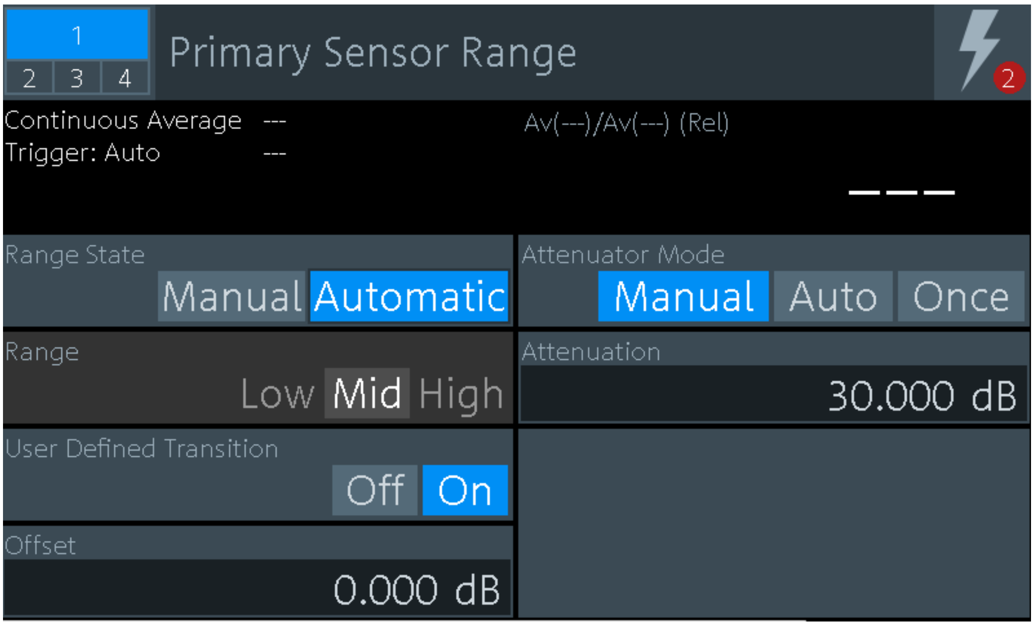
8.4 Range Settings

Access:

"Measurement Settings" > "Primary Sensor Config" > "Range" > "Primary Sensor Range"

"Measurement Settings" > "Secondary Sensor Config" > "Range" > "Secondary Sensor Range"

Available for Continuous Average, Burst Average, Trace, Pulse Analysis, Time Slot, Time Gate, Statistics.



Range State

Turns the "Auto" range function on/off.

Remote command:

`CALCulate<Measurement>[:CHANnel<Channel>][:POWer][:AVG]:RANGe:AUTO` on page 284

`[SENSe<Sensor>:]RANGe:AUTO` on page 285

Range

Effective if "Range State" on page 89 is set to "Manual".

Selects a measurement range in which the corresponding sensor is measuring.

Remote command:

`CALCulate<Measurement>[:CHANnel<Channel>][:POWer][:AVG]:RANGe[:VALue]` on page 285

`[SENSe<Sensor>:]RANGe[:VALue]` on page 285

User Defined Transition

Activates a shift of the transition regions.

Remote command:

`CALCulate<Measurement>[:CHANnel<Channel>][:POWer][:AVG]:RANGe:CLEVel:STATe` on page 283

Offset
Negative dB value as a measure for the shift of the transition regions. Modifications are immediately effective after each keystroke.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>][:POWer][:AVG]:RANGe:CLEVel[:VALue]` on page 284
`[SENSe<Sensor>:]RANGe:CLEVel` on page 284

Attenuator Mode
Specifies if the attenuator is set manually or automatically.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:INPut:ATTenuation:AUTO` on page 282
`[SENSe<Sensor>:]INPut:ATTenuation:AUTO` on page 282

Attenuation
Specifies the attenuation value. Only two values are possible, 0 dB and 30 dB.

For values < 15 dB, the attenuator is set to 0 dB.

For values ≥ 15 dB, the attenuation is set to 30 dB.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:INPut:ATTenuation[:VALue]` on page 283
`[SENSe<Sensor>:]INPut:ATTenuation[:VALue]` on page 283

8.5 For NRT Measurement Type

8.5.1 NRT Mode Settings

To configure the "Channel Mode", perform the following steps.

1. In start view of the R&S NRX, tap the measurement area of the display.

   The "Measurement Overview" dialog opens.

2. Tap "Channel Sensor Configuration".

   The "Channel Configuration" dialog opens.

3. Tap "Mode".
   The "Channel Mode Configuration" dialog opens.

4. Specify the parameters according to your needs.

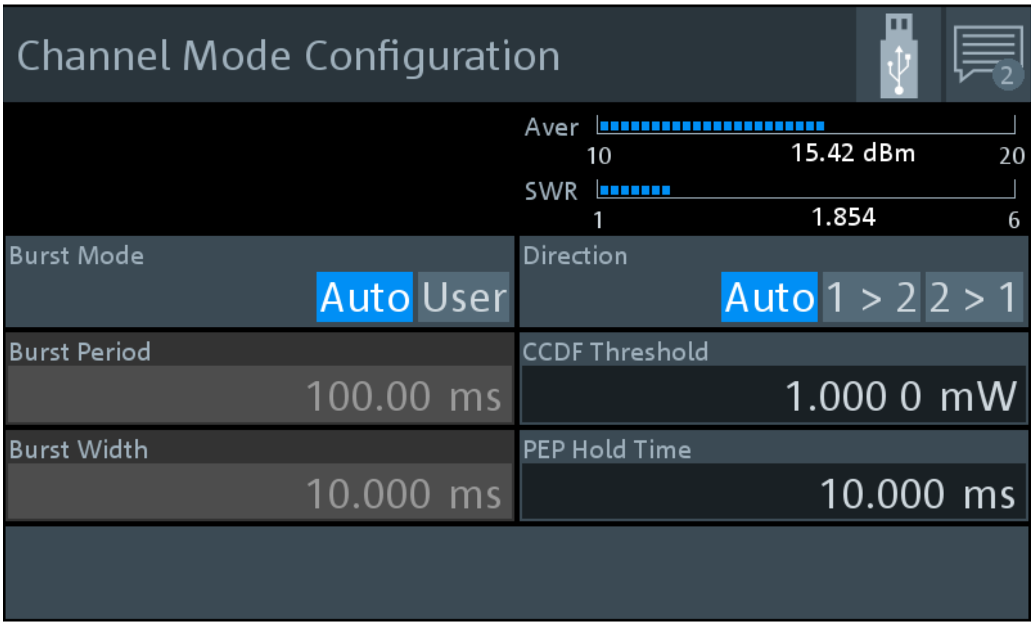


Figure 8-1: Channel Mode Configuration

Burst Mode

Sets the burst mode.

"Auto" The sensor automatically measures the average burst power. This applies also to multiple bursts and to duty cycles variable in time. To ensure proper operation of the automatic function, the video bandwidth has to be defined (see "Video Bandwidth" on page 77).

"User" The burst characteristic must be specified by defining the burst period and burst width.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:NRT:BURSt:MODE`
on page 287

Burst Period

Sets the burst period.

"Max." The maximum burst period is 1.000 s.

"Min." The minimum burst period is 0 ns.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:NRT:BURSt:PERiod`
on page 288

Burst Width

Sets the burst width.

"Max." The maximum burst width is 1.000 s.

"Min." The minimum burst width is 0 ns.

Remote command:
CALCulate<Measurement>[:CHANnel<Channel>]:NRT:BURSt:WIDTh
on page 288

Direction

The direction of the forward power can be fixed from port 1 to port 2 (1 > 2) and vice versa (2 > 1). The ports 1 and 2 are marked on each directional power sensor.

"Auto" Automatic selection of power flow direction. The greater of the two powers measured by the sensor is assumed to be the forward power.

"1 > 2" The forward power direction is fixed from port 1 to port 2.

"2 > 1" The forward power direction is fixed from port 2 to port 1.

Remote command:
CALCulate<Measurement>[:CHANnel<Channel>]:NRT:DIRection
on page 289

CCDF Threshold

Sets the CCDF threshold. The power in a settable time interval is measured and subsequently subjected to a statistical evaluation (CCDF).

"Max." The maximum CCDF threshold is 100.00 MW.

"Min." The minimum CDF threshold is 0.000 pW.

Remote command:
CALCulate<Measurement>[:CHANnel<Channel>]:NRT:CCDF:THReshold
on page 288

PEP Hold Time

Sets the PEP hold time.

"max." The maximum PEP hold time is 100.00 ms.

"min.." The minimum PEP hold time is 1.000 ms.

Remote command:
CALCulate<Measurement>[:CHANnel<Channel>]:NRT:PEP:HOLD:TIME
on page 289

8.5.2 NRT Correction Settings

To configure the "Channel Correction", perform the following steps.

1. In start view of the R&S NRX, tap the measurement area of the display.

   The "Measurement Overview" dialog opens.

2. Tap "Channel Sensor Configuration".

The "Channel Configuration" dialog opens.

3. Tap "Correction".
   The "Channel Correction Configuration" dialog opens.
4. Specify the parameters according to your needs.

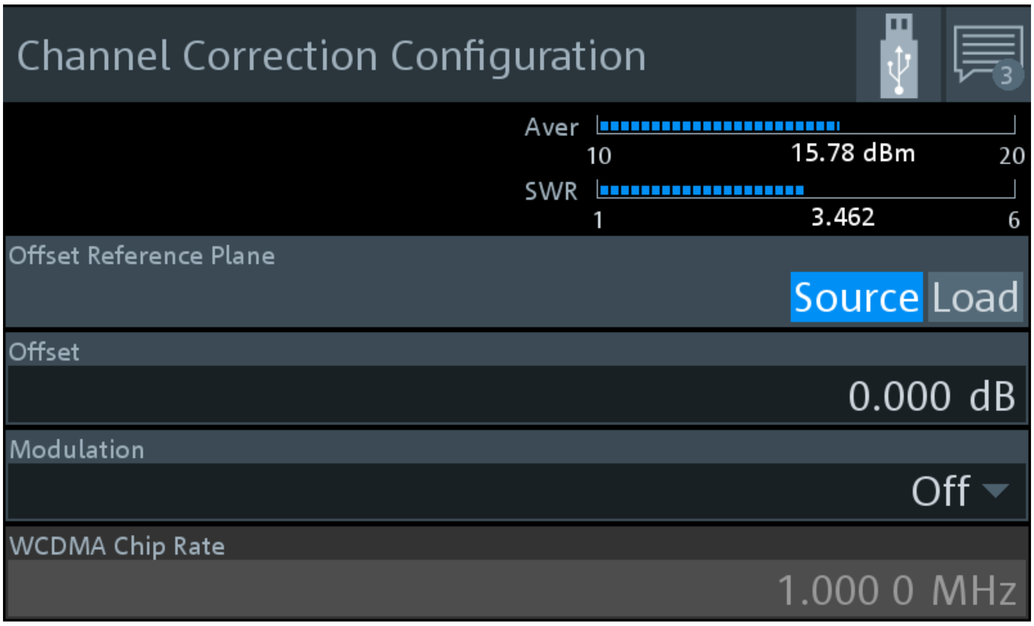


Figure 8-2: Channel Correction Configuration

Offset Reference Plane

Selects the reference plane. It defines the sensor port to which the measurement results are to be referred to.

"Source" Measurement of forward and reverse power at the source connector.

"Load" Measurement of forward and reverse power at the load connector.

Remote command:
`INPut<Sensor>:PORT:POSition` on page 290

Offset

After defining the reference plane the R&S NRX requests the entry of the cable loss (OFFSET) between the sensor and the measurement point desired.

"Min." 0.0 dB

"Max." 100.0 dB

Remote command:
`INPut<Sensor>:PORT:OFFSet` on page 290

Modulation
Allows parameters to be entered that are transferred to the sensor and taken into account, e.g. the type of communication standard.

"Off"	The correction of modulation-specific deviations is switched off.
"IS95"	Reduces systematic deviations occurring in power measurements on base stations (BTS) according to standard IS- 95 CDMA.
"WCDMA"	Reduces systematic deviations occurring in power measurements on BTS according to standard WCDMA.
"DVBT"	Reduces systematic deviations occurring in power measurements on terrestrial DVB TV transmitters.
"DAB"	Reduces systematic deviations occurring in power measurements on DAB radio transmitters.

Remote command:
`[SENSe<Sensor>:]DM:STANdard` on page 290

WCDMA Chip Rate
In contrast to other communication standards WCDMA is not based on a fixed RF bandwidth but on a bandwidth which varies according to the chip rate selected. This means that, if the standard "WCDMA" is selected, the chip rate must be entered

"Min."	0.000 Hz
"Max"	8.200 MHz

Remote command:
`[SENSe<Sensor>:]DM:WCDMa:CRATe` on page 290

8.5.3 NRT Filter Settings

To configure the "Channel Filter", perform the following steps.

1. In start view of the R&S NRX, tap the measurement area of the display.

   The "Measurement Overview" dialog opens.
2. Tap "Channel Sensor Configuration".

   The "Channel Configuration" dialog opens.
3. Tap "Filter".
   The "Channel Filter Configuration" dialog opens.
4. Specify the parameters according to your needs.

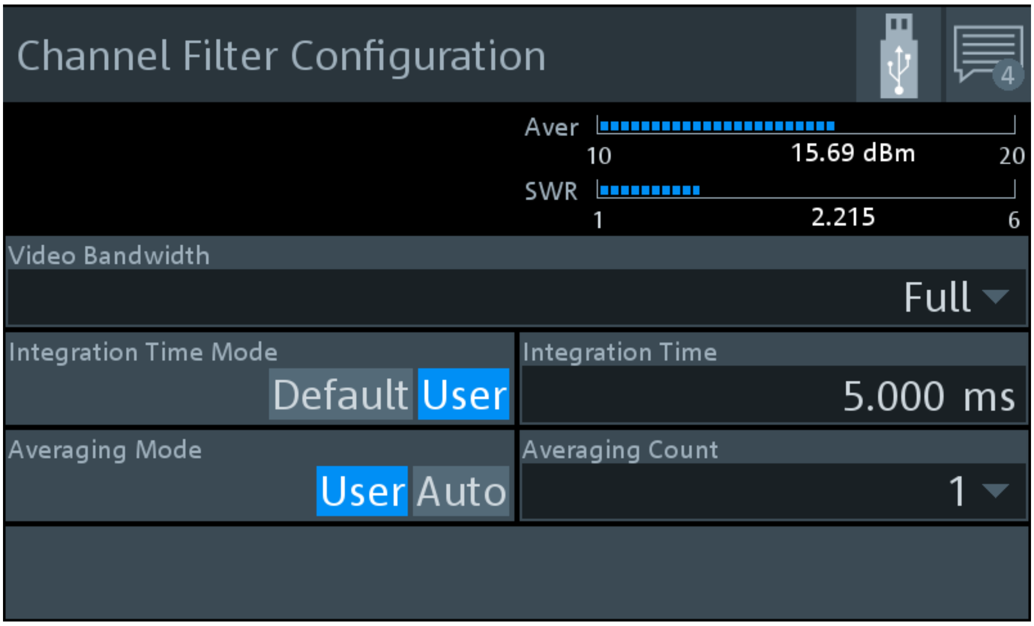


Figure 8-3: Channel Filter Configuration

Video Bandwidth

For measuring the peak envelope power, the video bandwidth used for measuring the detected RF signal has to be specified.

"4 kHz" The bandwidth of the sensor is set to 4 kHz.

"200 kHz" The bandwidth of the sensor is set to 200 kHz.

"Full" The maximum bandwidth of the sensor is used.

Remote command:

`CALCulate<Measurement>[:CHANnel<Channel>]:NRT:VBWidth[:VALue]`
on page 292

Integration Time Mode

Specifies which integration time is used for a single measurement.

"Default" Uses the default settings.

"User" Define a value under Integration Time.

Remote command:

`CALCulate<Measurement>[:CHANnel<Channel>]:NRT:APERture:MODE`
on page 291

Integration Time

Available if Integration Time Mode is set to "User".

Defines the integration time for a single measurement.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:NRT:APERture[:VALue]`
on page 291

Averaging Mode

Sets the averaging mode.

"User"	Define the value under Averaging Count.
"Auto"	The "Averaging Count" is set automatically.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:AVERage[:STATe]`
on page 272

Averaging Count

Available if Averaging Mode is set to "User".

Sets the filter length i.e. the number of readings to be averaged for one measured value. The higher the count, the lower the noise and the longer it takes to obtain a measured value.

"1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 264 "	Possible values for the filter length.

Remote command:
`CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt[:VALue]`
on page 273

9 Instrument Settings - Save, Recall, Preset

When shutting down, the R&S NRX saves the measurement settings. When booting the next time, the R&S NRX uses the settings from the last session. See also Chapter 3.6, "Switching On or Off", on page 23.

If you want to return to a defined initial state, perform a preset. See "Preset" on page 98.

If you want to save specific measurement settings to reuse at another time, save the setup in a file. The R&S NRX offers 20 setup files for this purpose.

Access: [Preset] > "Save / Recall / Preset" dialog

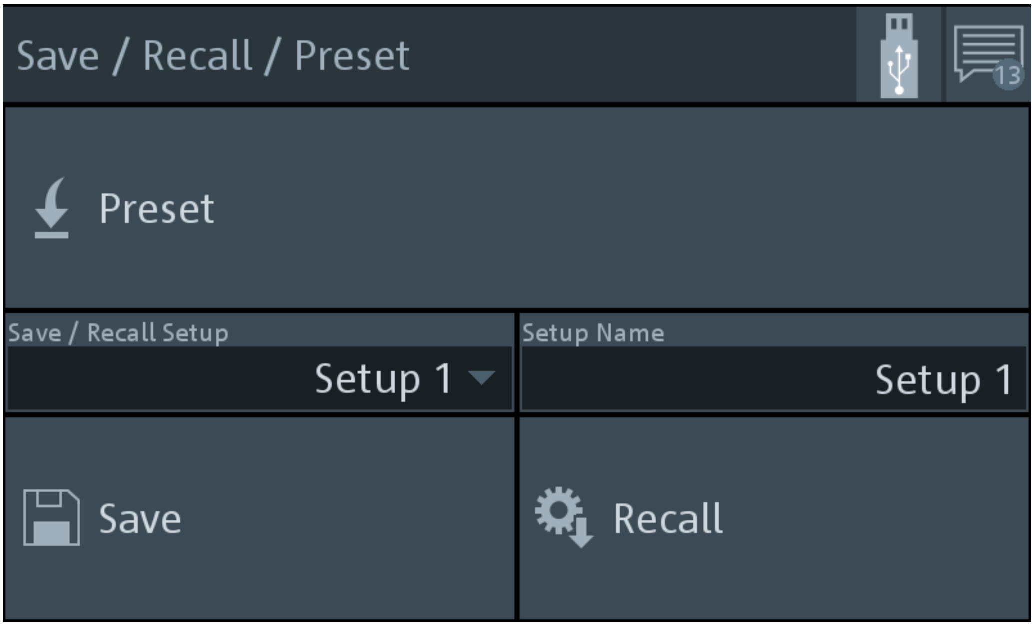


Figure 9-1: Save / Recall / Preset dialog

To save settings

1. Press [Preset].
2. Under "Save / Recall Setup", select a setup, for example "Setup 2".
3. If you want to give the setup a meaningful name, enter a new name under "Setup Name".
4. Tap "Save".

To recall settings

1. Press [Preset].
2. Under "Save / Recall Setup", select the setup you want to load, for example "Setup 2".

3. Tap "Recall".

Preset

Sets the R&S NRX and the connected R&S power sensors to a defined initial state. Thus you can change parameter values from a well defined starting point.

If the default setting of the R&S NRX is not compatible with the sensor, either the default settings are adapted for the sensor or a settings conflict results. See also Chapter 5.5, "Settings Conflict", on page 40.

For details on sensor settings, see the user manual of the R&S power sensor.

Remote command:
`SYSTem:PRESet` on page 327
`*RST` on page 138

Save / Recall Setup

Selects the setup file in which the instrument settings are saved.

Save

Saves the current instrument settings in the selected setup file.

Remote command:
`*SAV` on page 138

Setup Name

Selects the setup file from which to load the instrument settings.

Recall

Restores the selected instrument settings.

Remote command:
`*RCL` on page 138

10 Zeroing Sensors

Zeroing removes offset voltages from the analog circuitry of the sensors, so that there are only low powers displayed when there is no power applied.

Zeroing is recommended if:

- The temperature has varied by more than 5 K.
- The sensor has been replaced.
- No zeroing was performed in the last 24 hours.
- Signals of very low power are to be measured, for instance, if the expected measured value is less than 10 dB above the lower measurement range limit.

Access: [Zero] > "Zeroing Sensors" dialog

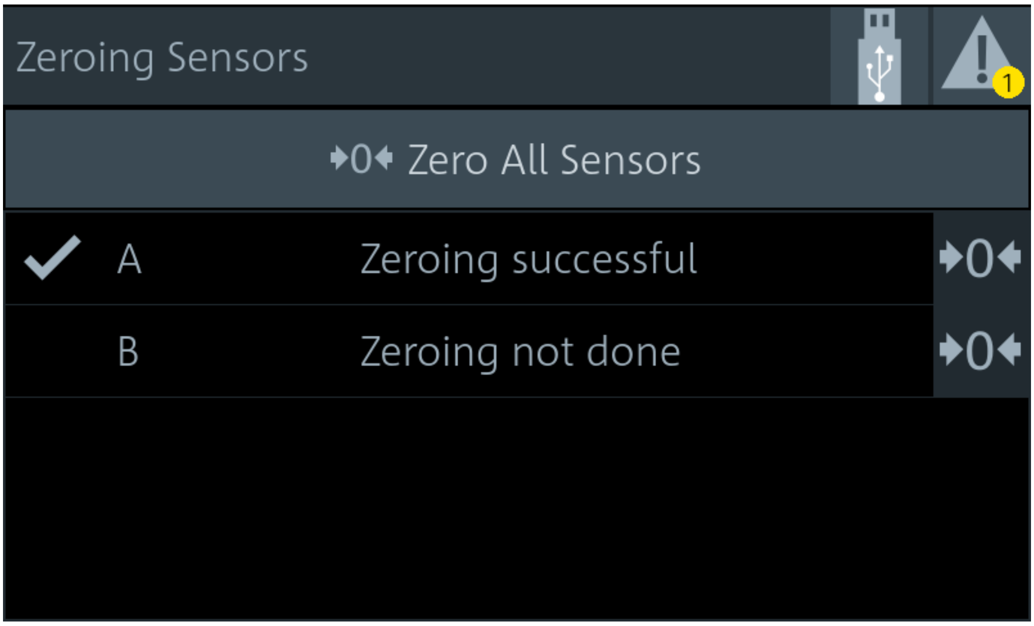


Figure 10-1: Zeroing Sensors dialog

The table below "Zero All Sensors" shows all connected sensors with:

- Port name, A to D
- Zeroing status: not done, in progress, successful
  Sensors zeroed successful are also checked: ☑

To zero sensors

1. Disconnect the sensors you want to zero from all power sources. Any signal present at the RF input of a sensor is taken into account. You can either switch off the RF output of a DUT or disconnect the sensor physically from any power source.

   Note: An active test signal during zeroing causes an error.

2. Press [Zero].

3. You can zero an individual sensor or all sensors at once:
   - Tap "Zero All Sensors".
   - Tap  in the row of the sensor you want to zero.

   The status changes from in progress to successful.

Remote command:

- See Chapter 13.9, "Calibrating and Zeroing", on page 306.

11 System Settings

The system settings do not directly affect the measurement.

Access: [System]

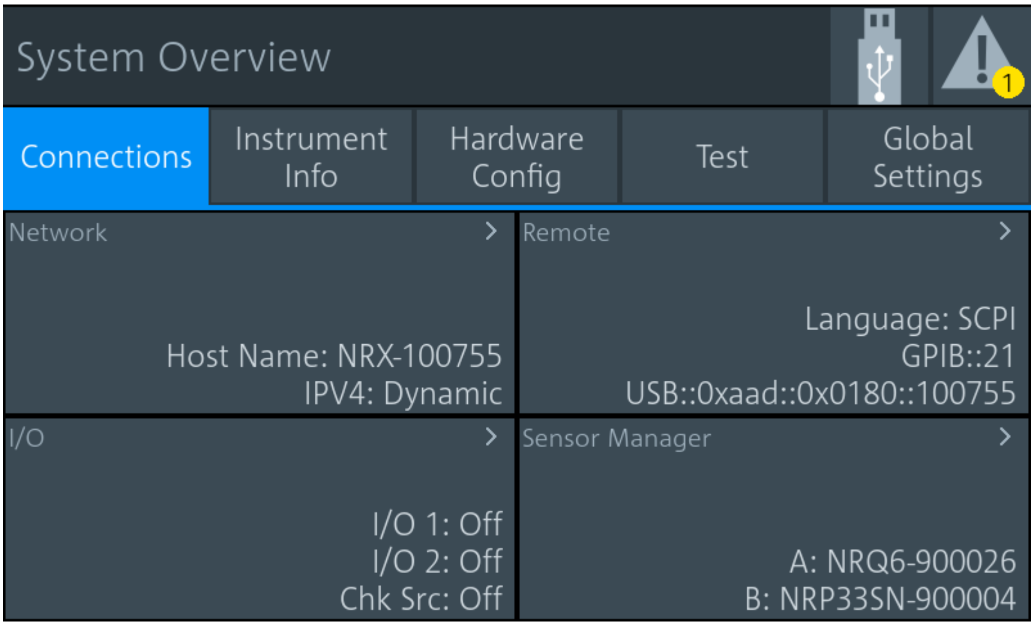


Figure 11-1: System Overview dialog

The "System Overview" dialog is divided into the following tabs:

11.1 Connections

Access: [System] > "System Overview" > "Connections"

See Figure 11-1.

On this tab, you display and configure the following settings:

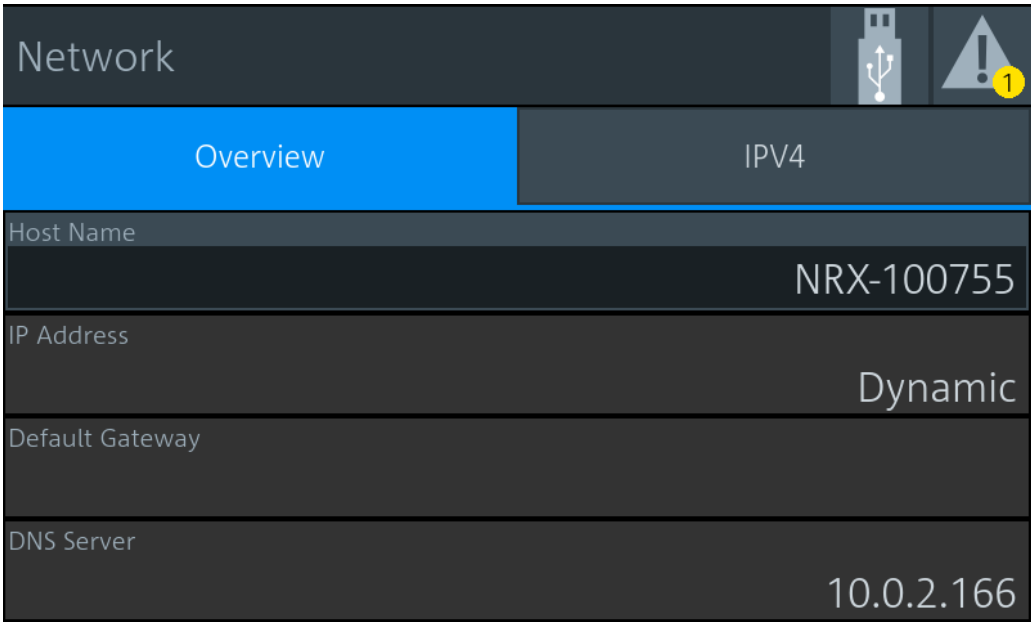
11.1.1 Network Settings

Access: [System] > "System Overview" > "Connections" > "Network"

Contains the settings for integrating the R&S NRX in a network.

The "Network" dialog is divided into the following tabs:

Overview tab



Host Name ← Overview tab

Sets the individual host name of the R&S NRX.

In a LAN that uses a DNS server (domain name system server), you can access each connected instrument using a unique hostname instead of its IP address. The DNS server translates the hostname to the IP address. Using a hostname is especially useful if a DHCP server is used, as a new IP address can be assigned each time the instrument is restarted.

The R&S NRX performs the change of the hostname immediately after the command is sent. For this purpose, the sensor restarts its connection to the network, which can take several seconds. During this time, you cannot address the sensor. After the restart, you can only address the sensor using the newly set hostname.

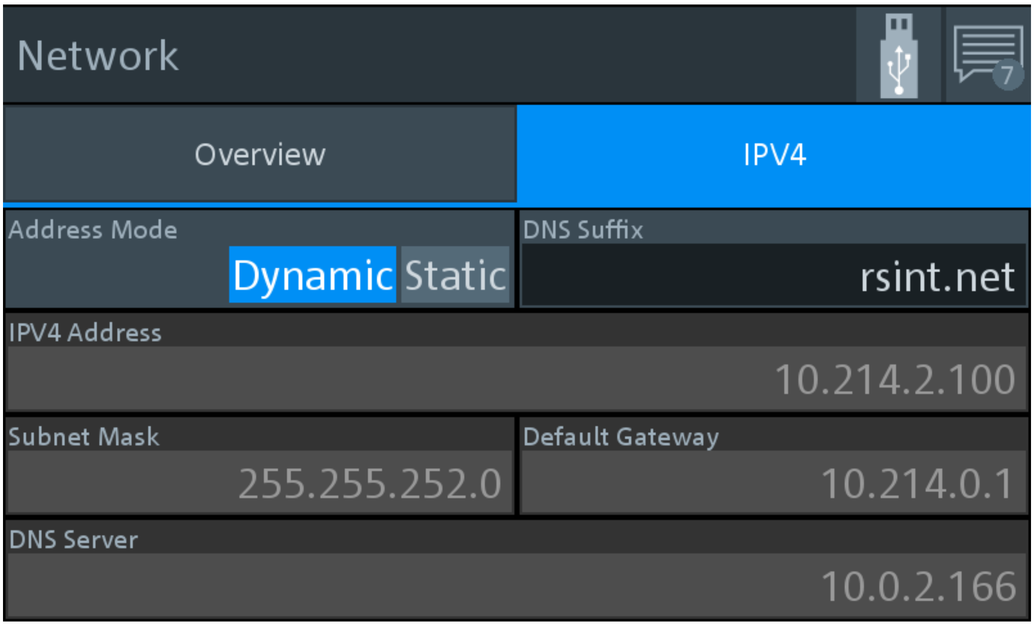
Remote command:
`SYSTem:COMMunicate:NETWork[:COMMon]:HOSTname` on page 322

IP Address ← Overview tab
Displays the set address mode and in "Static" mode, the IP address of the R&S NRX. Address mode and IP address are set on the "IPV4" tab.

Default Gateway ← Overview tab
Displays the IP address of the default gateway of the local subnet . The IP address of the default gateway is set on the "IPV4" tab.

DNS Server ← Overview tab
Displays the IP address of the DNS server of the local subnet. The IP address of the DNS server is set on the "IPV4" tab.

IPv4 tab



Address Mode ← IPv4 tab
Selects if the IP address, subnet mask and default gateway are assigned manually or automatically. If the R&S NRX is to be integrated into a network, contact your network administrator regarding the data to be set.

"Dynamic" The IP address , subnet mask and gateway are assigned automatically. A DHCP server must be available in the network.

"Static" The IP address, subnet mask, and default gateway are assigned manually. The IP address, subnet mask and gateway information as obtained from your network administrator are entered in the corresponding entry lines below.

Remote command:
`SYSTem:COMMunicate:NETWork[:IPADdress]:MODE` on page 320
`SYSTem:COMMunicate:INET[:SELF]:MODE` on page 320

DNS Suffix ← IPv4 tab

Sets the primary DNS (Domain Name System) suffix, that means the DNS name without the hostname part. The DNS system uses the suffix for registration and name resolution for unique identification of the instrument in the entire network.

Remote command:
`SYSTem:COMMunicate:NETWork[:COMMon]:DOMain` on page 322
`SYSTem:COMMunicate:INET[:SELF]:DNS:SUFFix` on page 322

IPv4 Address ← IPv4 tab

Sets the IP address of the R&S NRX if the "Address Mode Static" is selected.

Remote command:
`SYSTem:COMMunicate:NETWork[:IPADdress][:ADDRess]` on page 320
`SYSTem:COMMunicate:INET[:SELF]:ADDRess` on page 320

Subnet Mask ← IPv4 tab

Sets the subnet mask of your local subnet if the "Address Mode Static" is selected.

Remote command:
`SYSTem:COMMunicate:NETWork[:IPADdress]:SUBNet:MASK` on page 321
`SYSTem:COMMunicate:INET[:SELF]:SUBNetmask:ADDRess` on page 321

Default Gateway ← IPv4 tab

Sets the IP address of the default gateway if the "Address Mode Static" is selected.

Remote command:
`SYSTem:COMMunicate:NETWork[:IPADdress]:GATeway` on page 321
`SYSTem:COMMunicate:INET[:SELF]:GATeway:ADDRess` on page 321

DNS Server ← IPv4 tab

Sets the DNS server address of your local subnet if the "Address Mode Static" is selected.

Remote command:
`SYSTem:COMMunicate:NETWork[:IPADdress]:DNS` on page 321
`SYSTem:COMMunicate:INET[:SELF]:DNS:ADDRess` on page 321

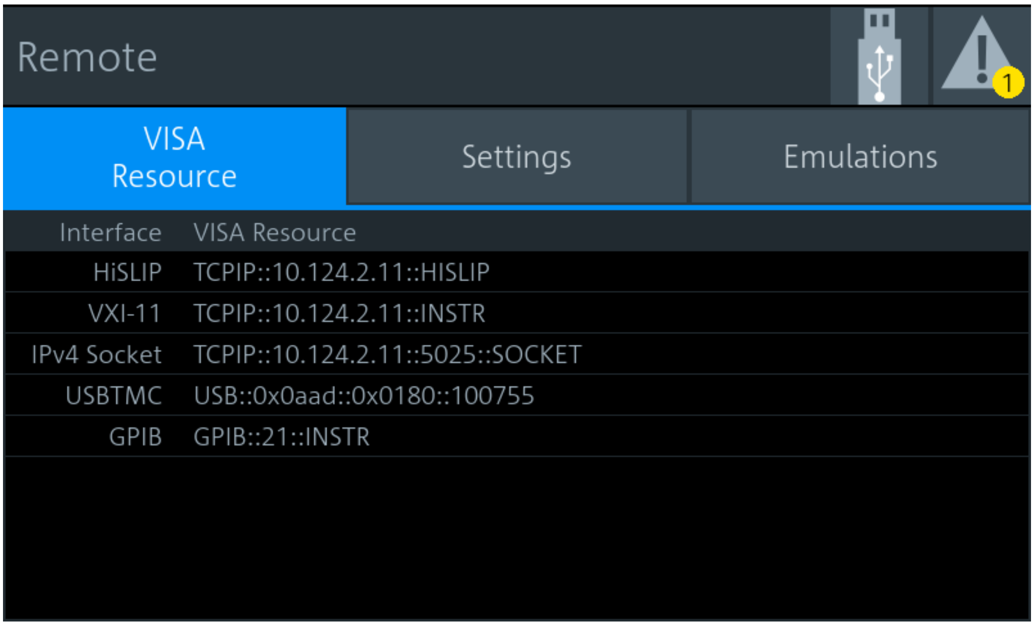
11.1.2 Remote Settings

Access: [System] > "System Overview" > "Connections" > "Remote"

Contains the settings for remote control.

The "Remote" dialog is divided into the following tabs:

VISA Resource tab



Interface - VISA Resource table ← VISA Resource tab

The VISA resource string is required to establish a communication session between the controller and the instrument in a LAN. The resource string is a unique identifier, composed of the specific IP address of the instrument and some network and VISA-specific keywords. The resource string depends on the interface used for remote control.

"HiSLIP" Address string for the HiSLIP protocol, composed as follows:
TCPIP::<IP address>::HISLIP

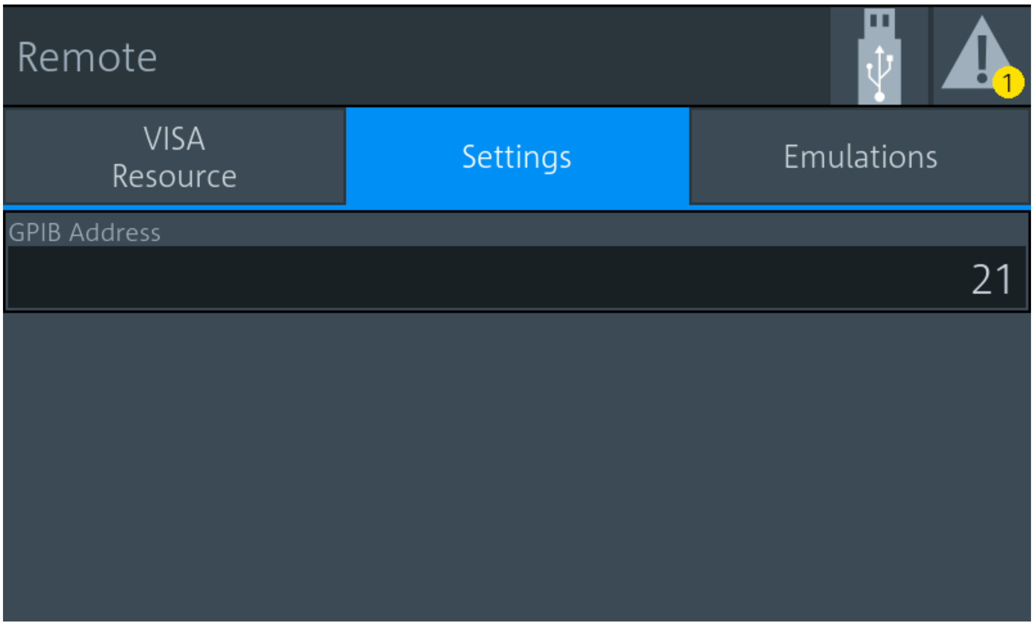
"VXI-11" Address string for the VXI-11 protocol, composed as follows:
TCPIP::<IP address>::INSTR

"IPv4 Socket" Address string for the IPv4 socket, composed as follows:
TCPIP::<IP address>::<data port>::SOCKET

"USBTMC" Address string for the USB interface, composed as follows:
USB::<vendor ID>::<product ID>::<instrument serial number>

"GPIB" Address string for the GPIB interface, composed as follows:
`GPIB::<primary address>::INSTR`

Settings tab



GPIB Address ← Settings tab

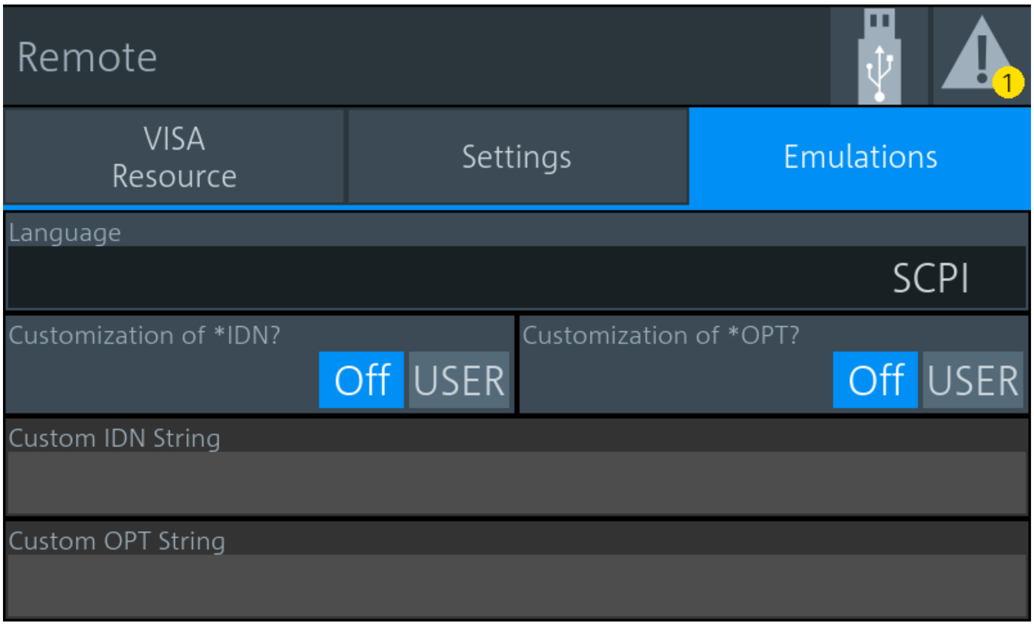
To be able to control the instrument via the GPIB bus, the R&S NRX and the controller must be linked by a GPIB bus cable. A GPIB bus card, the card drivers and the program libraries for the programming language used must be provided in the controller.

The controller must address the instrument with the GPIB bus channel.

"1" to "30" Channel address

Remote command:
`SYSTem:COMMunicate:GPIB[:SELF]:ADDRess` on page 320

Emulations tab



Language ← Emulations tab

Specifies the language for the remote commands.

"SCPI" Native remote command set of the R&S NRX, based on the standard commands for programmable instruments (SCPI-99).

Other emulations Emulations for the predecessors and other power meters.

Remote command:
SYSTem:LANGuage on page 325

Customization of *IDN? ← Emulations tab

Selects if the default or the user-defined identification string is used for the instrument.

"Off" No customization of the instrument identification string.

"User" In addition to the preset values, a user-defined identification string can be entered, e.g. to provide individual identification for each instrument. The customized instrument identification string is entered in line Custom IDN String).

Remote command:
SYSTem:IDN:MODE on page 325

Customization of *OPT? ← Emulations tab

Selects if the default or the user-defined option string is used for the instrument.

"Off" No customization of the option identification string.

"User" A user-defined option string can be created. The user-defined option string is entered at line Custom OPT String).

Remote command:
SYSTem:OPT:MODE on page 326

Custom IDN String ← Emulations tab
Specifies the user- defined instrument identification string.

Remote command:
`SYSTem:IDN:ANSWer` on page 326

Custom OPT String ← Emulations tab
Specifies the user-defined option identification string.

Remote command:
`SYSTem:OPT:ANSWer` on page 326

11.1.3 Input/Output Settings (I/O)

Access: [System] > "System Overview" > "Connections" > "I/O"

Contains the settings for the BNC connectors at the rear of the R&S NRX.

The "I/O" dialog is divided into the following tabs:

I/O 1, I/O 2 tabs
Configures the analog signal output at the two multifunction BNC connectors at the rear of the R&S NRX.

- Use the "I/O 1" tab for Out 1 / Trig Out BNC connector.
- Use the "I/O 2" tab for Trig In / Out 2 BNC connector.

See Chapter 2.2.1, "Trig In / Out 2 and Out 1 / Trig Out Connectors", on page 18.

Figure 11-2: Example

Mode ← I/O 1, I/O 2 tabs
Selects the connector output.

Off ← Mode ← I/O 1, I/O 2 tabs
Disables the port.

Analog Out ← Mode ← I/O 1, I/O 2 tabs
Available for Continuous Average, Burst, Time Gate, Tome Slot

Provides an analog voltage that is proportional to the value displayed in the selected window.

"Measurement for Recorder Output"
Specify the measurement to be used for recorder output.

"0 V Equivalent" Entry of the measurement value that corresponds to the output voltage of 0 V.

"2.5 V Equivalent" Entry of the measurement value that corresponds to the output voltage of 2.5 V.

Forw Analog Out, Refl Analog Out ← Mode ← I/O 1, I/O 2 tabs
Available for NRT

Provides an analog voltage that is proportional to the value displayed.

"Measurement for Recorder Output"
Specify the measurement to be used for recorder output.

"0 V Equivalent"
Entry of the measurement value that corresponds to the output voltage of 0 V.

"2.5 V Equivalent"
Entry of the measurement value that corresponds to the output voltage of 2.5 V.

Limit Violation ← Mode ← I/O 1, I/O 2 tabs
Available for:
- Continuous Average, Burst, Time Gate, Tome Slot measurement types
- Out 1 / Trig Out BNC connector ("I/O 1" tab)

Sets the logic output level for limit violation of measurement results.

"Measurement for Limit Output"
Specify the measurement to be used for limit output.

"Fail Voltage"
Low: Corresponds to an output voltage of 0 V, if a limit is violated.
High: Corresponds to an output voltage of 5 V, if a limit is violated.

Forw Limit Violation ← Mode ← I/O 1, I/O 2 tabs
Available for:
- NRT measurement type
- Out 1 / Trig Out BNC connector ("I/O 1" tab)

Sets the logic forward output level for limit violation of measurement results. The value range is 0 V to 5 V.

"Measurement for Limit Output"
Specify the measurement to be used for limit output.

"Fail Voltage"
Low: Corresponds to an output voltage of 0 V, if a limit is violated.
High: Corresponds to an output voltage of 5 V, if a limit is violated.

Refl Limit Violation ← Mode ← I/O 1, I/O 2 tabs
Only available for the Out 1 / Trig Out BNC connector ("I/O 1" tab).

Sets the logic reflection output level for limit violation of measurement results. The value range is 0 V to 5 V.

"Measurement for Limit Output"
Specify the measurement to be used for limit output.

"Fail Voltage"
Low: Corresponds to an output voltage of 0 V, if a limit is violated.
High: Corresponds to an output voltage of 5 V, if a limit is violated.

Trigger Out ← Mode ← I/O 1, I/O 2 tabs
Only available for the Out 1 / Trig Out BNC connector "I/O 1" tab.

Provides a logic signal, which represents the state of the internal trigger bus.

The trigger signal is either supplied by one of the connected sensors, i.e. the trigger master, or via the "TRIG IN / OUT2" socket.

For example, use the signal to synchronize externally connected instruments.

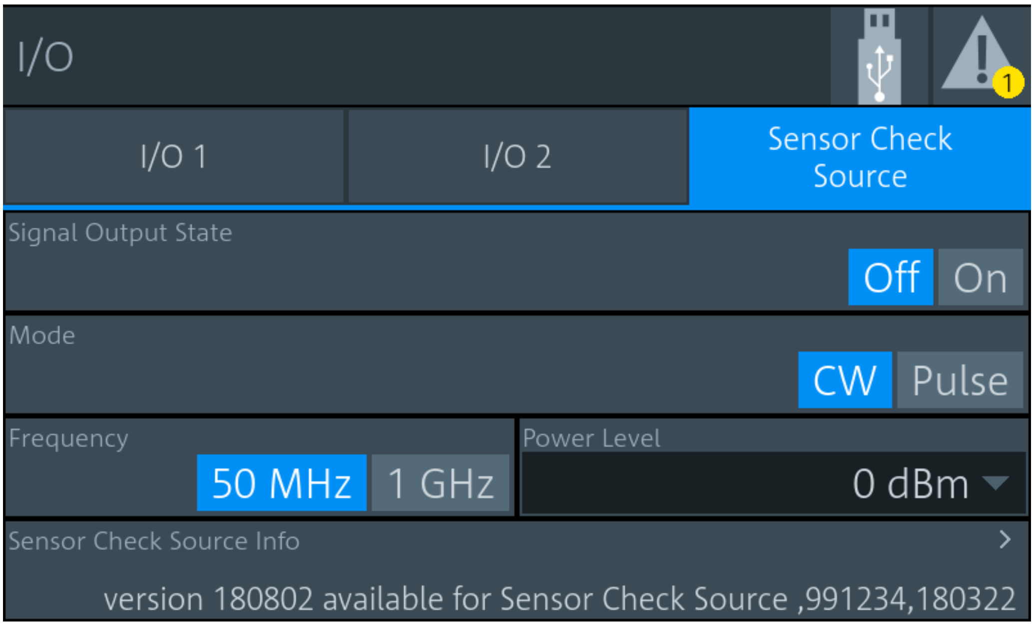
"Trigger Source for Trigger Output"
"Sensor A" | "Sensor B" | "Sensor C" | "Sensor D" | "External" | "Sensor Check Source"

Trigger In ← I/O 1, I/O 2 tabs
Only available for the Trig In / Out 2 BNC connector ("I/O 2" tab).

The connector is used as input. An external trigger signal can be applied.

Impedance for Trigger Input	10 kΩ | 50 Ω

Sensor Check Source tab
Requires the sensor check source (R&S NRX-B1).



Signal Output State ← Sensor Check Source tab
Enables or disables the output.

Mode ← Sensor Check Source tab
"CW" | "Pulse"

Frequency ← Sensor Check Source tab
"50 MHz" | "1 GHz"

Power Level ← Sensor Check Source tab
Sets the power level for the sensor check source.

Sensor Check Source Info ← Sensor Check Source tab
Displays the available versions for the sensor check source.

11.1.4 Sensor Manager

Access: [System] > "System Overview" > "Connections" > "Sensor Manager"

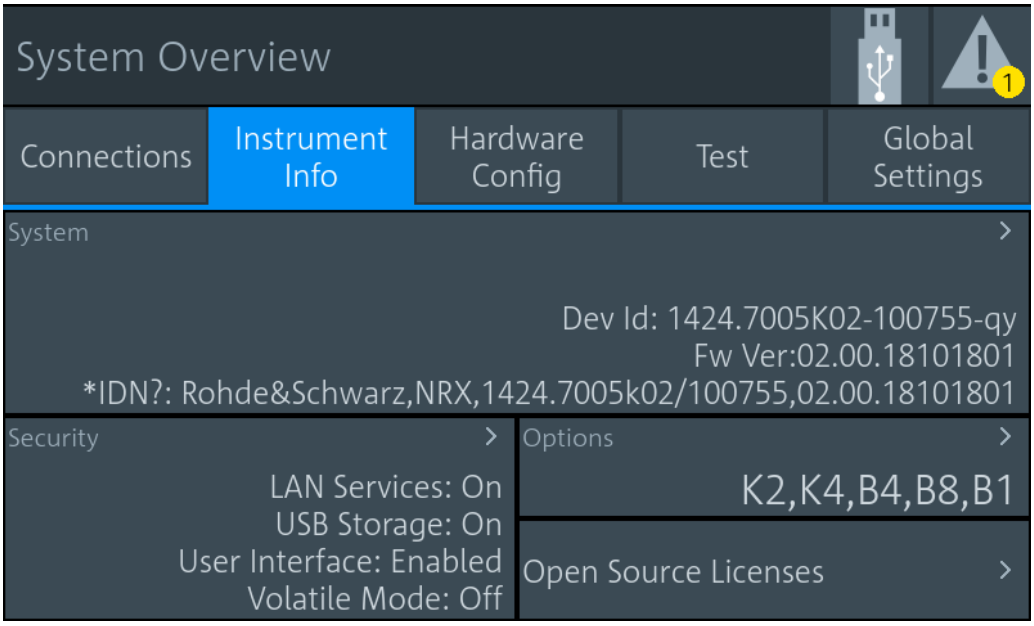
Active Sensors
This table displays the details for the active sensors.

"SCPI"	Index used in remote command.
"Port"	Port of the selected sensor
"Type"	Type of the selected sensor
"Serial"	Serial number of the selected sensor.

Manage Sensors
Displays the available sensors for management.

11.2 Instrument Info

Access: [System] > "System Overview" > "Instrument Info"

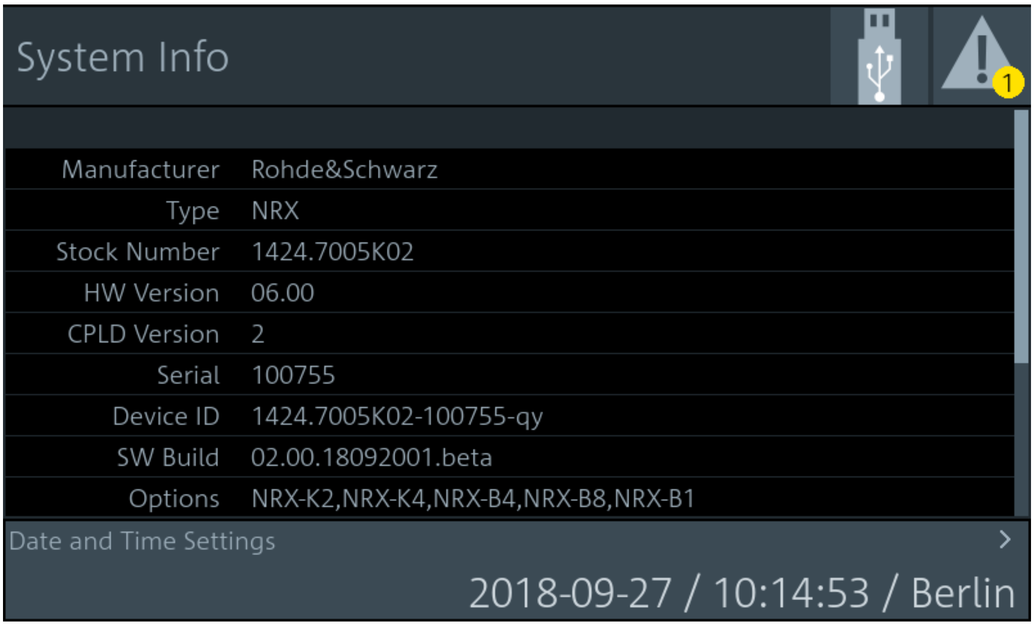


On this tab, you display and configure the following settings:

11.2.1 System Info

Access: [System] > "System Overview" > "Instrument Info" > "System Info"

Displays a list of instrument-specific parameters.



System Info

The "System Info" dialog displays the following parameters:

Manufacturer	Manufacturer
Type	Power meter type
Stock Number	Stock number of the R&S NRX
HW Version	Hardware version of the R&S NRX
CPLD Version	Complex programmable logic device (CPLD) version
Serial	Serial number of the R&S NRX
Device ID	Device ID of the R&S NRX
SW Build	Version of software build
Options	Short names of the installed options
MAC Address	MAC address (Ethernet hardware address)
Hostname	Hostname
IP Address	IP address of the R&S NRX
*IDN?	Instrument identification string: <manufacturer>,NRX,<serial number>,<firmware version>
*OPT?	Option identification string; lists the installed options: <option 1>, <option 2>, ...
Uptime	Operating time of the R&S NRX

Date and Time Settings
Opens the "Date and Time" dialog.

Date ← Date and Time Settings
Sets the current date in the format YYYY-MM-DD.

Remote command:
SYSTem:DATE on page 323

Time ← Date and Time Settings
Sets the current time in the format HH:MM:SS.

Remote command:
SYSTem:TIME on page 335

Time Zone Region ← Date and Time Settings
Sets the time zone region.

Remote command:
SYSTem:TZONe on page 337

Time Zone ← Date and Time Settings
Sets the time zone.

Remote command:
SYSTem:TIME:DSTime:RULE on page 336
SYSTem:TIME:DSTime:RULE:CATalog? on page 336

11.2.2 Security Settings

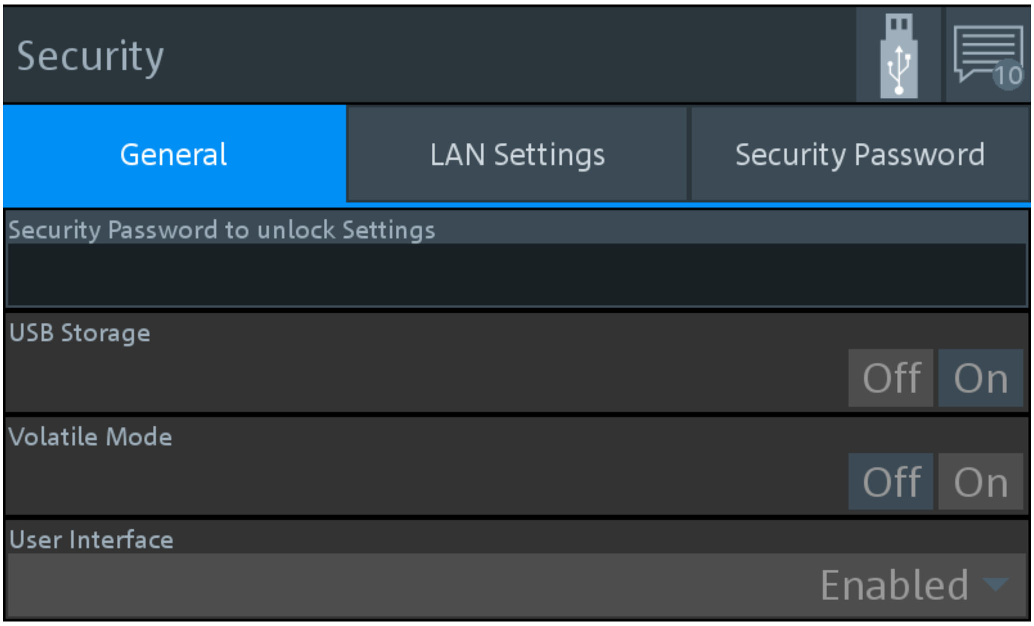
Access: [System] > "System Overview" > "Instrument Info" > "Security"

Contains the settings for access rights, LAN security and passwords.

The "Security" dialog is divided into the following tabs:

General tab

Configures the access rights for storage devices and restrictions for the user interface.



Security Password to Unlock Settings ← General tab

Enter the password that is required to enable the settings protected by a security password. When you leave the "Security" dialog, the settings are disabled automatically.

For default value and further information, see "Security Password tab" on page 117.

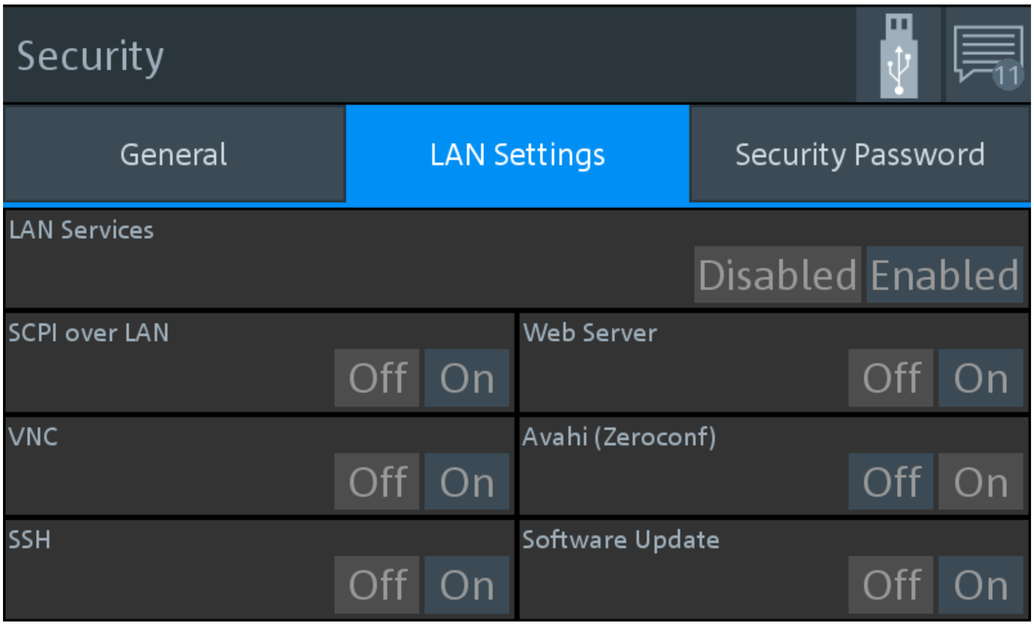
USB Storage ← General tab

Enables or disables the file transfer via USB storage.

Volatile Mode ← General tab
If enabled, allows you to write information to the hard disk memory permanently.

User Interface ← General tab
Enabled. Fixed setting.

LAN Settings tab
Configures the LAN interface in general or all LAN services individually.



LAN Services ← LAN Settings tab
Enables or disables the LAN services in general. If enabled, it provides remote access via all unlocked services.

SCPI over LAN ← LAN Settings tab
Enables or disables the access over LAN to control the R&S NRX remotely by using SCPI (standard commands for programmable instruments) commands.

Web Server ← LAN Settings tab
Enables or disables a web server that is required to access using a web application.

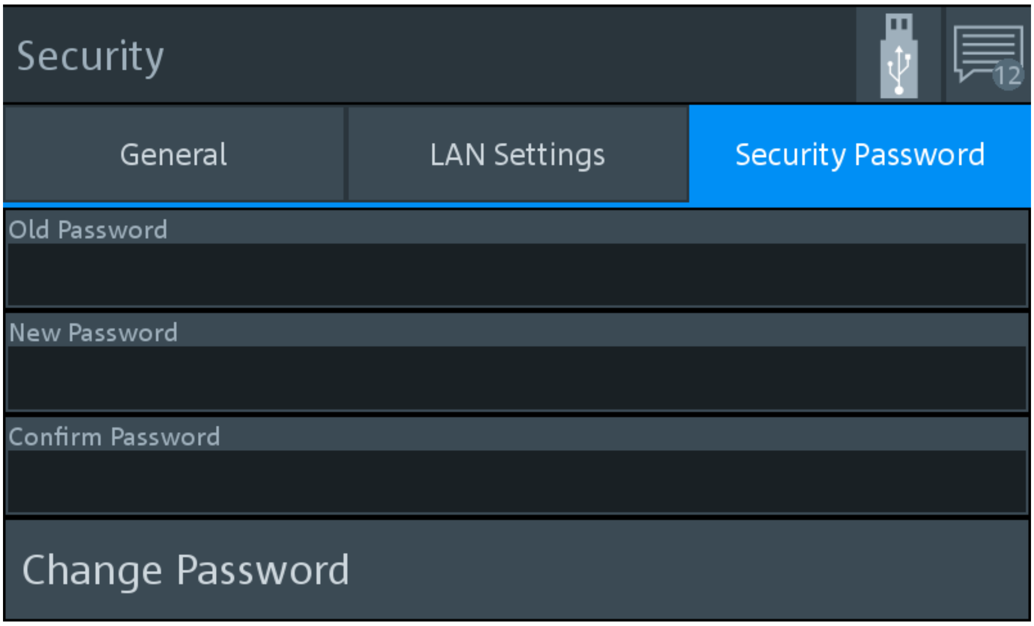
VNC ← LAN Settings tab
Enables or disables access using a virtual network computing (VNC) interface, a graphical desktop sharing system that uses RFB protocol to control the R&S NRX remotely.

Avahi (Zeroconf) ← LAN Settings tab
Enables or disables Avahi, a service for automatic configuration of the R&S NRX in a network environment.

SSH ← LAN Settings tab
Enables or disables access using a secure shell (SSH), a network protocol for secure data communication.

Software Update ← LAN Settings tab
Enables or disables the software update over LAN.

Security Password tab
Used to change the security password.



Old Password ← Security Password tab
Currently used security password. The default password is *123456*.

Note: We recommend that you change the default password before connecting the R&S NRX to a network.

The security password is required for changing security settings in the "Security" dialog.

New Password ← Security Password tab
New security password.

Confirm Password ← Security Password tab
New security password for confirmation.

Note: The new password is not assigned until you tap "Change Password".

Change Password ← Security Password tab
Sets the new password as security password.

11.2.3 Options Settings

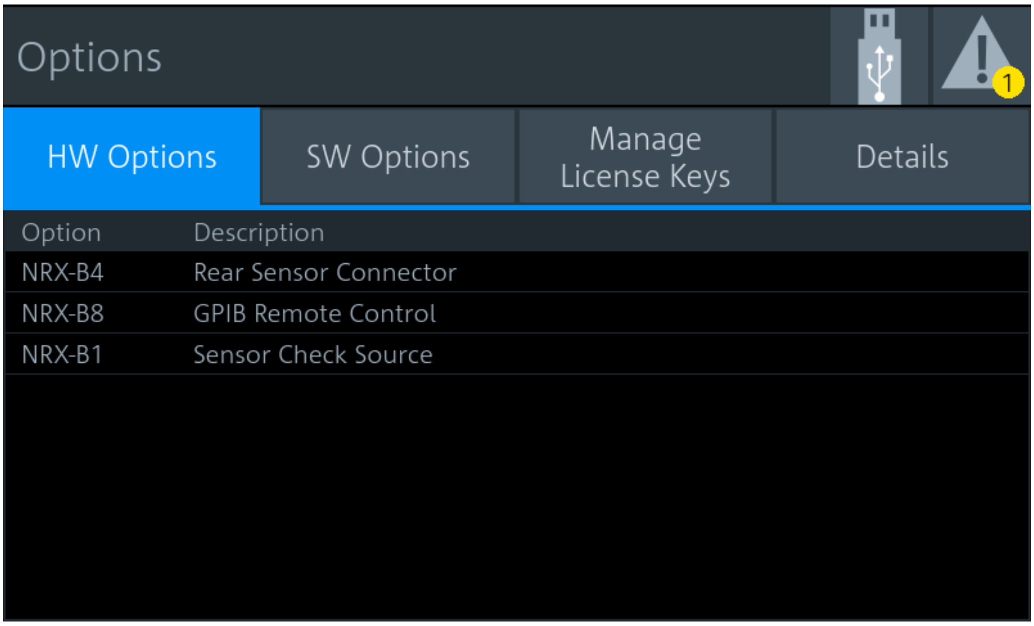
Access: [System] > "System Overview" > "Instrument Info" > "Options"

Displays installed options and offers an interface to install new options.

The "Options" dialog contains the following parameters:

HW Options tab

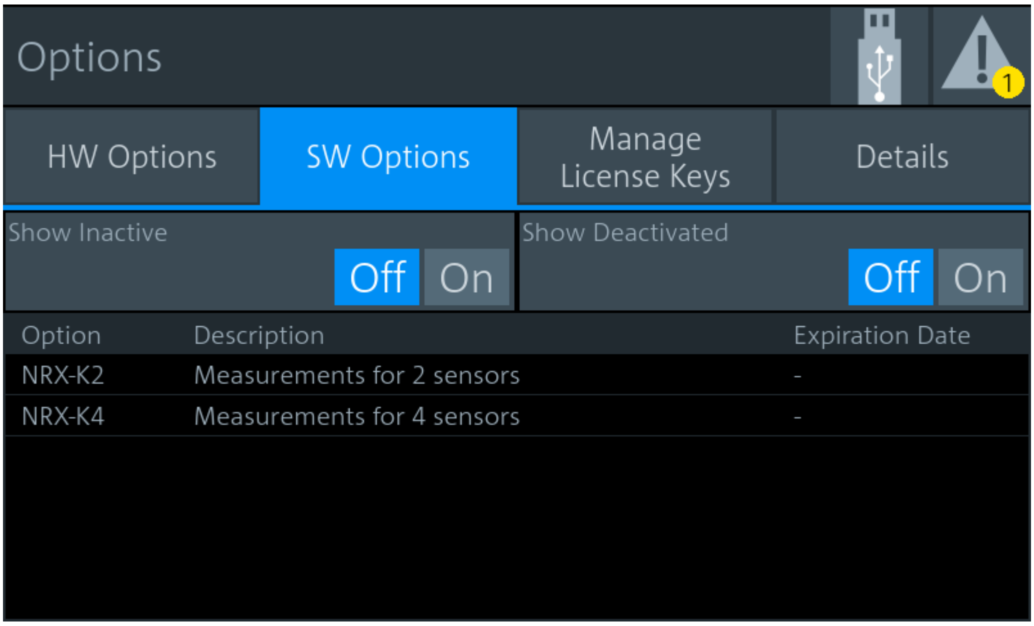
Displays the installed hardware options.



Remote command:
`*OPT?` on page 137

SW Options tab

Displays all software options and their status.



You can filter the displayed list by the following criteria:

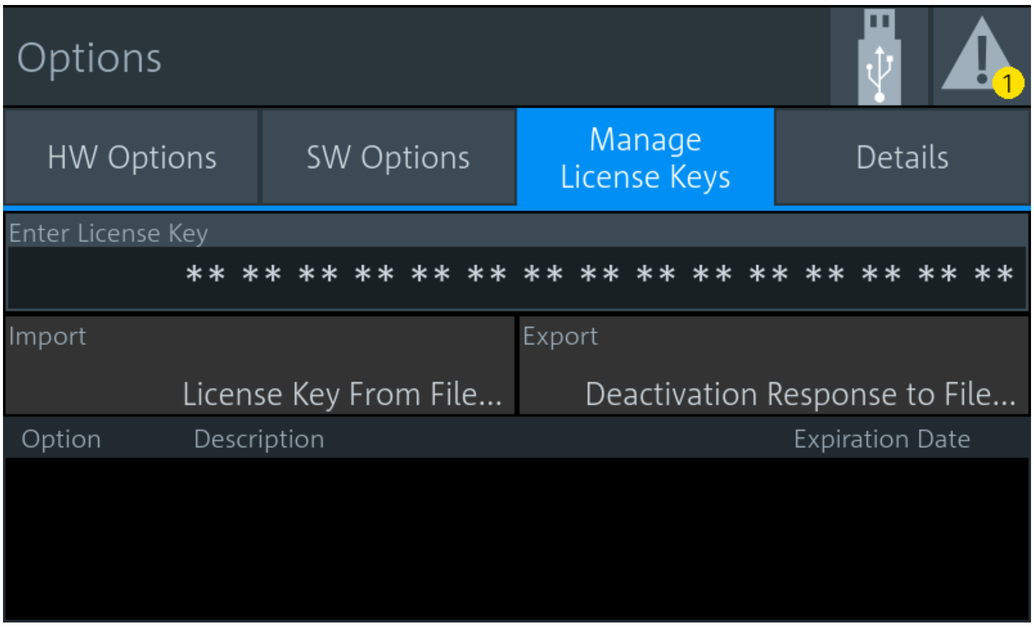
"Show Inactive On | Off"
: Shows or hides inactive software options. These software options are available in the firmware version but are not installed.

"Show Deactivated On | Off"
: Shows or hides deactivated software options. These software options have been installed but are not active any more, for example because the license key is expired.

Remote command:
`*OPT?` on page 137

Manage License Keys tab

Used to install or deinstall software options.



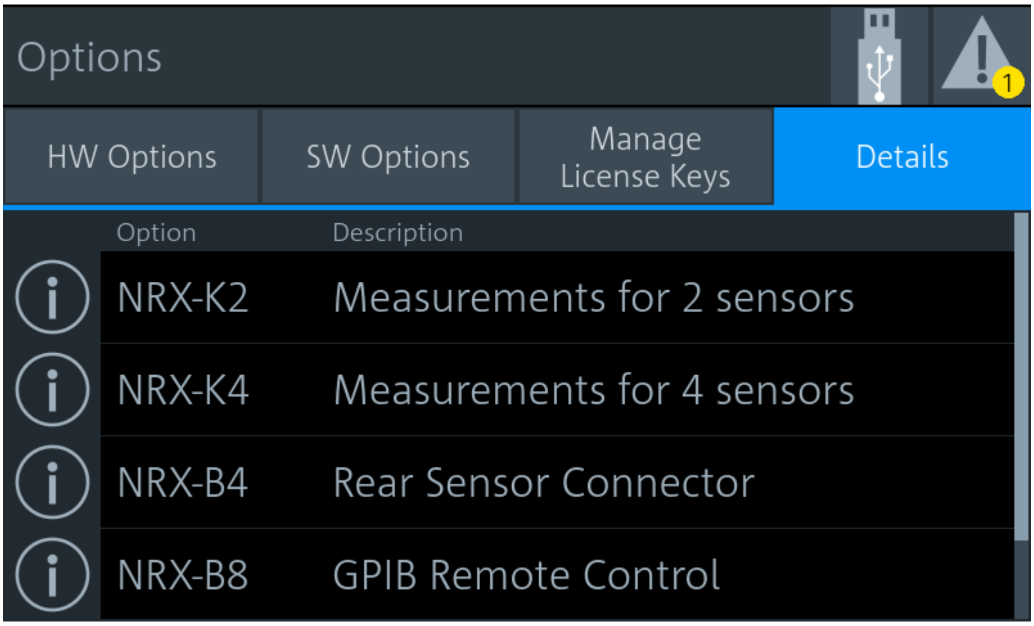
The list gives details on the installed or deinstalled options.

Enter License Key ← Manage License Keys tab
Enter the license key manually.

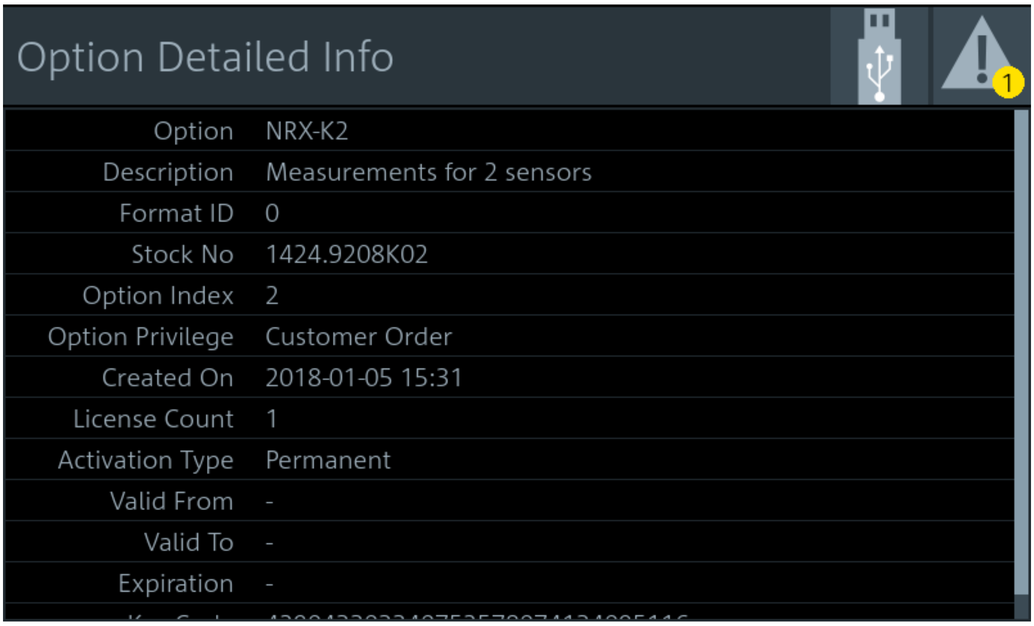
Import ← Manage License Keys tab
For future use.

Export ← Manage License Keys tab
For future use.

Details tab
Displays a list of all installed hardware and software options.



If you want to see more information on a specific option, tap ⓘ.



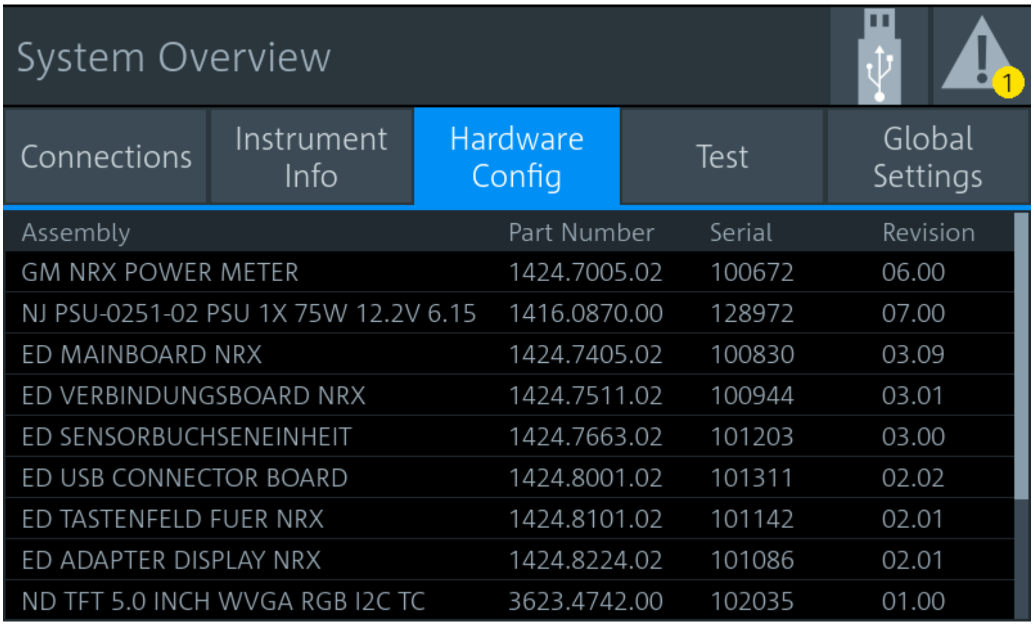
11.2.4 Open Source Licenses

Access: [System] > "System Overview" > "Instrument Info" > "Open Source Licenses"

Displays the license texts of open source software packages used in the R&S NRX software.

11.3 Hardware Configuration

Access: [System] > "System Overview" > "Hardware Configuration"

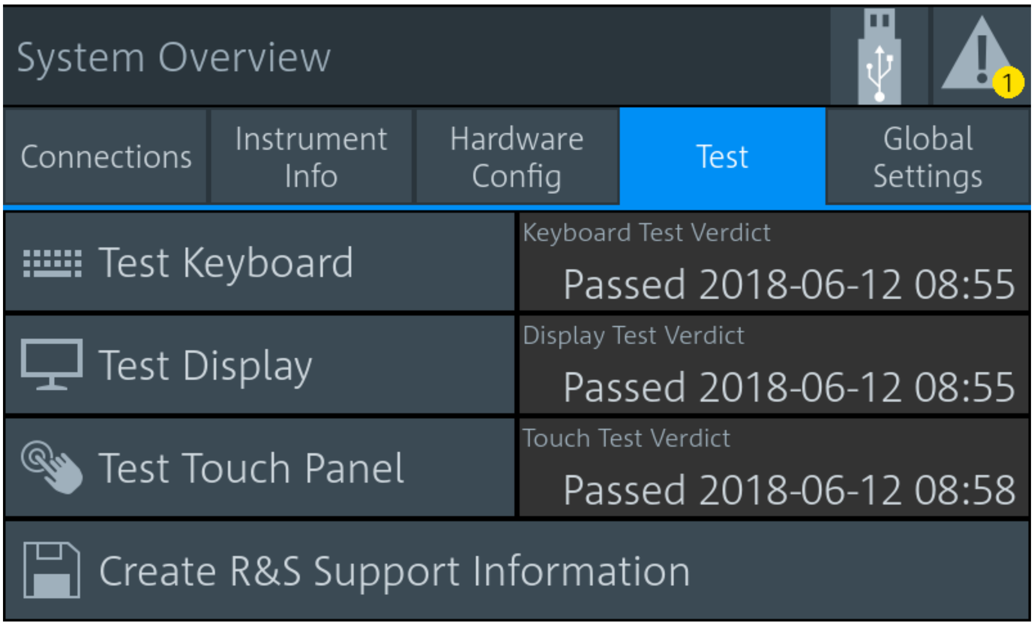


Assembly	Part Number	Serial	Revision
GM NRX POWER METER	1424.7005.02	100672	06.00
NJ PSU-0251-02 PSU 1X 75W 12.2V 6.15	1416.0870.00	128972	07.00
ED MAINBOARD NRX	1424.7405.02	100830	03.09
ED VERBINDUNGSBOARD NRX	1424.7511.02	100944	03.01
ED SENSORBUCHSENEINHEIT	1424.7663.02	101203	03.00
ED USB CONNECTOR BOARD	1424.8001.02	101311	02.02
ED TASTENFELD FUER NRX	1424.8101.02	101142	02.01
ED ADAPTER DISPLAY NRX	1424.8224.02	101086	02.01
ND TFT 5.0 INCH WVGA RGB I2C TC	3623.4742.00	102035	01.00

Lists the hardware details of the R&S NRX assemblies. This tab can be useful for looking up the revision of hardware, for example when troubleshooting.

11.4 Test

Access: [System] > "System Overview" > "Test"



On this tab, you can test whether the user interfaces are in working order and create information useful for troubleshooting.

Testing the user interfaces

1. Tap the test you want to perform.

   A dialog with detailed test instructions is displayed.

2. Read and follow the instructions.

3. Exit the test with PASS or FAIL.

   Note: "Exit with PASS" only becomes available when the test is finished successfully.

   The results, passed or failed, are displayed for each test.

Remote command:

- `TEST:DEVice[:ALL]` on page 308

Creating information for troubleshooting

1. If you want to save the information on a memory stick, connect a USB stick (FAT32).

2. Tap "Create R&S Support Information".

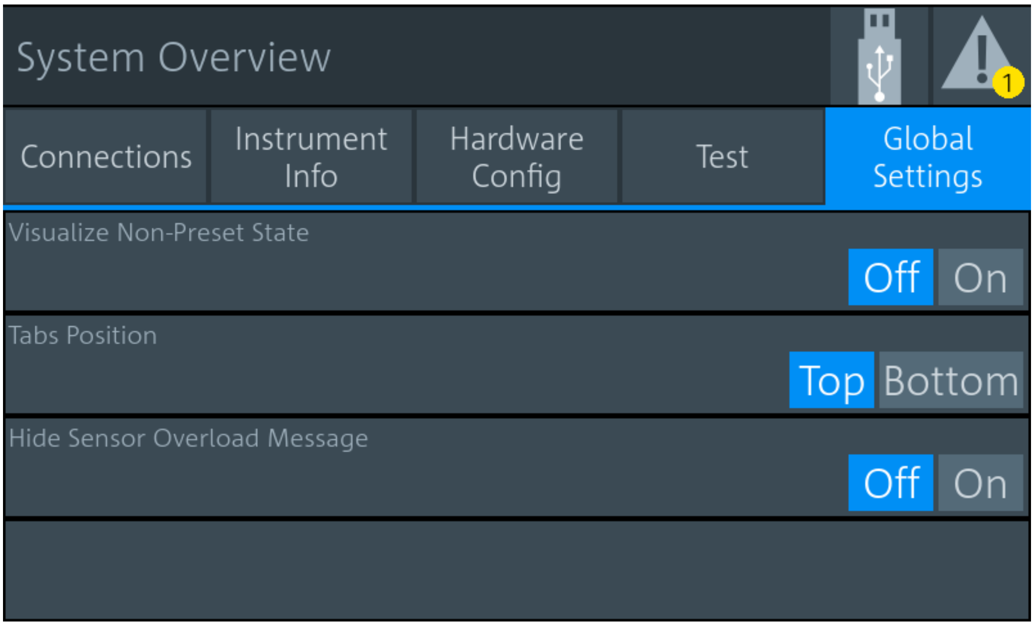
   An archive file (`*.tar.gz`) is created containing the following information:

   - Software errors
   - Hardware status
   - Current device footprint
   - Current device settings

   If a memory stick is connected, the archive file is saved there.
   Alternatively, you can transfer the information using secure shell (SSH).

11.5 Global Settings

Access: [System] > "System Overview" > "Global Settings"



On this tab, you configure the following settings:

Visualize Non-Preset State

If enabled, a setting that differs from the preset value is indicated by a pencil symbol.

The control elements in the hierarchies above that are leading to this setting are marked, too. Thus, you can find the setting easily if you want to use a preset value.

Tabs Position

Specifies the position of the tabs in dialogs, top or bottom.

Hide Sensor Overload Message

If enabled, hides the sensor overload message. But be aware that overload can damage the power sensor, depending on the amount of power and the duration of the overload condition. The maximum power is specified in the data sheet of the power sensor.

12 Firmware Update

This chapter contains information on installing/updating the firmware on the R&S NRX.

The latest firmware update files are available on our Internet site at www.rohde-schwarz.com.

NOTICE

Potential damage to the firmware of the device

Disconnecting the power supply while an update is in progress can lead to missing or faulty firmware.

Special care must be taken on not disconnecting the power supply while the update is in progress. Interrupting the power supply during the firmware update will most likely lead to an unusable device which needs to be sent in for maintenance.

12.1 Firmware Update via PC and USB or Ethernet Connection

This chapter contains information on installing/updating the firmware on the R&S NRX via PC and USB or Ethernet connection.

Use the Firmware Update program (PureFW) to load new firmware for the R&S NRX. It is part of the R&S NRP Toolkit.

12.1.1 Hardware and Software Requirements

The system requirements to perform a firmware update via PC are as follows:

- PC with free USB port (alternatively: PC and instrument are connected to an Ethernet network)
- USB cable (USB-A plug to USB-B plug) (alternatively: Ethernet cable)
- Operating system Microsoft Windows 7, Microsoft Windows 8 or Microsoft Windows 10
- **VISA software must be installed on your PC.**
- The R&S NRP Toolkit software must be installed on your PC (includes Firmware Update program).
- A Rohde & Schwarz update file (*.rsu) for the sensor must be available.

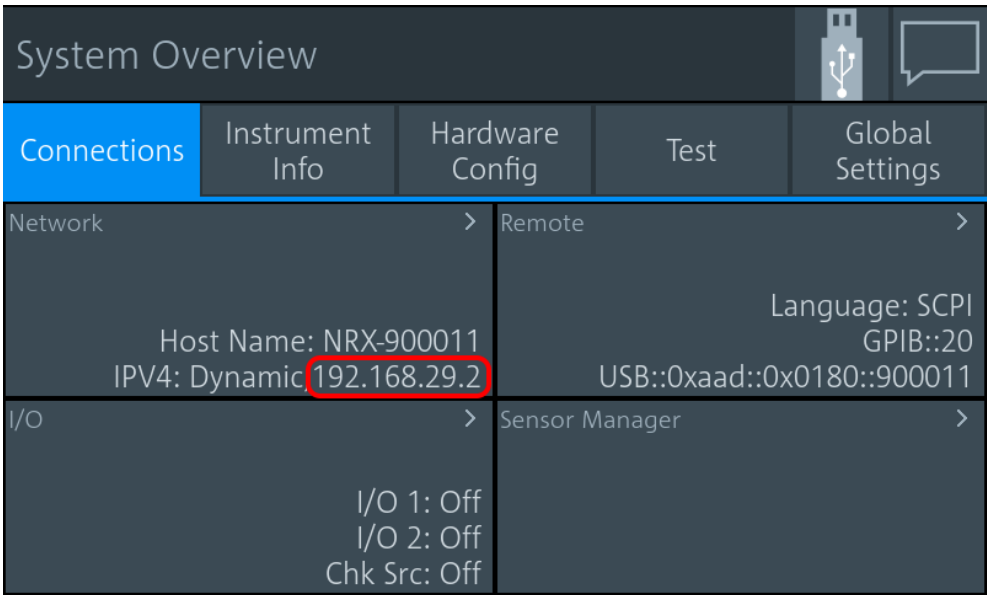
12.1.2 Preparing an Update

To prepare an update via USB connection:

1. Make sure a recent VISA software is installed. Firmware update with PureFW can only be performed with the device recognized as a VISA device.
2. Connect the R&S NRX to the PC using a USB cable. If the instrument is off, switch it on.
   Shortly afterwards, the PC should have identified the new USB hardware in case the instrument is connected via USB.
   If no recent VISA software is installed, Windows will try in vain to find a USB driver for the instrument. If this happens, the instrument is highlighted by a yellow exclamation mark in the Windows device manager.
   ⇒ Abort the installation process and install a recent VISA software.

To prepare an update via network connection:

1. Make sure a recent VISA software is installed. Firmware update with PureFW can only be performed with the device recognized as a VISA device.
2. Connect the R&S NRX to the network. If the instrument is off, switch it on.
   To check that the instrument is assigned an IP address, press the hardkey [System] on the front of the R&S NRX, choose the "Connections" tab, and check the IPv4 status under "Network":

   If the instrument is not assigned an IP address, perform the following:

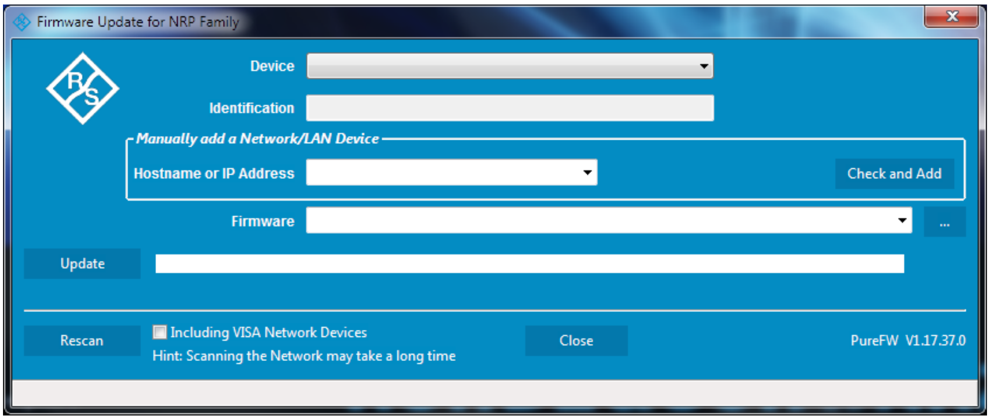
   a) Open the dialog "Network" and check whether the network settings are correct.
   b) Check the cable used to connect the instrument to the network.

3. Register the instrument as a VISA device. Refer to documentation of your VISA software for details.

12.1.3 Updating the Application Firmware

To perform a firmware update:

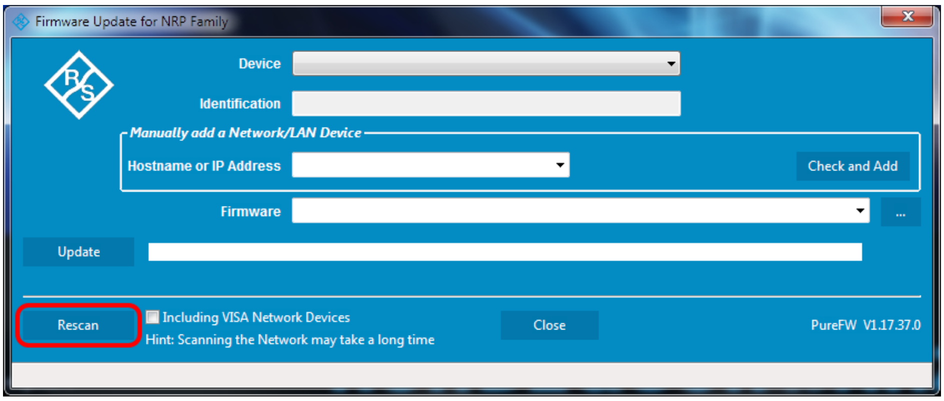
1. Start the Firmware Update program (PureFW) via "Start menu > NRP-Toolkit > Firmware Update". The following window should appear:



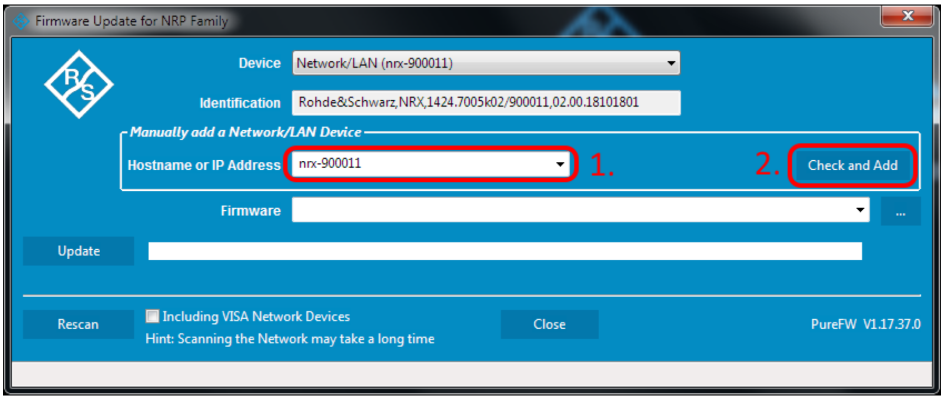
   The program automatically starts scanning for R&S power sensors and meters attached via USB. When the scan is completed, all recognized power sensors and meters are listed in the "Device" dropdown control.

2. If the instrument you want to update is not listed in the "Device" dropdown control, perform one of the following:

   a) If the instrument is connected to the PC via USB, press "Rescan" to search for R&S power sensors and meters attached via USB.

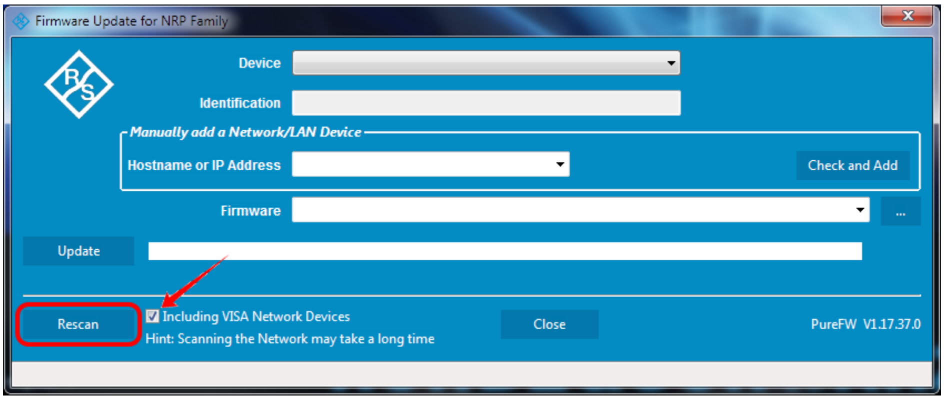


b) If the instrument is connected to the network, enter the hostname or the IP address of the instrument in the field "Manually add a Raw SCPI Device" and then press "Check and Add" or `Enter`.



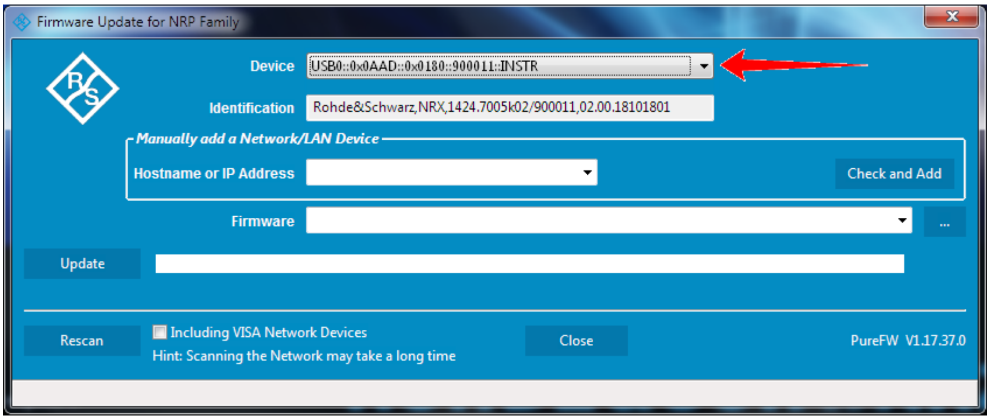
The program searches for the specified instrument on the network and adds it to the "Device" list.

c) It is also possible to scan the local network for VISA network devices automatically. This can be more time-consuming than adding the device manually as described above. To do this, check the setting "Including VISA Network Devices" before you press "Rescan".



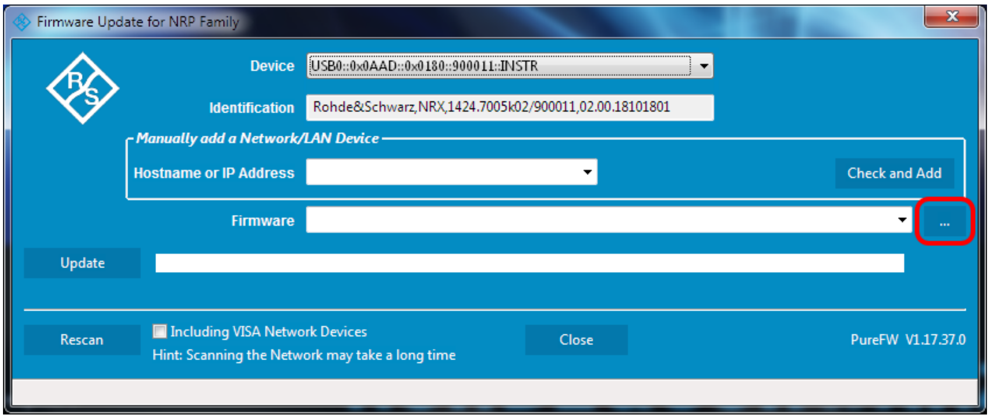
d) Check whether a VISA library is installed on the computer.
If no VISA library is installed on the computer, no VISA instrument will be accessible.
If a network connection is used: Check whether the instrument is registered as a VISA device.

3. In the "Device" line select the instrument you want to update.

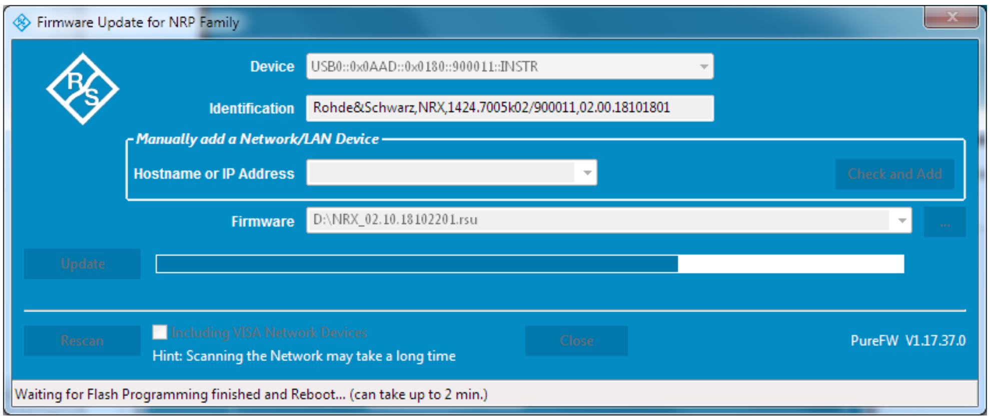


The "Hostname or IP Address" field is not used during this procedure and should therefore be left empty.

4. In the "Firmware" field enter the full path and file name of the update file or press the ellipsis button to browse the file system for it. New firmware for the R&S NRX generally has an `*.rsu` (Rohde & Schwarz Update) extension.

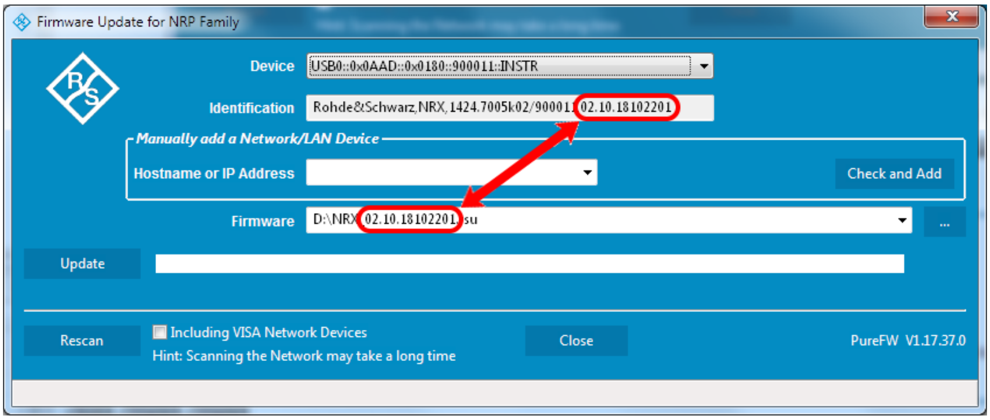


5. Select "Update" to download the new firmware and program it into the flash memory of the instrument.



During the update process the progress is shown through a progress bar. The update sequence may take a couple of minutes.

6. Check if the update was successful. This is the case if the firmware version in the "Identification" field is the same as the one you loaded in the "Firmware" field.



12.2 Firmware Update via a USB Flash Memory Stick

This chapter contains information on installing/updating the firmware on the R&S NRX via a USB flash memory stick.

12.2.1 Hardware and Software Requirements

The system requirements to perform a firmware update via a USB flash memory stick are as follows:

- PC or mobile device with free USB port running any operating system and software that supports copying files to the USB flash memory stick
- USB flash memory stick (USB 2.0 or 3.0, with USB-A plug, FAT32 file system, and sufficient space for the firmware file)
- A Rohde & Schwarz update file (*.rsu) for the sensor must be available.

12.2.2 Preparing an Update

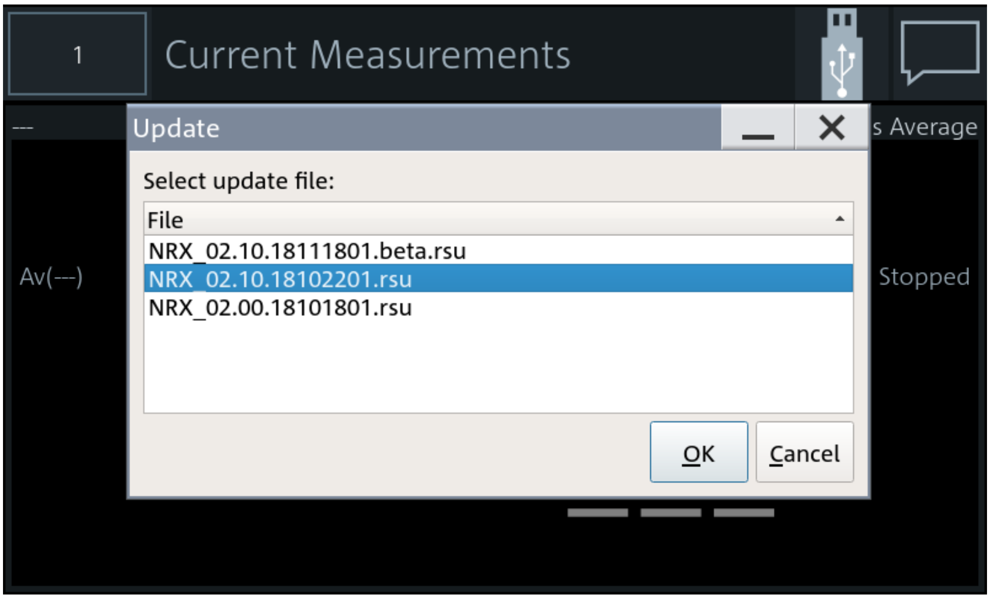
To prepare an update via USB flash memory stick:

1. Copy the Rohde & Schwarz update file to the root directory of the USB flash memory stick.
2. Disconnect the USB flash memory stick from the PC or mobile device. If the instrument is off, switch it on.

12.2.3 Updating the Application Firmware

To perform a firmware update:

1. Connect the USB flash memory stick to the front or rear USB host port of the R&S NRX.
   Shortly afterwards, the instrument should have identified the USB flash memory stick. A dialog will appear that allows selection of the Rohde & Schwarz update file (if there is more than one that matches the instrument) and asks for confirmation to start the update.

2. If there are more than one matching Rohde & Schwarz update files, select the file you want to use for the update. The latest version is on top. Then, press "Update" to start the update process.
3. After copying the Rohde & Schwarz update file to internal memory, a dialog will appear that asks you to remove the installation medium (USB flash memory stick) and press "OK" in order to reboot the instrument. Remove the stick and confirm with "OK". (If the stick is not removed at this point of the update process, the firmware update process will start another time after the reboot. In this case, just interrupt it by pressing "Cancel" when the selection dialog appears.)

13 Remote Control Commands

13.1 Conventions used in SCPI Command Descriptions

Note the following conventions used in the remote command descriptions:

- **Command usage**
  If not specified otherwise, commands can be used both for setting and for querying parameters.
  If a command can be used for setting or querying only, or if it initiates an event, the usage is stated explicitly.
- **Parameter usage**
  If not specified otherwise, a parameter can be used to set a value and it is the result of a query.
  Parameters required only for setting are indicated as **Setting parameters**.
  Parameters required only to refine a query are indicated as **Query parameters**.
  Parameters that are only returned as the result of a query are indicated as **Return values**.
- **Conformity**
  Commands that are taken from the SCPI standard are indicated as **SCPI confirmed**. All commands used by the R&S NRX follow the SCPI syntax rules.
- **Asynchronous commands**
  A command which does not automatically finish executing before the next command starts executing (overlapping command) is indicated as an **Asynchronous command**.
- **Reset values (*RST)**
  Default parameter values that are used directly after resetting the instrument (`*RST` command) are indicated as ***RST** values, if available.
- **Default unit**
  The default unit is used for numeric values if no other unit is provided with the parameter.

13.2 Common Commands

The common commands are taken from the IEEE 488.2 (IEC 625–2) standard. The headers of these commands consist of an asterisk * followed by three letters.

&ABO

Device clear

Usage: Event

&DFC

Disable flow control

Usage: Event

&GET

Group execute trigger

Usage: Event

&GTL

Goto local

Usage: Event

&GTM

Goto local with remote state.

Usage: Event

&GTR

Goto remote

Usage: Event

&HFC

Hardware flow control

Usage: Event

&LLO

Local lockout

Usage: Event

&NREN

Not remote enabled (goto local)

Usage: Event

***CLS**

CLear Status

Resets the:

- Status byte (`STB`)
- Standard event register (`ESR`)
- `EVENt` part of the `QUEStionable` and the `OPERation` register
- Error/event queue

The command does not alter the `ENABle` and `TRANsition` parts of the registers.

Usage: Event

***DEV** [<instrument_no>]

This command returns the selected "instrument" of the device. The command can be used to select between different "instruments" in a multichannel device.

Parameters:
<instrument_no> The assigned instrument.

***DMC** <Label>, <Macro>
***DMC?** <Label>

Defines a macro command.

Parameters:
<Macro>

Parameters for setting and query:
<Label>

***EMC** <Enable>

Enables macro command.

Parameters:
<Enable>

***ESE** <register>

Event Status Enable

Sets the event status enable register to the specified value. The query returns the contents of the event status enable register in decimal form.

Parameters:

<register>	Range:	0 to 255
	*RST:	0

***ESR?**

Event Status Read query

Returns the contents of the event status register in decimal form (0 to 255) and subsequently sets the register to zero.

Usage: Query only

***GCLS**

Clears all status information in all internal "instruments".

Usage: Event

***GMC?** <Label>

Get macro content.

Query parameters:
<Label>

Return values:
<Macro> <dblock>

Usage: Query only

***GOPC?**

Analogon of `*OPC?` for all instruments in multichannel device.

Return values:
<gopc> "1" is return if all pending operations in all internal "instruments" are finished.

Usage: Query only

***GWAI**

Waits for all pending operations in all internal "instruments".

Usage: Event

***IDN?**

IDeNtification query

Returns a string with information on the sensor's identity (device identification code). In addition, the version number of the installed firmware is indicated.

Usage: Query only

***IST?**

Individual STatus query

Returns the current value of the IST flag in decimal form. The IST flag is the status bit which is sent during a parallel poll.

Usage: Query only

***LMC?**

List macro commands.

Return values:
<Label>

Usage: Query only

***OPC**

OPeration Complete

Sets bit 0 in the event status register when all preceding commands have been executed. This bit can be used to initiate a service request. `*OPC` must be sent at the end of a program message.

The query form returns a "1" when all previous commands have been processed. It is important that the read timeout is set sufficiently long.

Since `*OPC?` waits until all previous commands are executed, "1" is returned in all cases.

`*OPC?` basically functions like the `*WAI` command, but `*WAI` does not return a response.

`*OPC?` is preferred to `*WAI` because with `*OPC?`, the execution of commands can be queried from a controller program before new commands are sent. This prevents overflow of the input queue when too many commands are sent that cannot be executed.

Unlike `*WAI`, `*OPC?` must be sent at the end of a program message.

***OPT?**

OPTion identification query

Returns a comma-separated list of installed options.

Usage: Query only

Manual operation: See "HW Options tab" on page 118
See "SW Options tab" on page 118

***PMC**

Purge macro command.

Usage: Event

***PRE** <register>

Parallel poll Register Enable

Sets the parallel poll enable register to the specified value or queries the current value.

Parameters:
<register> Range: 0 to 255
*RST: 0

***PSC** <psc>

Writes/reads the power on status clear flag (PSC).

Parameters:

<psc>	Power on status clear flag.

***RCL** <num>

ReCaLl

Recalls the instrument settings from the specified intermediate memory.

Setting parameters:

<number>	Number of the intermediate memory Range: 0 to 19 *RST: 0
Usage:	Setting only
Manual operation:	See "Recall" on page 98

***RMC** <Label>

Remove macro content.

Setting parameters:

<Label>

Usage:	Setting only

***RST**

ReSeT

Sets the instrument to a defined default status. The default settings are indicated in the description of commands.

The command corresponds to the`SYSTem:PRESet`

Usage:	Event
Manual operation:	See "Preset" on page 98

***SAV** <num>

SAVe

Saves the current instrument settings in the specified intermediate memory.

Setting parameters:

<number>	Number of the intermediate memory Range: 0 to 19 *RST: 0

Usage: Setting only

Manual operation: See "Save" on page 98

***SRE** <register>

Service Request Enable

Sets the service request enable register to the specified value. This command determines under which conditions a service request is triggered.

Parameters:

<register> Range: 0 to 255

*RST: 0

***SRQ?** [<timeout>]

A generic `srq wait` command to be used without `srq event transport`. It is simply read from the interface.

Query parameters:

<timeout>

Return values:

<srq>

Usage: Query only

***STB?**

STatus Byte query

Returns the contents of the status byte in decimal form.

Usage: Query only

***TRG**

TRiGger

Triggers a measurement. This command is only valid if the power sensor is in the waiting for trigger state and the trigger source is set to `BUS`

Usage: Event

Manual operation: See "Bus" on page 50

***TST?**

Selftest query

Triggers a self test of the instrument and outputs an error code in decimal form. `0` indicates that no errors have occurred.

Example: `*TST?`
Query
`0`
Response: Passed

Example: `*TST?`
Query
`1`
Response: Failed

Usage: Query only

***WAI**

WAIt to continue

Prevents the execution of the subsequent commands until all preceding commands have been executed and all signals have settled.

Usage: Event

***XESE** <xese>

This command specifies the standard event status enable register (ESE). This register determines which events from the standard event status register (ESR) are summarized in bit 5 (the event summary bit ESB) of the status byte.

Parameters:
<xese> <expr>

***XESR?**

This command reads the standard event status register (ESR). This command causes the register to be cleared.

Return values:
<xesr> <expr>

Usage: Query only

***XPRE** <xpre>

This command reads/writes the parallel pll enable register (PRE).

Parameters:
<xpre> <expr>
Parallel poll enable register.

***XSRE** <xsre>

The service request enable register. This command can be used to enable service requests.

Parameters:

<xsre>	<expr> Service request enable register (SRE).

***XSTB?**

Reads the status byte.

Return values:

<xstb>	<expr> Status byte (STB).
Usage:	Query only

13.3 Starting and Ending a Measurement

In a basic scenario, the measurement is started immediately after the measurement mode is enabled.

If you want to start the measurement only if a specific condition is fulfilled, define a trigger.

Further information:

- Chapter 6.2, "Trigger Settings", on page 48
- Chapter 13.4.2, "Configuring the Trigger", on page 168

ABORt<undef>:ALL
ABORt<Measurement>

Immediately sets the respective sensors to the IDLE state. Measurements in progress are interrupted. If `INIT:CONT ON` is set, a new measurement is immediately started since the trigger system is not influenced.

Suffix:

<Measurement>	1...100
Usage:	Event

INITiate<Undef>:ALL:CONTinuous <state>
INITiate<Measurement>:CONTinuous <state>

Selects either single-shot or continuous (free-running) measurement cycles. In the course of a measurement cycle, a sensor passes through the IDLE, INITIATED, WAIT_FOR_TRG and MEASURING states before it is again set to the IDLE (`INIT:CONT OFF`) or the INITIATED (`INIT:CONT ON`) state. The settings are not changed when control is switched from manual to remote.

`INIT:CONT ON` is set when remote control is switched back to manual control.

Suffix:

<Measurement>	1..100

Parameters:

<state>	*RST:	0

INITiate<Undef>:ALL:DISable <state>
INITiate<Measurement>:DISable <state>

This command prevents the execution of the `INIT:IMM` command for one or more sensors. It can thus suppress the start of a measurement for specific sensors if the `INIT:ALL:IMM` command is used.

Suffix:

<Measurement>	1..100

Parameters:

<state>	*RST:	0

INITiate<Undef>:ALL[:IMMediate]
INITiate<Measurement>[:IMMediate]

This command starts a single-shot measurement. The respective sensor goes to the INITIATED state. The command is completely executed when the sensor returns to the IDLE state. The command is ignored when the sensor is not in the IDLE state or when continuous measurements are selected (`INIT:CONT ON`). The command is only fully executed when the measurement is completed and the trigger system has again reached the IDLE state. Besides `CAL:ZERO:AUTO INIT` is the only remote control command that permits overlapping execution. Other commands can be received and processed while the command is being executed.

Note:

`INIT:IMM` invalidates all previous measuring results. A `FETCh?` command following INIT will thus always return a new measurement result.

Suffix:

<Measurement>	1..100

Usage: Event

13.4 Measurement Settings and Results

Further information:

- Chapter 13.5, "Calculation Functions", on page 227

13.4.1 Configuring the Display

Further information:

- Chapter 6.1, "Display Settings", on page 42

13.4.1.1 General Settings

CALCulate<Measurement>:AVALue <value>

Determines which additional information about the measured values is shown in the display.

Suffix:
<Measurement> 1...100

Parameters:

<value> NONE | EXTRemes | STATistics

*RST: NONE

Manual operation: See "Auxiliary Values" on page 44

CALCulate<Measurement>[:CHANNel<Channel>]:PSET <value>

Sets the parameter set for a specific sensor.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<value> DEFault

*RST: DEFault

CALCulate<Measurement>[:CHANNel<Channel>]:ROSCillator:REFio:FREQuency <freq>

Only effective for`CALCulate<Measurement>[:CHANNel<Channel>]:ROSCillator:SOURce` on page 144 `REFio`. Sets the frequency of the reference clock signal that is supplied at the REF connector.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<freq> Range: 1.0e+7 to 1.2e+8
*RST: 1.0e+7

CALCulate<Measurement>[:CHANNel<Channel>]:ROSCillator:REFio:OUTPut[:STATe] <state>

If the REF connector is used as an output, enables or disables the output signal.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<state> *RST: OFF

CALCulate<Measurement>[:CHANNel<Channel>]:ROSCillator:SOURce <source>

Sets the source of the reference oscillator.

Suffix:
<Measurement> 1...100

<Channel> 1...2

Parameters:
<source> HOST | INTernal | REFio

*RST: INTernal

CALCulate<Measurement>:DMODe <mode>

Selects the display mode.

Suffix:
<Measurement> 1...100

Parameters:
<mode> SDIGital | SANalog | MARKer | GRID | INFO | PULSe | STATistics | MARKer | TABLe

*RST: SDIGital

Manual operation: See "Display Format" on page 43

CALCulate<Measurement>:EXTRemes:RESet

The R&S NRX stores the maximum and minimum values for each calculate block. The current measured value is stored with CALC<Measurement>:EXTR:RES as the new minimum and maximum value.

Suffix:
<Measurement> 1...100

Usage: Event

CALCulate<Measurement>:HOLD:FUNCtion <function>

Configures the MaxHold function, holding the maximum (MAX), minimum (MIN) or difference of max - min (DIFF).

Suffix:
<Measurement> 1...100

Parameters:
<function> MAX | MIN | DIFFerence

*RST: MAX

Manual operation: See "Max Hold Function" on page 46

CALCulate<Measurement>:HOLD[:STATe] <state>

Enables or disables the MaxHold function or reset the currently hold values.

Suffix:
<Measurement> 1...100

Parameters:
<state> OFF | ON | RESet
*RST: OFF

Manual operation: See "Max Hold" on page 46

CALCulate<Measurement>:RESolution <resolution>

Selects the result resolution relating to dB. This affects both the display resolution as well as resolution settings for the sensor(s).

Suffix:
<Measurement> 1 to 4
Measurement channel

Parameters:
<resolution> I | OI | OOI | OOOI

I
No decimal places, e.g. 1 dBm

OI
1 decimal place, e.g. 0.1 dBm

OOI
2 decimal places, e.g. 0.01 dBm

OOOI
3 decimal places, e.g. 0.001 dBm

*RST: OOI

Manual operation: See "Resolution" on page 43

DISPlay:BRIGthness <brightness>

Parameters:
<brightness> Range: 0.0 to 1.0
*RST: 1.0

DISPlay:LAYout <layout>

The display can be split to 1 main window and up to 3 subwindows.

Parameters:
<layout> L1 | L2 | L3 | L4
Specifies the number of windows on the display.
*RST: L1

DISPlay[:WINDow<Window>]:POSition <position>

Defines the position of a window in the user interface.

Suffix:

<Window>	1...4

Parameters:

<position>	Range:	0 to 3
	*RST:	0

13.4.1.2 Scaling and Units

CALCulate<Measurement>:TRACe:X:POINts <points>

See `[SENSe<Sensor>:]TRACe:POINts` on page 185.

Suffix:

<Measurement>	1...100

Parameters:

<points>	Range:	1 to 8192
	*RST:	660

CALCulate<Measurement>:TRACe:X[:SCALe]:LEFT <value>

Defines the position of the left screen edge relative to the delayed trigger. The value may be negative so that signal components are displayed before the trigger event.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: -15.0 to 15.0
*RST: 0.0
Default unit: s

Manual operation: See "Start Time" on page 45

CALCulate<Measurement>:TRACe:X[:SCALe]:LENGth <value>

Sets the duration of the trace.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: 8.3e-9 to 30.0
*RST: 0.01
Default unit: s

Manual operation: See "Trace Length" on page 45

CALCulate<Measurement>:TRACe:Y[:SCALe]:SPAN:DB <value>

Used in measurement type "Trace".

Specifies the value range for the power axis in dB.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: 5.0 to 200.0
*RST: 50.0
Default unit: dB

Manual operation: See "Power Span" on page 46

CALCulate<Measurement>:TRACe:Y[:SCALe]:SPAN:DBM <value>

Used in measurement type "Trace".

Specifies the value range for the power axis in dBm.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: 5.0 to 200.0
*RST: 50.0
Default unit: dB

Manual operation: See "Power Span" on page 46

CALCulate<Measurement>:TRACe:Y[:SCALe]:SPAN:DBUV <value>

Used in measurement type "Trace".

Specifies the value range for the power axis in dBμV.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: 5.0 to 200.0
*RST: 100.0
Default unit: dB

Manual operation: See "Power Span" on page 46

CALCulate<Measurement>:TRACe:Y[:SCALe]:SPAN:DPCT <value>

Used in measurement type "Trace".

Specifies the value range for the power axis in %.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: 5.0 to 2e18
*RST: 200.0
Default unit: dpct

Manual operation: See "Power Span" on page 46

CALCulate<Measurement>:TRACe:Y[:SCALe]:SPAN:ONE <value>

Used in measurement type "Trace".

Specifies the value range for the power axis without unit.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: 5.0 to 2e18
*RST: 10.0
Default unit: -

Manual operation: See "Power Span" on page 46

CALCulate<Measurement>:TRACe:Y[:SCALe]:SPAN:WATT <value>

Used in measurement type "Trace".

Specifies the value range for the power axis in W.

Suffix:

<Measurement> 1...100

Parameters:

<value> Range: 1e-9 to 2e9
*RST: 1e-3
Default unit: W

Manual operation: See "Power Span" on page 46

CALCulate<Measurement>:TRACe:Y[:SCALe]:TOP:DB <value>

Used in measurement type "Trace".

Specifies the reference value for the power axis in dB.

Suffix:

<Measurement> 1...100

Parameters:

<value> Range: -200.0 to 200.0
*RST: 25.0
Default unit: dB

Manual operation: See "Power Reference" on page 45

CALCulate<Measurement>:TRACe:Y[:SCALe]:TOP:DBM <value>

Used in measurement type "Trace".

Specifies the reference value for the power axis in dBm.

Suffix:

<Measurement> 1...100

Parameters:

<value> Range: -200.0 to 200.0
*RST: 0.0
Default unit: dBm

Manual operation: See "Power Reference" on page 45

CALCulate<Measurement>:TRACe:Y[:SCALe]:TOP:DBUV <value>

Used in measurement type "Trace".

Specifies the reference value for the power axis in dBµV.

Suffix:

<Measurement> 1...100

Parameters:

<value> Range: -100.0 to 300.0
*RST: 150.0
Default unit: dBuV

Manual operation: See "Power Reference" on page 45

CALCulate<Measurement>:TRACe:Y[:SCALe]:TOP:DPCT <value>

Used in measurement type "Trace".

Specifies the reference value for the power axis in %.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: -1e18 to 1e18
*RST: 100.0
Default unit: dpct

Manual operation: See "Power Reference" on page 45

CALCulate<Measurement>:TRACe:Y[:SCALe]:TOP:ONE <value>

Used in measurement type "Trace".

Specifies the reference value for the power axis without unit.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: -1e18 to 1e18
*RST: 10.0
Default unit: -

Manual operation: See "Power Reference" on page 45

CALCulate<Measurement>:TRACe:Y[:SCALe]:TOP:WATT <value>

Used in measurement type "Trace".

Specifies the reference value for the power axis in W.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: -1e9 to 1e9
*RST: 1e-3
Default unit: W

Manual operation: See "Power Reference" on page 45

UNIT<Measurement>:POWer:RATio <unit>

Selects the output unit for the measured power ratio values.

This setting also determines the unit for the parameters of the following commands:

- `CALC:REL`
- `CALC:LIM:UPP`
- `CALC:LIM:LOW`
- `DISP:MET:UPP`
- `DISP:MET:LOW`
- `OUTP:REC:LIM:LOW`
- `OUTP:REC:LIM:UPP`

Error messages:

If the compute function of the associated calculate block is `:SWR`, `:RLOSs` or `:REFLection`, then the unit cannot be changed and error message **26,"State not supported"**, is output.

Suffix:
<Measurement> 1...100

Parameters:
<unit> DB | DPCT | O
*RST: DB

Manual operation: See "Unit" on page 43
See "Forward Unit" on page 43

UNIT<Measurement>:POWer[:VALue] <unit>

Selects the output unit for the measured power values.

This setting also determines the unit for the parameters of the following commands:

- `CALC:REL`
- `CALC:LIM:UPP`
- `CALC:LIM:LOW`
- `DISP:MET:UPP`
- `DISP:MET:LOW`
- `OUTP:REC:LIM:LOW`
- `OUTP:REC:LIM:UPP`

Suffix:
<Measurement> 1...100

Parameters:
<unit> DBM | DBUV | W
*RST: DBM

Manual operation: See "Unit" on page 43
See "Forward Unit" on page 43

UNIT<Measurement>:POWer:REFLection <unit>

This command defines the matching of the load being measured as standing wave ratio, return loss, reflection coefficient, or power ratio R/F (in percent).

NOTE: The command is only effective if the measurement function `POW:S11` or `POW:REFL` has been activated, see SENS<n>:FUNC subsystem

Suffix:
<Measurement> 1...100

Parameters:
<unit> RCO | RL | SWR | RFR

RCO
Reflection coefficient (0 to 1, without unit)

RL
Return loss (in dB)

SWR
Standing wave ratio (1 to ∞, without unit)

RFR
Ratio between forward and reverse power (0% to 100%)

*RST: SWR

Example:
```
SENSe1:FUNC "POW:REFL"
UNIT1:POW:REFL RCO
```

UNIT<Measurement>:POWer:RELative:STATe <state>

This command defines the indication of the forward power (FWD), reverse power (REV) and absorbed power (F-R) in absolute units (W, dBm) or in relative display mode (%, dB).

Suffix:
<Measurement> 1...100

Parameters:
<state>

ON
Switches the relative display mode on and the absolute display off.

OFF
OFF has the opposite effect.

*RST: 0

Example:
```
UNIT1:POW:REL:STAT ON
```

UNIT<Measurement>:POWer:RELative[:VALue] <unit>

This command allows the forward power (FWD) and the absorbed power (F-R) to be indicated in relative display mode. For the setting to become effective, the relative display mode must be switched on, see `UNIT<Measurement>:POWer:RELative:STATe` on page 153 and the `UNIT<n>:POWer:RELative: STATe ON` command.

Suffix:

<Measurement> 1...100

Parameters:

<unit> PCT | DB

PCT
Deviation from reference value in percent.

DB
Deviation from reference value in dB.

*RST: PCT

Example:

```
UNIT2:POW:REL:STAT ON
UNIT2:POW:REL DB
```

13.4.1.3 Limits

CALCulate<Measurement>:LIMit<undef>[:STATe] <state>

Switches the monitoring function for the upper limit on or off.

Suffix:

<Measurement> 1...100

<undef> 1..n
No suffix required

Parameters:

<state> *RST: OFF

CALCulate<Measurement>:LIMit<undef>:TYPE <type>

This command configures the limit evaluation function, checking the maximum (MAX), minimum (MIN) or difference of max - min (DIFF)

Suffix:

<Measurement> 1...100

<undef> 1..n
No suffix required

Parameters:

<type> MAX | MIN | DIFFerence

MAXimum
Maximum value

MINimum
Minimum value

DIFFerence
Difference between maximum and minimum value

*RST: MAX

Example: `CALC1:LIM:TYPE MAX`

CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer:STATe <state>

Enables or disables the checking of the lower limit.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<state> *RST: OFF

Manual operation: See "Lower Limit State" on page 47
See "Forward Lower Limit State, Reflection Lower Limit State" on page 48

CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer:STATe <state>

Enables or disables the checking of the upper limit.

Suffix:

<Measurement>	1 to 4 Measurement channel
<DirectionalChannel>	1 to 2 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<state>	*RST: OFF

Manual operation: See "Upper Limit State" on page 47
See "Forward Upper Limit State, Reflection Upper Limit State" on page 48

CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA]:CCDF <value>

Lower limit value for CCDF.

Suffix:

<Measurement>	1 to 4 Measurement channel
<DirectionalChannel>	1 to 2 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value>	Range: 0.0 to 100.0 *RST: 0.0 Default unit: pct

Manual operation: See "Lower Limit" on page 47

CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA]:RATio:RCOefficient <value>

Lower limit value for reflection coefficient.

Suffix:

<Measurement>	1 to 4 Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:
<value> Range: -1e18 to 1e18
*RST: 1.0
Default unit: -

Manual operation: See "Lower Limit" on page 47

CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA]:RATio:RFRatio <value>

Lower limit value for ratio of forward/reverse power.

Suffix:
<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:
<value> Range: 0.0 to 100.0
*RST: 0.0
Default unit: pct

Manual operation: See "Lower Limit" on page 47

CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA]:RATio:RLOSs <value>

Lower limit value for return loss.

Suffix:
<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:
<value> Range: -200.0 to 200.0
*RST: -200.0
Default unit: dB

Manual operation: See "Lower Limit" on page 47

CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA]:RATio:SWR <value>

Lower limit value for SWR.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: 0.0 to 1e18
*RST: 1.0
Default unit: -

Manual operation: See "Lower Limit" on page 47

CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA]:RATio[:VALue] <value>

Lower limit value for power ratio.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: 1e-18 to 1e18
*RST: 1e-2
Default unit: -

Manual operation: See "Lower Limit" on page 47

CALCulate<Measurement>:LIMit<DirectionalChannel>:LOWer[:DATA][:POWer] <value>

Lower limit value for power value.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: 1e-15 to 1e12
*RST: 1e-9
Default unit: W

Manual operation: See "Lower Limit" on page 47

CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA]:CCDF <value>

Upper limit value for CCDF.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: 0.0 to 100.0
*RST: 100.0
Default unit: pct

Manual operation: See "Upper Limit" on page 47

CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA]:RATio: RCOefficient <value>

Upper limit value for reflection coefficient.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: -1e18 to 1e18
*RST: 5.0
Default unit: -

Manual operation: See "Upper Limit" on page 47

CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA]:RATio: RFRatio <value>

Upper limit value for ratio of forward/reverse power.

Suffix:
<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:
<value> Range: 0.0 to 100.0
*RST: 100.0
Default unit: pct

Manual operation: See "Upper Limit" on page 47

CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA]:RATio:RLOSs <value>

Upper limit value for return loss.

Suffix:
<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:
<value> Range: -200.0 to 200.0
*RST: 200.0
Default unit: dB

Manual operation: See "Upper Limit" on page 47

CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA]:RATio:SWR <value>

Upper limit value for SWR.

Suffix:
<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:
<value> Range: 0.0 to 1e18
*RST: 2.0
Default unit: -

Manual operation: See "Upper Limit" on page 47

CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA]:RATio[:VALue] <value>

Upper limit value for power ratio.

Suffix:

<Measurement>	1 to 4 Measurement channel
<DirectionalChannel>	1 to 2 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value>	Range: 1e-18 to 1e18 *RST: 100.0 Default unit: -

Manual operation: See "Upper Limit" on page 47

CALCulate<Measurement>:LIMit<DirectionalChannel>:UPPer[:DATA][:POWer] <value>

Upper limit value for power value.

Suffix:

<Measurement>	1 to 4 Measurement channel
<DirectionalChannel>	1 to 2 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value>	Range: 1e-15 to 1e12 *RST: 1e-2 Default unit: W

Manual operation: See "Upper Limit" on page 47

CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA]:CCDF <value>

Lower limit value for CCDF bargraph display.

Suffix:

<Measurement>	1 to 4 Measurement channel
<DirectionalChannel>	1 to 2 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value>	Range:	0.0 to 100.0
	*RST:	0.0
	Default unit:	pct

Manual operation: See "Scale Lower Limit" on page 44

CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA]:RATio:RCOefficient <value>

Lower limit value for reflection coefficient bargraph display.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value>	Range:	-1e18 to 1e18
	*RST:	1.0
	Default unit:	-

Manual operation: See "Scale Lower Limit" on page 44

CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA]:RATio:RFRatio <value>

Lower limit value for ratio of forward/reverse power bargraph display.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value>	Range:	0.0 to 100.0
	*RST:	0.0
	Default unit:	pct

Manual operation: See "Scale Lower Limit" on page 44

CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA]:RATio:RLOSs <value>

Lower limit value for return loss bargraph display.

Suffix:
<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:
<value> Range: -200.0 to 200.0
*RST: -200.0
Default unit: dB

Manual operation: See "Scale Lower Limit" on page 44

CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA]:RATio:SWR <value>

Lower limit value for SWR bargraph display.

Suffix:
<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:
<value> Range: 0.0 to 1e18
*RST: 1.0
Default unit: -

Manual operation: See "Scale Lower Limit" on page 44

CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA]:RATio[:VALue] <value>

Lower limit value for power ratio bargraph display.

Suffix:
<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:
<value> Range: 1e-18 to 1e18
*RST: 1e-2
Default unit: -

Manual operation: See "Scale Lower Limit" on page 44

CALCulate<Measurement>:METer<DirectionalChannel>:LOWer[:DATA][:POWer] <value>

Lower limit value for power value bargraph display.

Suffix:

<Measurement>	1 to 4 Measurement channel
<DirectionalChannel>	1 to 2 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value>
Range: 1e-15 to 1e12
*RST: 1e-9
Default unit: W

Manual operation: See "Scale Lower Limit" on page 44

CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA]:CCDF <value>

Upper limit value for CCDF bargraph display.

Suffix:

<Measurement>	1 to 4 Measurement channel
<DirectionalChannel>	1 to 2 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value>
Range: 0.0 to 100.0
*RST: 100.0
Default unit: pct

Manual operation: See "Scale Upper Limit" on page 45

CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA]:RATio:RCOefficient <value>

Upper limit value for reflection coefficient bargraph display.

Suffix:

<Measurement>	1 to 4 Measurement channel
<DirectionalChannel>	1 to 2 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: -1e18 to 1e18
*RST: 5.0
Default unit: -

Manual operation: See "Scale Upper Limit" on page 45

CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA]:RATio:RFRatio <value>

Upper limit value for ratio of forward/reverse power bargraph display.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: 0.0 to 100.0
*RST: 100.0
Default unit: pct

Manual operation: See "Scale Upper Limit" on page 45

CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA]:RATio:RLOSs <value>

Upper limit value for return loss bargraph display.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: -200.0 to 200.0
*RST: 200.0
Default unit: dB

Manual operation: See "Scale Upper Limit" on page 45

CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA]:RATio:SWR <value>

Upper limit value for SWR bargraph display.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: 0.0 to 1e18
*RST: 2.0
Default unit: -

Manual operation: See "Scale Upper Limit" on page 45

CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA]:RATio[:VALue] <value>

Upper limit value for power ratio bargraph display.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: 1e-18 to 1e18
*RST: 100.0
Default unit: -

Manual operation: See "Scale Upper Limit" on page 45

CALCulate<Measurement>:METer<DirectionalChannel>:UPPer[:DATA][:POWer] <value>

Upper limit value for power value bargraph display.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: 1e-15 to 1e12
*RST: 1e-2
Default unit: W

Manual operation: See "Scale Upper Limit" on page 45

13.4.1.4 Result Formats

FORMat[:READings]:BORDer <border>

Selects the order of bytes in 64-bit binary data.

Parameters:

<border> NORMal | SWAPped

NORMal
The 1st byte is the most significant byte (MSB), the 8th byte the least significant byte (LSB).
Fulfills the Big Endian (the big end comes first) convention.

SWAPped
The 1st byte is the LSB, the 8th byte the MSB.
Fulfills the Little Endian convention.

*RST: NORMal

Example: `FORM:BORD NORM`

FORMat:SREGister <sregister>

Specifies which format is used for the return value of `*STB?`.

Parameters:

<sregister> ASCii | HEXadecimal | OCTal | BINary

*RST: ASCii

Example: `FORM:SREG ASC`

FORMat[:READings][:DATA] [<data,length>, <arg1>]

Specifies whether numeric data is sent as block data in binary form (REAL) or as character strings in plain text (ASCII). Also specifies the length.

Parameters:

<data,length> ASCii | REAL

*RST: ASCii

<arg1> Range: 0 to 63
*RST: 0

Example: `FORM ASC,12`

13.4.2 Configuring the Trigger

Further Information:

- Chapter 6.2, "Trigger Settings", on page 48

[SENSe<Sensor>:]INTernal:TRIGger:JITTer:METHod <method>

Available in trace mode.

Defines the method how to cope with the misalignment between the trigger event and the sample point.

Parameters:

<method> COMPensate | MEASure | NONE

*RST: COMPensate

Manual operation: See "Jitter Suppression" on page 52

TRIGger<undef>:ALL:HOLDoff <holdoff>
TRIGger<Measurement>[:CHANnel<Channel>]:HOLDoff <holdoff>

Sets the hold-off time, a period after a trigger event during which all trigger events are ignored.

Suffix:

<Measurement> 1...100
Specifies the measurement.

<Channel> 1...2
Specifies the channel.

Parameters:

<holdoff> Range: 0.0 to 10.0
*RST: 0.0
Default unit: s

Manual operation: See "Holdoff" on page 51

TRIGger<undef>:ALL:HYSTeresis <hysteresis>
TRIGger<Measurement>[:CHANnel<Channel>]:HYSTeresis <hysteresis>

Sets the hysteresis. A trigger event occurs, if the trigger level:

- Falls below the set value on a rising slope.
- Rises above the set value on a falling slope.

Thus, you can use this setting to eliminate the effects of noise in the signal for the edge detector of the trigger system.

Suffix:

<Measurement> 1...100
Specifies the measurement.

<Channel> 1...2
Specifies the channel.

Parameters:

<hysteresis> Range: 0.0 to 10.0
*RST: 0.0
Default unit: dB

Manual operation: See "Hysteresis" on page 52

TRIGger<undef>:ALL:LEVel <level>
TRIGger<Measurement>[:CHANnel<Channel>]:LEVel <level>

Sets the trigger threshold for internal triggering derived from the test signal.

Suffix:

<Measurement> 1...100
Specifies the measurement.

<Channel> 1...2
Specifies the channel.

Parameters:

<level> Range: 1.0e-32 to 2.0e19
*RST: 100.0e-6
Default unit: W

Manual operation: See "Primary Sensor Trigger Level, Secondary Sensor Trigger Level" on page 50

TRIGger<undef>:ALL:SLOPe <slope>
TRIGger<Measurement>[:CHANnel<Channel>]:SLOPe <slope>

Determines which edge of the envelope power, with internal triggering, or increasing voltage, with external triggering, is used for triggering.

Suffix:

<Measurement> 1...100
Specifies the measurement.

<Channel> 1...2
Specifies the channel.

Parameters:

<slope> POSitive | NEGative
*RST: POSitive

Manual operation: See "Slope" on page 51

TRIGger<undef>:ALL[:IMMediate]
TRIGger<Measurement>[:IMMediate]

This command triggers a measurement.

Suffix:

<Measurement> 1...100

Usage: Event

Manual operation: See "Bus" on page 50
See "Hold" on page 50

TRIGger<undef>:ALL:MODE <mode>
TRIGger<Measurement>:MODE <mode>

The trigger mode determines the behavior of the instrument if no trigger occurs, and also the number of acquired waveforms when a trigger occurs.

Suffix:

<Measurement> 1...100

Parameters:

<mode> NORMal | FREerun | SINGle

NORMal
Continuous triggering with regular trigger events.

FREerun
This setting automatically starts a measurement if no trigger event has occurred after 300 ms.

SINGle
This setting disables continuous triggering so that only one trigger event at a time is executed.

*RST: NORMal

Manual operation: See "Trigger Mode" on page 49

TRIGger<undef>:ALL:ATRigger[:STATe] <stat>
TRIGger<Measurement>[:CHANnel<Channel>]:ATRigger[:STATe] <stat>

When `TRIG:ATR` is set to `ON`, the WAIT_FOR_TRG state is automatically exited when no trigger event occurs within a period that corresponds to the reciprocal of the display update rate.

Suffix:

<Measurement>	1...100 Specifies the measurement.
<Channel>	1...2 Specifies the channel.

Parameters:

<stat>	ON | OFF *RST: OFF

TRIGger<undef>:ALL:COUNt <count>
TRIGger<Measurement>[:CHANnel<Channel>]:COUNt <count>

Sets the number of measurement cycles to be performed when the measurement is started with `INIT`.

Suffix:

<Measurement>	1...100 Specifies the measurement.
<Channel>	1...2 Specifies the channel.

Parameters:

<count>	Range: depending on sensor *RST: 1

TRIGger<undef>:ALL:DELay:AUTO <stat>
TRIGger<Measurement>[:CHANnel<Channel>]:DELay:AUTO <stat>

`TRIG:CHAN:DELA:AUTO ON` makes certain that a measurement is not started until the sensor has settled. To this end, the delay value is automatically determined. This is especially important when thermal sensors are used.

Suffix:

<Measurement> 1...100
Specifies the measurement.

<Channel> 1...2
Specifies the channel.

Parameters:

<stat> ON | OFF
*RST: OFF

TRIGger<undef>:ALL:DTIMe <dropout>
TRIGger<Measurement>[:CHANnel<Channel>]:DTIMe <dropout>

If the trigger level has been underrun with internal triggering, it is sometimes useful to wait some time (drop-out time) before retriggering. The measurement of unwanted signal components can thus be suppressed. This setting parameter is used with pulsed GSM signals, for example, if only specific timeslots are to be measured.

Figure 13-1 shows the importance of the drop-out time. If the timeslots BF and DH are not to be measured, the drop-out time is set to a higher value than the period EB (GD). In this case, the trigger events B and D are ignored.

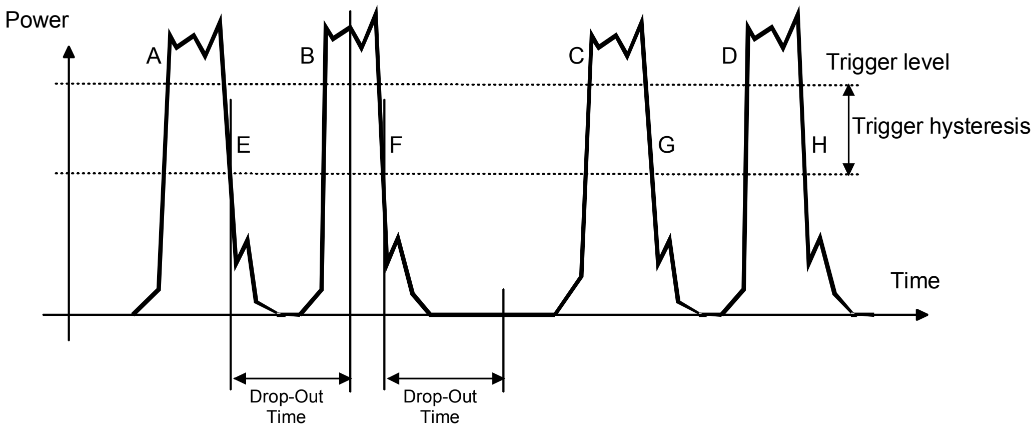


Figure 13-1: Significance of the drop-out time parameter

A similar response is achieved with the `SENSe:BURSt:DTOLerance` command in the Burst mode. However, the Burst mode makes certain that a burst measurement is not discontinued too early, whereas `TRIGger:DTIMe` suppresses a new measurement that is performed too early.

Suffix:

<Measurement> 1...100
Specifies the measurement.

<Channel> 1...2
Specifies the channel.

Parameters:

<dropout> Range: 0.0 to 10.0
*RST: 0.0
Default unit: s

Manual operation: See "Dropout" on page 51

TRIGger<undef>:ALL:SOURce <source>
TRIGger<Measurement>[:CHANnel<Channel>]:SOURce <source>

Sets the trigger signal source for the WAIT_FOR_TRG state.

Suffix:

<Measurement> 1...100
Specifies the measurement.

<Channel> 1...2
Specifies the channel.

Parameters:

<source> INTernal | INTA | INTB | INTC | INTD | EXTernal | EXT2 | EXTernal2 | CHKSource | BUS | HOLD

INTernal
The sensor determines the trigger time by means of the signal to be measured. When this signal exceeds (`TRIG:SLOP POS`) or fall short of (`TRIG:SLOP NEG`) the power set by `TRIG:LEV`, the measurement is started after the time set by `TRIG:DEL`. Similar to `TRIG:SOUR EXT`, waiting for a trigger event can also be skipped by `TRIG:IMM`.

EXTernal
Triggering is performed with an external signal applied to the trigger connector. The `TRIG:SLOP` command determines whether the rising or the falling edge of the signal is to be used for triggering. Waiting for a trigger event can be skipped by `TRIG:IMM`.

BUS
The trigger event is initiated by `TRIG:IMM` or `*TRG`. In this case, the other trigger setting are meaningless.

HOLD
A measurement can only be triggered when the command `TRIG:IMM` is executed.

*RST: INTernal

Manual operation: See "Primary Sensor Trigger Source, Secondary Sensor Trigger Source" on page 49

TRIGger<undef>:ALL:SYNChronize[:STATe] <state>
TRIGger<Measurement>[:CHANnel<Channel>]:SYNChronize[:STATe] <state>

Usually used if `TRIGger<Measurement>[:CHANnel<Channel>]:SYNChronize[:STATe]` `ON` is set.

If enabled, blocks the external trigger bus as long as the sensor remains in the measurement state. Thus, ensures that a new measurement is only started after all sensors have completed their measurements.

Make sure that the number of repetitions is the same for all sensors involved in the measurement. Otherwise, the trigger bus is blocked by any sensor that has completed its measurements before the others and has returned to the idle state.

Suffix:

<Measurement> 1...100
Specifies the measurement.

<Channel> 1...2
Specifies the channel.

Parameters:

<state> ON | OFF
*RST: OFF

Manual operation: See "Trigger Synchronize State" on page 52

TRIGger<Measurement>[:CHANnel<Channel>]:SYNChronize:PORT <port>

Sets the internal or external connection for the sync output of the sensor. For more information, see `TRIGger<Measurement>[:CHANnel<Channel>]:SYNChronize[:STATe]` on page 174.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<port> INTernal | EXT2 | EXTernal2
*RST: INTernal

Manual operation: See "Trigger Synchronize Port" on page 53

TRIGger<Measurement>[:CHANnel<Channel>]:MASTer[:STATe] <state>

Enables or disables the trigger master mode of the sensor. If enabled, the power sensor outputs a digital trigger signal in sync with its own trigger event. The trigger signal is output at the port selected under `TRIGger<Measurement>[:CHANnel<Channel>]:MASTer:PORT`.

The trigger master has to use its internal trigger source. Set all other sensors to external triggering. The trigger signal generated by the trigger master is routed to the R&S NRX and from there distributed to the other sensors and the trigger output. Only one sensor can be trigger master at a time.

Suffix:

<Measurement>	1...100 Specifies the measurement.
<Channel>	1...2 Specifies the channel.

Parameters:

<state>	ON | OFF *RST: OFF

Manual operation: See "Trigger Master State" on page 52

TRIGger<Measurement>[:CHANnel<Channel>]:MASTer:PORT <port>

Effective only if the connected sensor is trigger master, see
`TRIGger<Measurement>[:CHANnel<Channel>]:MASTer[:STATe]`

Sets the port where the trigger master sensor outputs a digital trigger signal.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<port>	INTernal | EXT2 | EXTernal2 *RST: INTernal

Manual operation: See "Trigger Master Port" on page 52

TRIGger<Measurement>[:CHANnel<Channel>]:JITTer:METHod <method>

Available in trace mode. Defines the method how to cope with the misalignment between the trigger event and the sample point.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<method>	COMPensate | MEASure | NONE **COMPensate** Compensation means resampling of trace result. **MEASure** Does not perform resampling, but stores the measured trigger jitter.

NONE
Neither measures nor corrects or compensates the trigger jitter.
*RST: COMPensate

Manual operation: See "Jitter Suppression" on page 52

TRIGger<Measurement>[:CHANNel<Channel>]:EXTernal<Port>:IMPedance <impedance>

Sets termination resistance of the external trigger input. Choose the setting that fits the impedance of the trigger source to minimize reflections on the trigger signals.

Suffix:

<Measurement> 1...100

<Channel> 1...2

<Port> 1...2

Parameters:

<impedance> HIGH | LOW

HIGH
~10 kΩ

LOW
50 kΩ

*RST: HIGH

Manual operation: See "Trigger 2 I/O Impedance" on page 53

TRIGger<undef>:ALL:DELay[:VALue] <delay>
TRIGger<Measurement>[:CHANNel<Channel>]:DELay[:VALue] <delay>

Sets the delay between the trigger event and the beginning of the actual measurement (integration).

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<delay> Range: -5.0 to 10.0
*RST: 0.0
Default unit: s

Manual operation: See "Delay" on page 51

13.4.3 Selecting the Measurement

Before starting a measurement, select the measurement type.

CALCulate<Measurement>:TYPE <type>

Specifies the measurement type.

Suffix:

<Measurement> 1...100

Parameters:

<type> CONTav | NRT | TRACe | STATistics | TGATe | BURStav | TSLot | PULSe

*RST: CONTav

Manual operation: See "Measurement Type" on page 54

[SENSe<Sensor>:]AUXiliary <mode> <mode>

Activates the measurement of additional measured values that are determined together with the main measured value.

Suffix:

<Sensor> 1 to 4
Denotes the sensor channel.

Parameters:

<mode> NONE | MINMax | RNDMax

NONE
No additional values are measured.

MINMax
By averaging the measured values in the sensor, extreme values are lost.

RNDMax
In contrast to `MINMax`, instead of the Min value the value of a randomly selected sample is returned. All evaluations occur using these values instead of the average values.

*RST: NONE

[SENSe<Sensor>:]FUNCtion[:ON] <function>

Sets the sensor to the selected measurement mode.

Parameters:

<function>

POWer:CFACtor
Crest factor; level difference between the PEP value and the average power in dB. It allows thus to recognize larger modulation distortions.

POWer:FORWard:AVERage
Average power

POWer:FORWard:AVERage:BURST
Average burst power; used for pulsed RF signal to define the average carrier power within the burst. The average burst is equal to the PEP (Peak Envelope Power) value if the burst is unmodulated and has no overshoots. The R&S NRX measures the average burst power by multiplying the average power with the ratio of burst period to burst width. The two burst parameters must either be user-defined or the ratio is automatically determined by the R&S NRX. Manual entry of the parameters is possible any time, and some sensors also allow automatic measurement.

POWer:FORWard:PEP
Peak envelope power; periodically recurring peak value of the carrier power at maximum modulation. The PEP is an important parameter for describing the modulation characteristics of transmitter output stages. The level difference between PEP and AVG can be between 0 dB (CW signal) and some 10 dB (radar bursts).

POWer:FORWard:CCDFunctio
CCDF; probability of the peak envelope power exceeding a preset threshold. It is, for example, suitable for assessing the power distribution of spread-spectrum signals (CDMA or similar). The video bandwidth can be selected.

POWer:ABSorbtion:AVERage
Average absorbed power; difference between forward and reverse power.

POWer:ABSorbtion:AVERage:BURSt
Average absorbed burst power; difference between forward and reverse power (burst).

POWer:ABSorbtion:PEP
Absorbed peak envelope power; difference between forward and reverse power (PEP).

POWer:REVerse
Reverse power in W or dBm, according to power indication.

*RST: POWer:AVG

[SENSe<Sensor>:]FUNCtion:CONCurrent <concurrent>

This command defines whether several measurement functions may be simultaneously activated.

Parameters:
<concurrent>

ON
Two measurement functions may be simultaneously active. If two measurement functions are mutually exclusive, the error message. –221 "Settings conflict“ is generated and the first setting retained. All `POW:FORW` and `POW:ABS` functions are mutually exclusive. This applies also to the `POW:REV` and `POW:S11` functions.

OFF
Only a single function can be active. If a new measurement function is switched on, the previously active function is switched off automatically.

*RST: ON

Example: `SENS2:FUNC:CONC ON`

[SENSe<Sensor>:]FUNCtion:OFF:ALL<Channel>

This command switches off all measurement functions referring to a specific channel no. <m>, i.e. `SENSe<Sensor>:Function:OFF:ALL1` switches off all forward measurement functions, `SENSe<Sensor>:Function:OFF:ALL2` switches off all measurement functions in the reverse channel.

The command is a function call and therefore has no *RST-value.

Suffix:
<Channel> 1...2

Example: `SENS1:FUNC:OFF:ALL1`

Usage: Event

[SENSe<Sensor>:]FUNCtion:OFF[:FUNC] <function>

This command switches off a specified measurement function. If the command is in the form of a query, the headers of all switched-off measurement functions will be returned in the sequence defined under `[SENS<n>]:FUNC:ON`.

The command is a function call or query and therefore has no *RST value.

Setting parameters:
<function>

Example:
```
SENS2:FUNC:OFF "POW:REV"
SENS2: FUNC:OFF?
```
The following response would be possible:
"POW:CFAC","POW:FORW:AVER:BURS", "POW:FORW:PEP", "POW:FORW:CCDF", "POW:ABS:AVER", "POW:ABS:AVER:BURS", "POW:ABS:PEP", "POW:REV"

Usage: Setting only

[SENSe<Sensor>:]FUNCtion:STATe? <function>

This command returns the status of the measurement function:

- Response 0: measurement function switched off
- Response 1: measurement function switched on

All functions defined under `SENS<n>:FUNC:ON` are available as measurement functions.

The command is a query and therefore has no *RST value.

Query parameters:
<function>

Example: `SENS2:FUNC:STAT? "POW:REV"`

Usage: Query only

13.4.4 Selecting the Power Sensor

Further information:

- Chapter 6.3, "Measurement Settings Dialog", on page 53

CALCulate<Measurement>[:CHANnel<Channel>]:SENSe:INDex <index>

Assigns a connected power sensor to a measurement.

Suffix:

<Measurement> 1 to 4
Measurement channel

<Channel> 1 to 2
1 = primary sensor, 2 = secondary sensor

Parameters:

<index> Addresses the sensors depending on how they are connected to the R&S NRX.

1 to 4
Sensor connector A, B, C, D

4 to 100
USB connector

101
Optional connector: sensor interface for R&S NRT (R&S NRX-B9)

102 to 128
LAN interface

Range: 0 to 128

*RST: 0

Manual operation: See "Primary Sensor, Secondary Sensor" on page 55

[SENSe<Sensor>:]CATalog?

Displays a list of all connected sensors.

Usage: Query only

Manual operation: See "Primary Sensor, Secondary Sensor" on page 55

[SENSe<Sensor>:]LIST?

List all configured sensors.

Usage: Query only

Manual operation: See "Primary Sensor, Secondary Sensor" on page 55

13.4.5 Continuous Average

Further information:

- Chapter 7.1, "Continuous Average", on page 57

[SENSe<Sensor>:][POWer:][AVG:]BUFFer:CLEar

Used in buffered mode to clear the buffer.

Usage: Event

[SENSe<Sensor>:][POWer:][AVG:]BUFFer:COUNt?

Shows the currently present number of results in buffered output mode.

Usage: Query only

[SENSe<Sensor>:][POWer:][AVG:]BUFFer:DATA?

Inquires the results in the buffer even if the buffer is not full.

Usage: Query only

[SENSe<Sensor>:][POWer:][AVG:]BUFFer:INFO? [<ITEM>]

Only for compatibility reasons.

Query parameters:
<ITEM>

Usage: Query only

[SENSe<Sensor>:][POWer:][AVG:]BUFFer:SIZE <count>

Sets the number of desired values for the buffered ContAv mode.

Parameters:

<count> Range: 1 to 131072
*RST: 1

[SENSe<Sensor>:][POWer:][AVG:]BUFFer:STATe <state>

Switches on the buffered ContAv mode, after which data blocks rather than single measured values are then returned. In this mode a higher data rate is achieved than in the non-buffered ContAv mode.

Parameters:

<state> ON | OFF
*RST: OFF

13.4.6 Burst Average

Further information:

- Chapter 7.2, "Bust Average", on page 58

[SENSe<Sensor>:]BURSt:MODE <mode>

Defines how to measure the average burst power.

Parameters:

<mode> AUTO | USER

AUTO
The sensor automatically recognizes the duty cycle of the burst series and calculates the average burst power from this duty cycle and the average power. Set an appropriate video bandwidth.

USER
The duty cycle is defined by the burst width and burst period, [SENSe<Sensor>:]BURSt:PERiod and [SENSe<Sensor>:]BURSt:WIDTh. The R&S NRX calculates the average burst power from these values.

*RST: AUTO

Example: `SENS1:BURS:MODE AUTO`

[SENSe<Sensor>:]BURSt:PERiod <value>

This command defines the burst period. Only effective if [SENSe<Sensor>:]BURSt:MODE USER is set.

Parameters:

<value> Range: 0.0 to 1.0
*RST: 0.1
Default unit: s

Example: `SENS1:BURS:PER 0.1`

[SENSe<Sensor>:]BURSt:WIDTh <width>

This command defines the width of a burst. Only effective if [SENSe<Sensor>:]BURSt:MODE USER is set.

Parameters:

<width> Range: 0.0 to 1.0
*RST: 0.01
Default unit: s

Example: `SENS1:BURS:WIDT 0.1`

13.4.7 Trace

Further information:

- Chapter 7.3, "Trace", on page 58

13.4.7.1 Trace Measurement Settings

In a trace measurement, you can use commands that combine several setting commands. They are described in Chapter 13.4.7.2, "Combining Trace Commands", on page 186.

The same principle is used for the calculation functions, see Chapter 13.5.2, "Using a Calculation Function", on page 229.

CALCulate<Measurement>:TRACe:MEASurement[:STATe] [<? state>]

See `[SENSe<Sensor>:]TRACe:MEASurement[:STATe]` on page 184.

Suffix:

<Measurement>	1...100

Setting parameters:

<? state>	*RST:	OFF

Usage: Setting only

[SENSe<Sensor>:]TRACe:MEASurement[:STATe] <value>

Enables or disables automatic pulse measurements in the Trace mode. If pulse measurement is on, the sensor automatically determines the pulse parameters for the currently measured trace. For pulse measurements, also set `[SENSe<Sensor>:]TRACe:MEASurement:AUTO[:STATe]` on page 184 `ON`.

Parameters:

<value>	ON | OFF	
	*RST:	OFF

[SENSe<Sensor>:]TRACe:MEASurement:AUTO[:STATe] <value>

Switches on/off automatic transfer of the measured pulse parameters after each trace. This enables a synchronous display of the trace and the pulse data during a continuous measurement with `INIT:CONT ON`. For pulse measurements, this settings has to be switched `ON`.

Parameters:

<value>	*RST:	OFF

[SENSe<Sensor>:]TRACe:DATA?

Returns the measured trace data in a well-defined format.

Usage: Query only

[SENSe<Sensor>:]TRACe:MPWidth?

Queries the attainable time resolution for the Trace mode. The result is the smallest possible distance between two pixels, i.e. it is the smallest time interval that can be assigned to a pixel.

Usage: Query only

[SENSe<Sensor>:]TRACe:OFFSet:TIME <time>

Determines the relative position of the trigger event in relation to the beginning of the Trace measurement sequence.

Parameters:

<time> Range: -15.0 to 15.0
*RST: 0.0
Default unit: s

[SENSe<Sensor>:]TRACe:POINts <points>

Sets the number of required values per trace sequence.

Parameters:

<points> Range: 1 to 8192
*RST: 260

[SENSe<Sensor>:]TRACe:REALtime <state>

In the default state (`OFF`), each measurement from the sensor is averaged. With `[SENSe<Sensor>]:TRACe:REALtime ON`, this behavior can be switched off, which may increase the measurement speed. With a higher measurement speed the measured values of an individual measurement are immediately delivered.

Parameters:

<state> ON | OFF
*RST: OFF

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:RELative:TIME <time>

Sets the position of the marker according to the position mode.

Suffix:

<Window> 1...4
Select the window, where the command is executed.

<Marker> 1...4
Select the marker, which is configured via the command.

Parameters:

<time> Range: -15.0 to 15.0
*RST: 0.0
Default unit: s

Manual operation: See "Position" on page 59

[SENSe<Sensor>:]TRACe:TIME <time>

Sets the time to be covered by the Trace sequence.

Parameters:

<time> Range: 8.3e-9 to 30.0
*RST: 0.01
Default unit: s

13.4.7.2 Combining Trace Commands

Parameter list

The following parameters are used.

- <scope_size>
  Mandatory. Number of test points on the time axis.
  Corresponds to `[SENSe<Sensor>:]TRACe:POINts` on page 185.
- <capture_time>
  Mandatory. Period within which measured data are captured in the Trace mode.
  Corresponds to `[SENSe<Sensor>:]TRACe:TIME` on page 186.
- <source_list>
  Mandatory. Primary and secondary sensor. The number for each sensor is preceded by the character @. The entire expression is enclosed in parentheses.
  Example: (@3),(@2)
  Sensor C is the primary sensor, and sensor B is the secondary sensor.

CONFigure<Measurement>:XTIMe[:POWer]? <scope_size>, <capture_time>, <source_list>
FETCh<Measurement>:XTIMe[:POWer]? <scope_size>, <capture_time>, <source_list>
READ<Measurement>:XTIMe[:POWer]? <scope_size>, <capture_time>, <source_list>
MEASure<Measurement>:XTIMe[:POWer]? <scope_size>, <capture_time>, <source_list>

Used to measure power over time.

The used parameters are described in "Parameter list" on page 186.

Suffix:

<Measurement> 1 to 4
Measurement channel

Query parameters:
<scope_size> <expr>

<capture_time> Default unit: s

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>:XTIMe[:POWer]:NONE <scope_size>, <capture_time>, <source_list>

Disables trace 2. In contrast, trace 1 is always active.

The used parameters are described in "Parameter list" on page 186.

Suffix:
<Measurement> 1 to 4
Measurement channel

Setting parameters:
<scope_size> <expr>

<capture_time> Default unit: s

<source_list> <expr>

Usage: Setting only

CONFigure<Measurement>:XTIMe[:POWer]:RATio? <scope_size>, <capture_time>, <source_list>
FETCh<Measurement>:XTIMe[:POWer]:RATio? <scope_size>, <capture_time>, <source_list>
READ<Measurement>:XTIMe[:POWer]:RATio? <scope_size>, <capture_time>, <source_list>
MEASure<Measurement>:XTIMe[:POWer]:RATio? <scope_size>, <capture_time>, <source_list>

Power ratio over time measured by two power sensors.

The used parameters are described in "Parameter list" on page 186.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<scope_size> <expr>

<capture_time> Default unit: s

<source_list> <expr>

Usage: Query only

13.4.7.3 Using Markers

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:MODE <mode>

Sets the mode for the selected marker.

Suffix:

<Window> 1...4
Select the window, where the command is executed.

<Marker> 1...4
Select the marker, which is configured via the command.

Parameters:

<mode> OFF | RULer | MEASure

OFF
The measurement is off.

RULer
Draws a line ate the power or time position of the marker.

MEASure
Measures power (ratio) or time (difference).

*RST: OFF

Manual operation: See "Marker Mode" on page 59

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:MODE <mode>

Sets the position mode. This mode decide the basis of the marker position.

Suffix:

<Window> 1...4
Select the window, where the command is executed.

<Marker> 1...4
Select the marker, which is configured via the command.

Parameters:

<mode> FTIMe | FPOWer | RPOSition | RPOWer | RPLeft | RPRight | PSEarch | MSEarch | RPSLeft | RPSRight | RMSLeft | RMSRight

FTIMe
Fixed time

FPOWer
Fixed power

RPOSition
Relative to reference position

RPOWer
Relative to reference power

RPLeft
From reference power left

RPRight
From reference power right

PSEarch
Peak search

MSEarch
Minimum search

RPSLeft
Peak search from reference left

RPSRight
Peak search from reference right

RMSLeft
Minimum search from reference left

RMSRight
Minimum search from reference right

*RST: FTIMe

Manual operation: See "Position Mode" on page 59

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:TIME <time>

Sets the position of the marker according to the position mode.

Suffix:

<Window> 1...4
Select the window, where the command is executed.

<Marker> 1...4
Select the marker, which is configured via the command.

Parameters:

<time> Range: -15.0 to 15.0
*RST: 0.0
Default unit: s

Manual operation: See "Position" on page 59

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:FUNCtion <function>

Suffix:

<Window> 1...4

<Marker> 1...4

Parameters:

<function> POWer | RPOWer | RTIMe | RPAVerage

POWer
Measures the power of the trace.

RPOWer
Measures the power ratio to the power value of the reference marker.

RTIMe
Measures the time difference to the time position of the reference marker.

RPAVerage
Measures the average power on selected trace between time positions of the marker and its reference marker.

*RST: POWer

Manual operation: See "Measurement Mode" on page 60

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:POWer:DBM <power>

Sets the position of the marker according to the position mode and the selected channel calculation function.

Suffix:

<Window> 1...4
Select the window, where the command is executed.

<Marker> 1...4
Select the marker, which is configured via the command.

Parameters:

<power> Range: -200.0 to 200.0
*RST: 0.0
Default unit: dBm

Manual operation: See "Position" on page 59

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:FEED:INDex <index>

This command specifies for a trace window the measurement for which a marker is defined.

Suffix:

<Window>	1...4	
<Marker>	1...4	

Parameters:

<index>	Range:	0 to 100
	*RST:	0

DISPlay[:WINDow<Window>]:TRACe:MEASurement:SELection <traceNo>

Suffix:

<Window>	1...4

Parameters:

<traceNo>	Range:	1 to 100
	*RST:	1

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:POWer:DBUV <power>

Sets the position of the marker according to the position mode and the selected channel calculation function.

Suffix:

<Window>	1...4 Select the window, where the command is executed.
<Marker>	1...4 Select the marker, which is configured via the command.

Parameters:

<power>	Range:	-100.0 to 300.0
	*RST:	0.0
	Default unit:	dBuV

Manual operation: See "Position" on page 59

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:POWer:RATio:DB <power>

Sets the position of the marker according to the position mode and the selected channel calculation function.

Suffix:

<Window>	1...4 Select the window, where the command is executed.

<Marker> 1...4
Select the marker, which is configured via the command.

Parameters:

<power> Range: -200.0 to 200.0
*RST: 0.0
Default unit: dB

Manual operation: See "Position" on page 59

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:POWer:RATio:DPCT <power>

Sets the position of the marker according to the position mode and the selected channel calculation function.

Suffix:

<Window> 1...4
Select the window, where the command is executed.

<Marker> 1...4
Select the marker, which is configured via the command.

Parameters:

<power> Range: -1e18 to 1e18
*RST: 0.0
Default unit: dpct

Manual operation: See "Position" on page 59

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:POWer:RATio:O <power>

Sets the position of the marker according to the position mode and the selected channel calculation function.

Suffix:

<Window> 1...4
Select the window, where the command is executed.

<Marker> 1...4
Select the marker, which is configured via the command.

Parameters:

<power> Range: -1e18 to 1e18
*RST: 0.0
Default unit: -

Manual operation: See "Position" on page 59

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:POWer:WATT <power>

Sets the position of the marker according to the position mode and the selected channel calculation function.

Suffix:

<Window>	1...4 Select the window, where the command is executed.
<Marker>	1...4 Select the marker, which is configured via the command.

Parameters:

<power>	Range: -100e-3 to 1e12 *RST: 1e-3 Default unit: W

Manual operation: See "Position" on page 59

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:RELative:POWer:DB <power>

Sets the position of the marker according to the position mode and the selected channel calculation function.

Suffix:

<Window>	1...4 Select the window, where the command is executed.
<Marker>	1...4 Select the marker, which is configured via the command.

Parameters:

<power>	Range: -200.0 to 200.0 *RST: 0.0 Default unit: dB

Manual operation: See "Position" on page 59

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:RELative:POWer:DPCT <power>

Sets the position of the marker according to the position mode and the selected channel calculation function.

Suffix:

<Window>	1...4 Select the window, where the command is executed.
<Marker>	1...4 Select the marker, which is configured via the command.

Parameters:

<power>	Range: -1e18 to 1e18 *RST: 0.0 Default unit: dpct

Manual operation: See "Position" on page 59

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:RELative:POWer:O <power>

Sets the position of the marker according to the position mode and the selected channel calculation function.

Suffix:

<Window>	1...4 Select the window, where the command is executed.
<Marker>	1...4 Select the marker, which is configured via the command.

Parameters:

<power>	Range: -1e18 to 1e18 *RST: 0.0 Default unit: -

Manual operation: See "Position" on page 59

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:POSition:RELative:POWer:WATT <power>

Sets the position of the marker according to the position mode and the selected channel calculation function.

Suffix:

<Window>	1...4 Select the window, where the command is executed.
<Marker>	1...4 Select the marker, which is configured via the command.

Parameters:

<power>	Range: -1e12 to 1e12 *RST: 0.0 Default unit: W

Manual operation: See "Position" on page 59

DISPlay[:WINDow<Window>]:TRACe:MARKer<Marker>:REFerence <reference>

Sets one the available markers as reference.

Suffix:

<Window>	1...4

<Marker> 1...4

Parameters:

<reference> Range: 1 to 4
*RST: 1

Manual operation: See "Reference Marker" on page 60

DISPlay[:WINDow<Window>]:TRACe:MARKer<Undef>:SELection <markerNo>

Suffix:

<Window> 1...4

<Undef> 1..n

Parameters:

<markerNo> NONE | M1 | M2 | M3 | M4
*RST: NONE

Manual operation: See "Marker" on page 59

13.4.8 Pulse Analysis

Further information:

- Chapter 7.4, "Pulse Analysis", on page 61

CALCulate<Measurement>:TRACe:MEASurement:ALGorithm <value>

Selects the analysis algorithm for detecting the pulse top and the pulse base power of a pulsed signal. From these two power levels the reference levels are derived.

Suffix:
<Measurement> 1...100

Parameters:
<value> HISTogram | INTegration | PEAK
*RST: HISTogram

Manual operation: See "Algorithm" on page 64

[SENSe<Sensor>:]TRACe:MEASurement:ALGorithm <value>

Selects the analysis algorithm for detecting the pulse top and the pulse base power of a pulsed signal. These two power levels are fundamental for further signal analysis.

Parameters:
<value> HISTogram | INTegration | PEAK

HISTogram
Computes the pulse levels by analyzing the histogram of the trace data. The pulse top level is taken on the mean value of all points representing the pulse top. Similarly the pulse base is determined from the points representing the pulse base.
Note: This algorithm is recommended for analyzing most of the pulse signals.

INTegration
Computes the pulse as a reference top power by fitting a rectangle pulse of same energy into the pulse signal.
Note: Use this algorithm for pulse signals with modulation or when the pulse energy must be taken into account, e.g. when comparing the measurement result with a dual thermal power sensor.

PEAK
Assigns the pulse peak power to the pulse top level.
*RST: HISTogram

CALCulate<Measurement>:TRACe:MEASurement:DEFine:DURation:REFerence <value>

See `[SENSe<Sensor>:]TRACe:MEASurement:DEFine:DURation:REFerence` on page 198.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: 0.0 to 100.0
*RST: 50.0
Default unit: pct

[SENSe<Sensor>:]TRACe:MEASurement:DEFine:DURation:REFerence <value>

Sets the medial reference level in terms of percentage of the pulse power amplitude. This level is used to define the pulse width, pulse start time and pulse stop time.

Parameters:
<value> float value

Range: depending on sensor
*RST: depending on sensor
Default unit: PCT

CALCulate<Measurement>:TRACe:MEASurement:DEFine:TRANsition:HREFerence <value>

See `[SENSe<Sensor>:]TRACe:MEASurement:DEFine:TRANsition:HREFerence` on page 198.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: 0.0 to 100.0
*RST: 90.0
Default unit: pct

[SENSe<Sensor>:]TRACe:MEASurement:DEFine:TRANsition:HREFerence <value>

Sets the high reference level in terms of percentage of the pulse power amplitude. The high reference level defines the end of the rising edge and the start of the falling edge of the pulse. These values are needed for measurement of the rise / fall time.

Parameters:
<value> float_value

Range: depending on the sensor
*RST: depending on the sensor
Default unit: PCT

CALCulate<Measurement>:TRACe:MEASurement:DEFine:TRANsition:LREFerence <value>

See [SENSe<Sensor>:]TRACe:MEASurement:DEFine:TRANsition:LREFerence on page 199.

Suffix:

<Measurement>	1...100

Parameters:

<value>	Range:	0.0 to 100.0
	*RST:	10.0
	Default unit:	pct

[SENSe<Sensor>:]TRACe:MEASurement:DEFine:TRANsition:LREFerence <value>

Sets the low reference level in terms of percentage of the pulse power amplitude. The low reference level defines the start of the rising edge and the end of the falling edge of the pulse. These values are needed for measurement of the rise / fall time.

Parameters:

<value>	float_value	
	Range:	depending on the sensor
	*RST:	depending on the sensor
	Default unit:	PCT

[SENSe<Sensor>:]TRACe:MEASurement:OFFSet:TIME <value>

Parameters:

<value>	Default unit: s

[SENSe<Sensor>:]TRACe:MEASurement:POWer:AVG?
CALCulate<Measurement>:TRACe:MEASurement:POWer:AVG?
Suffix:

<Measurement>	1...100
Usage:	Query only

[SENSe<Sensor>:]TRACe:MEASurement:POWer:HREFerence?
CALCulate<Measurement>:TRACe:MEASurement:POWer:HREFerence?
Suffix:

<Measurement>	1...100
Usage:	Query only

[SENSe<Sensor>:]TRACe:MEASurement:POWer:LREFerence?
CALCulate<Measurement>:TRACe:MEASurement:POWer:LREFerence?

Suffix:

<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:POWer:MAX?
CALCulate<Measurement>:TRACe:MEASurement:POWer:MAX?

Suffix:

<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:POWer:MIN?
CALCulate<Measurement>:TRACe:MEASurement:POWer:MIN?

Suffix:

<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:POWer:PULSe:BASE?
CALCulate<Measurement>:TRACe:MEASurement:POWer:PULSe:BASE?

Suffix:

<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:POWer:PULSe:TOP?
CALCulate<Measurement>:TRACe:MEASurement:POWer:PULSe:TOP?

Suffix:

<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:POWer:REFerence?
CALCulate<Measurement>:TRACe:MEASurement:POWer:REFerence?

Suffix:

<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:PULSe:DCYCle?
CALCulate<Measurement>:TRACe:MEASurement:PULSe:DCYCle?

Suffix:

<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:PULSe:DURation?
CALCulate<Measurement>:TRACe:MEASurement:PULSe:DURation?
Suffix:
<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:PULSe:PERiod?
CALCulate<Measurement>:TRACe:MEASurement:PULSe:PERiod?
Suffix:
<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:PULSe:SEParation?
CALCulate<Measurement>:TRACe:MEASurement:PULSe:SEParation?
Suffix:
<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:TRANsition:NEGative:DURation?
CALCulate<Measurement>:TRACe:MEASurement:TRANsition:NEGative:DURation?
Suffix:
<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:TRANsition:NEGative:OCCurrence?
CALCulate<Measurement>:TRACe:MEASurement:TRANsition:NEGative:OCCurrence?
Suffix:
<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:TRANsition:NEGative:OVERshoot?
CALCulate<Measurement>:TRACe:MEASurement:TRANsition:NEGative:OVERshoot?
Suffix:
<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:TRANsition:POSitive:DURation?
CALCulate<Measurement>:TRACe:MEASurement:TRANsition:POSitive:DURation?

Suffix:

<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:TRANsition:POSitive:OCCurrence?
CALCulate<Measurement>:TRACe:MEASurement:TRANsition:POSitive:OCCurrence?

Suffix:

<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:TRANsition:POSitive:OVERshoot?
CALCulate<Measurement>:TRACe:MEASurement:TRANsition:POSitive:OVERshoot?

Suffix:

<Measurement> 1...100

Usage: Query only

[SENSe<Sensor>:]TRACe:MEASurement:TRANsition:SPERiod?
CALCulate<Measurement>:TRACe:MEASurement:TRANsition:SPERiod?

Suffix:

<Measurement> 1...100

Usage: Query only

DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:AVG[:STATe] <value>

Indicates the average power of the signal.

Suffix:

<Window> 1...4

Parameters:

<value> *RST: OFF

Manual operation: See "Trace Average" on page 63

DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:MAXimum[:STATe] <value>

Indicates the maximum power measured within the analysis window.

Suffix:

<Window> 1...4

Parameters:

<value> *RST: OFF

Manual operation: See "Trace Peak" on page 63

DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:MINimum[:STATe] <value>

Indicates the minimum power measured within the analysis window.

Suffix:

<Window> 1...4

Parameters:

<value> *RST: OFF

Manual operation: See "Trace Min" on page 63

DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:PULSe:HREFerence[:STATe] <value>

Defines the end of the rsing edge and the start of the fallinng edge of the pulse.

Suffix:

<Window> 1...4

Parameters:

<value> *RST: OFF

Manual operation: See "High Reference Level" on page 64

DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:PULSe:LREFerence[:STATe] <value>

Defines the start of the rising edge and the end of the falling edge of the pulse.

Suffix:

<Window> 1...4

Parameters:

<value> *RST: OFF

Manual operation: See "Low Reference Level" on page 65

DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:PULSe:BASE[:STATe] <value>

Indicates the power of the pulse base.

Suffix:

<Window> 1...4

Parameters:

<value> *RST: OFF

Manual operation: See "Pulse Top / Pulse Base" on page 62

DISPlay[:WINDow<Window>]:TRACe:MEASurement:POWer:PULSe:TOP[:STATe] <value>

Indicates the power of the pulse top.

Suffix:
<Window> 1...4

Parameters:
<value> *RST: OFF

Manual operation: See "Pulse Top / Pulse Base" on page 62

DISPlay[:WINDow<Window>]:TRACe:MEASurement:PULSe:DCYCle[:STATe] <value>

Indicates the duty cycle of the measured power.

Suffix:
<Window> 1...4

Parameters:
<value> *RST: OFF

Manual operation: See "Duty Cycle" on page 62

DISPlay[:WINDow<Window>]:TRACe:MEASurement:PULSe:DURation[:STATe] <value>

Indicates the puls duration.

Suffix:
<Window> 1...4

Parameters:
<value> *RST: OFF

Manual operation: See "Pulse Width" on page 61

DISPlay[:WINDow<Window>]:TRACe:MEASurement:PULSe:PERiod[:STATe] <value>

Indicates the time, the pulse signal needs to complete one cycle.

Suffix:
<Window> 1...4

Parameters:
<value> *RST: OFF

Manual operation: See "Pulse Period" on page 62

DISPlay[:WINDow<Window>]:TRACe:MEASurement:PULSe:SEParation[:STATe] <value>

Indicates the gap between two pulses.

Suffix:
<Window> 1...4

Parameters:
<value> *RST: OFF

Manual operation: See "Pulse Off Time" on page 62

DISPlay[:WINDow<Window>]:TRACe:MEASurement:RRELation <refRelation>

Selects how the threshold parameters are to be interpreted, either voltage related or power related.

Suffix:
<Window> 1...4

Parameters:
<refRelation> POWer | VOLTage
*RST: POWer

Manual operation: See "Reference Levels relate to" on page 63

DISPlay[:WINDow<Window>]:TRACe:MEASurement:PULSe:RESolution[:STATe] <value>

Suffix:
<Window> 1...4

Parameters:
<value> *RST: OFF

DISPlay[:WINDow<Window>]:TRACe:MEASurement:TRANsition:NEGative:DURation[:STATe] <value>

Displays the fall time of the first detected pulse. The fall time is the time the signal requires to change from high to low level.

Suffix:
<Window> 1...4

Parameters:
<value> *RST: OFF

Manual operation: See "Rise / Fall Time" on page 62

DISPlay[:WINDow<Window>]:TRACe:MEASurement:TRANsition:POSitive: DURation[:STATe] <value>

Displays the rise time of the first detected pulse. The rise time is the time the signal requires to change from low to high level.

Suffix:

<Window>	1...4

Parameters:

<value>	*RST:	OFF

Manual operation: See "Rise / Fall Time" on page 62

DISPlay[:WINDow<Window>]:TRACe:MEASurement:TRANsition:NEGative: OCCurrence[:STATe] <value>

Displays the stop point of the current pulse, i.e. the time when the signal passes through the medial reference level with falling edge.

Suffix:

<Window>	1...4

Parameters:

<value>	*RST:	OFF

Manual operation: See "Start /Stop Time" on page 62

DISPlay[:WINDow<Window>]:TRACe:MEASurement:TRANsition:POSitive: OCCurrence[:STATe] <value>

Displays the start point of the current pulse, i.e. the time when the signal passes through the medial reference level with rising edge.

Suffix:

<Window>	1...4

Parameters:

<value>	*RST:	OFF

Manual operation: See "Start /Stop Time" on page 62

DISPlay[:WINDow<Window>]:TRACe:MEASurement:TRANsition:NEGative: OVERshoot[:STATe] <value>

Indicates the relative amount of negative overshoot.

Suffix:

<Window>	1...4

Parameters:

<value>	*RST:	OFF

Manual operation: See "Pos. / Neg. Overshoot" on page 63

DISPlay[:WINDow<Window>]:TRACe:MEASurement:TRANsition:POSitive:OVERshoot[:STATe] <value>

Indicates the relative amount of positive overshoot.

Suffix:
<Window> 1...4

Parameters:
<value> *RST: OFF

Manual operation: See "Pos. / Neg. Overshoot" on page 63

[SENSe<Sensor>:]TRACe:MEASurement:TRANsition:ESAMpling:AUTO[:STATe] <value>

Enables or disables the equivalent sampling mode, which allows for high-resolution measurements.

Parameters:
<value> *RST: ON

[SENSe<Sensor>:]TRACe:MEASurement:TIME <value>

Parameters:
<value> Default unit: s

[SENSe<Sensor>:]TRACe:MID:OFFSet:TIME <time>

Parameters:
<time> Range: 0.0 to 30.0
*RST: 0.01
Default unit: s

[SENSe<Sensor>:]TRACe:MID:TIME <time>

Parameters:
<time> Range: 0.0 to 30.0
*RST: 0.01
Default unit: s

13.4.9 Time Gate

Further information:

- Chapter 7.5, "Time Gate", on page 65

[SENSe<Sensor>:][POWer:]TGATe<Gate>[:EXCLude]:MID:OFFSet[:TIME] <time_interval>
CALCulate<Measurement>[:POWer]:TGATe<Gate>[:AVG]:OFFSet[:TIME] <value>

Sets the length of the gate.

Suffix:

<Measurement>	1...100
<Gate>	1...4

Parameters:

<value>	Range:	0.0 to 15.0
	*RST:	0.0
	Default unit:	s

Manual operation: See "Start / Length of Gate" on page 65

[SENSe<Sensor>:][POWer:]TGATe<Gate>:TIME <time>
CALCulate<Measurement>[:POWer]:TGATe<Gate>[:AVG]:TIME <value>

Sets the start time of the gate.

Suffix:

<Measurement>	1...100
<Gate>	1...4

Parameters:

<value>	Range:	50.0e-9 to 0.1
	*RST:	1.0e-3
	Default unit:	s

Manual operation: See "Start / Length of Gate" on page 65

[SENSe<Sensor>:][POWer:]TGATe<Gate>:OFFSet:TIME <time>
CALCulate<Measurement>[:POWer]:TGATe<Gate>[:AVG][:EXCLude]:MID:OFFSet[:TIME] <value>

Sets length of the fence.

Suffix:

<Measurement>	1...100
<Gate>	1...4

Parameters:

<value>	Range: 0.0 to 0.1 *RST: 0.0 Default unit: s

Manual operation: See "Start / Length of Fence" on page 66

[SENSe<Sensor>:][POWer:]TGATe<Gate>[:EXCLude]:MID:TIME <time_interval>
CALCulate<Measurement>[:POWer]:TGATe<Gate>[:AVG][:EXCLude]:MID:TIME <value>

Sets the start time of the fence.

Suffix:

<Measurement>	1...100
<Gate>	1...4

Parameters:

<value>	Range: 0.0 to 0.1 *RST: 0.0 Default unit: s

Manual operation: See "Start / Length of Fence" on page 66

[SENSe<Sensor>:][POWer:]TGATe[:EXCLude]:MID[:STATe] <state>
CALCulate<Measurement>[:POWer]:TGATe<Gate>[:AVG][:EXCLude]:MID[:STATe] <value>

Enables or disables the "Fence" function.

Suffix:

<Measurement>	1...100
<Gate>	1...4

Parameters:

<value>	*RST: OFF

Manual operation: See "Fence" on page 66

[SENSe<Sensor>:][POWer:]TGATe:SELect <gate>
CALCulate<Measurement>[:POWer]:TGATe<Undef>[:AVG]:SELection <value>

Selects the gate to be configured.

Suffix:

<Measurement>	1...100
<Undef>	1..n

Parameters:

<value>	Range: 1 to 4 *RST: 1

Manual operation: See "Current Timegate" on page 65

13.4.10 Timeslot

Further information:

- Chapter 7.6, "Timeslot", on page 67

CALCulate<Measurement>[:POWer]:TSLot[:AVG]:SELection <value>

Selects the timeslot to be modified.

Suffix:
<Measurement> 1...100

Parameters:

<value>	Range:	1 to 128
	*RST:	1

CALCulate<Measurement>[:POWer]:TSLot[:AVG]:COUNt <value>

See `[SENSe<Sensor>:][POWer:]TSLot[:AVG]:COUNt` on page 210.

Suffix:
<Measurement> 1...100

Parameters:

<value>	Range:	1 to 128
	*RST:	8

[SENSe<Sensor>:][POWer:]TSLot[:AVG]:COUNt <count>

Sets the number of simultaneously measured timeslots in the timeslot mode.

Parameters:

<count>	Range:	1 to 128
	*RST:	8

CALCulate<Measurement>[:POWer]:TSLot[:AVG][:EXCLude]:MID:OFFSet[:TIME] <value>

See `[SENSe<Sensor>:][POWer:]TSLot[:AVG][:EXCLude]:MID:OFFSet[:TIME]` on page 211.

Suffix:

<Measurement>	1...100

Parameters:

<value>	Range: 0.0 to 0.1 *RST: 0.0 Default unit: s

[SENSe<Sensor>:][POWer:]TSLot[:AVG][:EXCLude]:MID:OFFSet[:TIME] <time>

Determines the distance from the start of the timeslots to the start of the interval to be blanked out.

Parameters:

<time>	Range: 0.00 to 0.10 *RST: 0.00 Default unit: s

CALCulate<Measurement>[:POWer]:TSLot[:AVG][:EXCLude]:MID:TIME <value>

See `[SENSe<Sensor>:][POWer:]TSLot[:AVG][:EXCLude]:MID:TIME` on page 211.

Suffix:

<Measurement>	1...100

Parameters:

<value>	Range: 0.0 to 0.1 *RST: 0.0 Default unit: s

[SENSe<Sensor>:][POWer:]TSLot[:AVG][:EXCLude]:MID:TIME <time>

Sets the length of the time interval in the timeslots to be excluded from the measurement The parameter applies to each individual timeslot.

Note: Even if the exclusion interval exceeds the timeslot because, for example, its right limit is outside the timeslot, correct results are obtained. In the extreme case, where the interval length has been set to a value greater than the timeslot length, 0 W is output as the measured power. No error message is output.

Parameters:

<time>	Range: 0.00 to 0.10 *RST: 0.00 Default unit: s

CALCulate<Measurement>[:POWer]:TSLot[:AVG][:EXCLude]:MID[:STATe] <value>

See [SENSe<Sensor>:][POWer:]TSLot[:AVG][:EXCLude]:MID[:STATe] on page 212.

Suffix:
<Measurement> 1...100

Parameters:
<value> *RST: OFF

[SENSe<Sensor>:][POWer:]TSLot[:AVG][:EXCLude]:MID[:STATe] <state>

Enables or disables the blanking out of time intervals in the timeslots.

Parameters:
<state> *RST: OFF

CALCulate<Measurement>:TSLot:TIMing:EXCLude:STARt <value>

See [SENSe<Sensor>:]TIMing:EXCLude:STARt on page 212.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: 0.0 to 15.0
*RST: 0.0
Default unit: s

[SENSe<Sensor>:]TIMing:EXCLude:STARt <exclude_start>

Sets a time that is to be excluded at the beginning of the integration period.

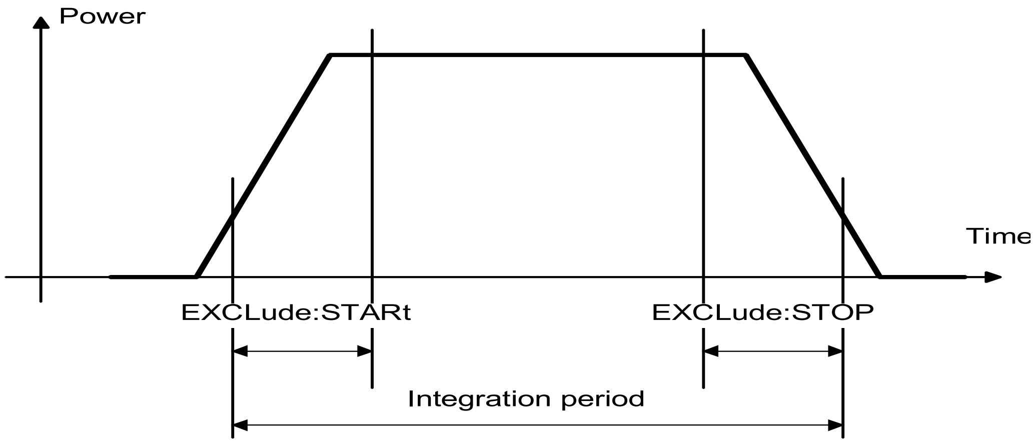


Figure 13-2: Effect of commands SENS<Sensor>:TIM:EXCL:STAR and :STOP

Parameters:

<exclude_start>	Range:	0.0 to 15.0
	*RST:	0.0
	Default unit:	s

CALCulate<Measurement>:TSLot:TIMing:EXCLude:STOP <value>

See `[SENSe<Sensor>:]TIMing:EXCLude:STOP` on page 213.

Suffix:

<Measurement> 1...100

Parameters:

<value>	Range:	0.0 to 15.0
	*RST:	0.0
	Default unit:	s

[SENSe<Sensor>:]TIMing:EXCLude:STOP <exclude_stop>

Sets a time that is to be excluded at the end of the integration period.

Parameters:

<exclude_stop>	Range:	0.0 to 15.0
	*RST:	0.0
	Default unit:	s

CALCulate<Measurement>[:POWer]:TSLot[:AVG]:WIDTh <value>

See `[SENSe<Sensor>:][POWer:]TSLot[:AVG]:WIDTh` on page 213.

Suffix:

<Measurement> 1...100

Parameters:

<value>	Range:	50.0e-9 to 0.1
	*RST:	1.0e-3
	Default unit:	s

[SENSe<Sensor>:][POWer:]TSLot[:AVG]:WIDTh <width>

Sets the length of the timeslot in the Timeslot mode (see figure below).

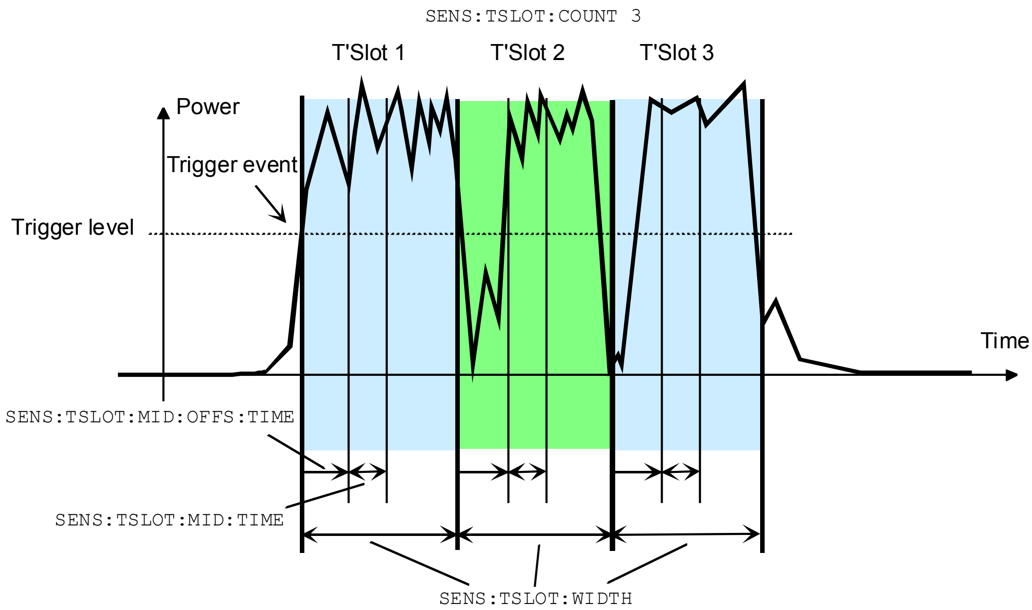


Figure 13-3: Timeslot parameters

Parameters:

<width>	Range:	50.0e-9 to 0.10
	*RST:	1.000e-3
	Default unit: s	

13.4.11 Statistics

Further information:

- Chapter 7.7, "Statistics", on page 69

13.4.11.1 Statistics Measurement Settings

In a statistics measurement, you can use commands that combine several setting commands. They are described in Chapter 13.4.11.2, "Combining Statistics Commands", on page 217.

The same principle is used for the calculation functions, see Chapter 13.5.2, "Using a Calculation Function", on page 229.

CALCulate<Measurement>[:CHANnel<Channel>]:STATistics:AWGN[:STATe] <value>

Offers a second trace - either from a second sensor or from an internal AWGN (Additional White Gaussian Noise) source - which can be used as reference trace.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<value>

Manual operation: See "AWGN" on page 70

CALCulate<Measurement>:STATistics:POWer:AVG:DATA?

Suffix:

<Measurement> 1...100

Usage: Query only

CALCulate<Measurement>:STATistics:SAMPles[:MINimum] <value>

Determines the minimum number of samples to be included in the statistics. For this purpose, the filter length (which can only be set in powers of 2) is set such that the following inequality applies:

$N_{fil} \geq (N_{MinSamples} * mpw) / dt$

In this inequality, N_{fil} is the filter length, *mpw* the time width of a sample and *dt* the length of the window in which the measurement is performed.

Suffix:

<Measurement> 1...100

Parameters:

<value> Range: 1 to 2147483647
*RST: 1000000

Manual operation: See "Minimum Samples" on page 70

CALCulate<Measurement>:STATistics:TGATe:SELection <value>

Available for statistics measurement. Selects the gate that you want to be modify.

Suffix:

<Measurement> 1 to 4
Measurement channel

Parameters:

<value> Gate number

Range: 0 to 4
*RST: 1

Manual operation: See "G1, G2, G3, G4" on page 73

[SENSe<Sensor>:]STATistics:AVERage?

Usage: Query only

[SENSe<Sensor>:]STATistics[:EXCLude]:MID:OFFSet[:TIME] <time>

Together with `SENS:STAT:MID:TIME`, allows a time interval within the time window to be blanked out; in this interval, the data for the statistics is collected.

`SENS:STAT:MID:OFFS` determines the distance from the start of the measurement to the start of the interval to be blanked out.

Parameters:

<time> Range: 0.0 to 0.3
*RST: 0.0
Default unit: s

Manual operation: See "t1, t2, t3" on page 74

[SENSe<Sensor>:]STATistics[:EXCLude]:MID:TIME <time>

Together with `SENS:STAT:MID:OFFS`, allows a time interval within the time window to be blanked out; in this interval, the data for the statistics is collected.

`SENS:STAT:MID:TIME` determines the length of the interval to be blanked out.

Parameters:

<time> Range: 0.0 to 0.3
*RST: 0.0
Default unit: s

Manual operation: See "t1, t2, t3" on page 74

[SENSe<Sensor>:]STATistics:OFFSet[:TIME] <time>

Sets the start of the interval relative to the (possibly delayed) trigger time.

Determines, together with `[SENSe<Sensor>:]STATistics:TIME`, the time interval in which the power for the statistical evaluation is measured.

Parameters:

<time> Range: 0.0 to 10.0
*RST: 0.0
Default unit: s

Manual operation: See "t1, t2, t3" on page 74

[SENSe<Sensor>:]STATistics:PEAK?

Usage: Query only

[SENSe<Sensor>:]STATistics:SAMPles[:MINimum] <value>

Parameters:
<value> <block_data>

[SENSe<Sensor>:]STATistics:TIME <time>

Determines, together with the `SENS:STAT:OFFS` command, the time interval in which the power for the statistical evaluation is measured. `SENS:STAT:TIME` determines the length of the interval.

Parameters:
<time> Range: 10.0e-6 to 0.3
*RST: 0.01
Default unit: s

Manual operation: See "t1, t2, t3" on page 74

13.4.11.2 Combining Statistics Commands

Parameter list

For the calculation functions of the statistics measurement, the following parameters are used.

- <statistics_size>
  Mandatory. Number of test points on the time axis.
  Corresponds to `[SENSe<Sensor>:]STATistics:SCALe:X:POINts` on page 222.
- <capture_time>
  Mandatory. Time interval during which the power for the statistical evaluation is measured.
  Corresponds to `[SENSe<Sensor>:]STATistics:TIME` on page 217
- <source_list>
  Mandatory. Defines the primary and secondary sensor. The number for each sensor is preceded by the character @. The entire expression is enclosed in parentheses.
  Example: (@3),(@2)
  Sensor C is the primary sensor, and sensor B is the secondary sensor.

CONFigure<Measurement>:STATistics:CCDF? <statistics_size>, <capture_time>, <source_list>
FETCh<Measurement>:STATistics:CCDF? <statistics_size>, <capture_time>, <source_list>
READ<Measurement>:STATistics:CCDF? <statistics_size>, <capture_time>, <source_list>
MEASure<Measurement>:STATistics:CCDF? <statistics_size>, <capture_time>, <source_list>

Measures the power in the defined time interval and performs a statistic evaluation (probability density function, PDF).

The used parameters are described in "Parameter list" on page 217.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<statistics_size>	<expr>
<capture_time>	Default unit: s
<source_list>	<expr>
Usage:	Query only
Manual operation:	See "Statistics Function" on page 70

CONFigure<Measurement>:STATistics:PDF? <statistics_size>, <capture_time>, <source_list>
FETCh<Measurement>:STATistics:PDF? <statistics_size>, <capture_time>, <source_list>
READ<Measurement>:STATistics:PDF? <statistics_size>, <capture_time>, <source_list>
MEASure<Measurement>:STATistics:PDF? <statistics_size>, <capture_time>, <source_list>

Measures the power in the defined time interval and performs a statistic evaluation (complementary cumulative distribution function, CCDF).

The used parameters are described in "Parameter list" on page 217.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<statistics_size>	<expr>
<capture_time>	Default unit: s
<source_list>	<expr>
Usage:	Query only
Manual operation:	See "Statistics Function" on page 70

13.4.11.3 Scaling

CALCulate<Measurement>:STATistics[:SCALe]:X:MODE <value>

Sets the measurement result scaling to absolute or relative values.

Suffix:
<Measurement> 1...100

Parameters:
<value> ABSolute | RELative
*RST: ABSolute

Manual operation: See "Scaling of Power Axis" on page 72

CALCulate<Measurement>:STATistics[:SCALe]:X:POINts <value>

Sets the measurement-result resolution in both "Statistics" measurement types. It specifies the number of pixels that are to be assigned to the logarithmic level range `CALCulate<Measurement>:STATistics[:SCALe]:X:RANGe` on page 219 for measured value output. The width of the level range divided by N–1, where N is the number of pixels, must not be less than the value which can be read out with `[SENSe<Sensor>:]STATistics:SCALe:X:MPWidth?` on page 222.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: 3 to 8191
*RST: 600

CALCulate<Measurement>:STATistics[:SCALe]:X:RANGe <value>

Specifies the width of the level range for the analysis result for both Statistic modes.

Suffix:
<Measurement> 1...100

Parameters:

<value>	Range: 0.01 to 100.0 *RST: 50.0 Default unit: dB

Manual operation: See "Power / div" on page 72

CALCulate<Measurement>:STATistics[:SCALe]:X:RLEVel:RELative <value>

Defines the lower limit of the level range for the analysis result in both Statistics modes in a power relative display. This level can be assigned to the first pixel. The level assigned to the last pixel is equal to the level of the first pixel plus the level range.

Suffix:

<Measurement> 1...100

Parameters:

<value>	Range: -400.0 to 400.0 *RST: -25.0 Default unit: dB

Manual operation: See "Minimum Power" on page 72

CALCulate<Measurement>:STATistics[:SCALe]:X:RLEVel[:ABSolute] <value>

Defines the lower limit of the level range for the analysis result in both Statistics modes in a power absolute display. This level can be assigned to the first pixel. The level assigned to the last pixel is equal to the level of the first pixel plus the level range.

Suffix:

<Measurement> 1...100

Parameters:

<value>	Range: -400.0 to 400.0 *RST: -30.0 Default unit: dBm

Manual operation: See "Minimum Power" on page 72

CALCulate<Measurement>:STATistics:PDF[:SCALe]:Y:PDIVision <value>

Sets the scaling of the Y axis with PDF as selected statistics function.

Suffix:

<Measurement> 1...100

Parameters:

<value>	Range: 0.01 to 1000.0 *RST: 0.2 Default unit: -

Manual operation: See "Y factor / div" on page 73

CALCulate<Measurement>:STATistics:PDF[:SCALe]:Y:TOP <value>

Sets the maximum value of the Y axis with PDF as selected statistics function.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: 0.0 to 10000.0
*RST: 1.0
Default unit: -

Manual operation: See "Y Maximum" on page 73

CALCulate<Measurement>:STATistics[:CDF][:SCALe]:Y[:LINear]:PDIVision <value>

Sets the scaling of the Y axis with CDF as selected statistics function.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: 0.001 to 20.0
*RST: 20.0
Default unit: pct

Manual operation: See "Y factor / div" on page 73

CALCulate<Measurement>:STATistics[:CDF][:SCALe]:Y[:LINear]:TOP <value>

Sets the maximum value of the Y axis with CDF as selected statistics function.

Suffix:
<Measurement> 1...100

Parameters:
<value> Range: 0.0 to 100.0
*RST: 100.0
Default unit: pct

Manual operation: See "Y Maximum" on page 73

CALCulate<Measurement>:STATistics[:SCALe]:Y:SPACing <value>

Sets the scaling mode of the y axis.

Suffix:
<Measurement> 1...100

Parameters:
<value> LINear | LOGarithmic

LINear
Sets a linear scale for the Y axis.

LOGarithmic
Sets a logarithmic scale for the Y axis.

*RST: LOGarithmic

Manual operation: See "Scaling of Y Axis" on page 72

[SENSe<Sensor>:]STATistics:SCALe:X:MPWidth?

Returns the minimum width of a sample on the power axis.

Usage: Query only

[SENSe<Sensor>:]STATistics:SCALe:X:POINts <points>

Determines the number of samples on the power axis for the Statistics modes or returns the current setting. Due to the limited storage capacity of theR&S NRX, the number is limited to 1024.

Parameters:

<points> Range: 3 to 8191
*RST: 200

[SENSe<Sensor>:]STATistics:SCALe:X:RANGe <range>

Defines, together with the `SENS:STAT:SCAL:X:RLEV` command, the range on the power axis over which the statistics function (CCDF/PDF) is calculated

Parameters:

<range> Range: 0.01 to 100.0
*RST: 50.0
Default unit: dB

[SENSe<Sensor>:]STATistics:SCALe:X:RLEVel <rlev>

Stets the lower limit of the level range for the analysis result in both Statistics modes. This level can be assigned to the first pixel. The level assigned to the last pixel is equal to the level of the first pixel plus the level range.

Parameters:

<rlev> Range: -280.0 to 220.0
*RST: -30.0
Default unit: dBm

13.4.11.4 Using Markers

CALCulate<Measurement>:STATistics:MARKer:X:POSition[:ABSolute] <value>

Sets the absolute position of the power marker in the statistics measurement type.

Suffix:
<Measurement> 1...100

Parameters:

<value>	Range:	-200.0 to 200.0
	*RST:	0.0
	Default unit:	dBm

CALCulate<Measurement>:STATistics:MARKer:X:POSition:RELative <value>

Sets the relative position of the power marker in the statistics measurement type.

Suffix:
<Measurement> 1...100

Parameters:

<value>	Range:	-200.0 to 200.0
	*RST:	0.0
	Default unit:	dB

CALCulate<Measurement>:STATistics:PDF:MARKer:Y:POSition <value>

Sets the PDF marker in the statistics measurement type.

Suffix:
<Measurement> 1...100

Parameters:

<value>	Range:	0.0 to 10000.0
	*RST:	0.0
	Default unit:	-

CALCulate<Measurement>:STATistics[:CDF]:MARKer:Y:POSition <value>

Sets the CDF marker in the statistics measurement type.

Suffix:
<Measurement> 1...100

Parameters:

<value>	Range:	0.0 to 100.0
	*RST:	50.0
	Default unit:	pct

13.4.12 NRT

Further information:

- Chapter 7.8, "NRT", on page 74

CALCulate<Measurement>:RELative<DirectionalChannel>:CCDF <value>

Relative limit value for CCDF.

Suffix:

<Measurement>	1 to 4 Measurement channel
<DirectionalChannel>	1 to 2 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value>	Range: 0.0 to 100.0 *RST: 50.0 Default unit: pct

CALCulate<Measurement>:RELative<DirectionalChannel>:POWer <value>

Relative limit value for power.

Suffix:

<Measurement>	1 to 4 Measurement channel
<DirectionalChannel>	1 to 2 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value>	Range: 1e-15 to 1e12 *RST: 1e-3 Default unit: W

CALCulate<Measurement>:RELative<DirectionalChannel>:RATio:RCOefficient <value>

Relative value for reflection coefficient.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: 0.0 to 1.0
*RST: 0.5
Default unit: -

CALCulate<Measurement>:RELative<DirectionalChannel>:RATio:RFRatio <value>

Relative value for ratio of forward/reverse power.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: 0.0 to 100.0
*RST: 50.0
Default unit: pct

CALCulate<Measurement>:RELative<DirectionalChannel>:RATio:RLOSs <value>

Relative value for return loss.

Suffix:

<Measurement> 1 to 4
Measurement channel

<DirectionalChannel> 1 to 2
1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value> Range: -200.0 to 200.0
*RST: 0.0
Default unit: dB

CALCulate<Measurement>:RELative<DirectionalChannel>:RATio:SWR <value>

Relative value for SWR.

Suffix:

<Measurement>	1 to 4 Measurement channel
<DirectionalChannel>	1 to 2 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value>	Range: 0.0 to 1.0 *RST: 0.5 Default unit: -

CALCulate<Measurement>:RELative<DirectionalChannel>:RATio[:VALue] <value>

Relative value for power ratio.

Suffix:

<Measurement>	1 to 4 Measurement channel
<DirectionalChannel>	1 to 2 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<value>	Range: 1e-18 to 1e18 *RST: 1.0 Default unit: -

CALCulate<Measurement>:RELative<DirectionalChannel>[:STATe] <state>

Enables or disables the relative forward or reflection measurement.

Suffix:

<Measurement>	1 to 4 Measurement channel
<DirectionalChannel>	1 to 2 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

Parameters:

<state>	OFF | ON | SET **SET** Uses the current measurement value as reference value and enables the relative measurement. *RST: OFF

CALCulate<Measurement>[:CHANNel<Channel>]:NRT:DMODulation:WCDMa:CRATe <value>

Defines the WCDMA chip-rate.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value>
Range: 0.0 to 8.2e6
*RST: 1.0e6
Default unit: Hz

CALCulate<Measurement>[:CHANNel<Channel>]:NRT:DMODulation[:VALue] <modulation>

Selects a certain communication standard for the modulation correction.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<modulation>
OFF | IS95 | WCDMa | DVBT | DAB
*RST: OFF

13.5 Calculation Functions

Further information:

- "Channel Calculation Function" on page 54

13.5.1 Selecting a Calculation Function

CALCulate<Measurement>:MATH[:EXPRession] <expression>

Selects a measurement function that processes the results of one or two power sensors. The result of this calculation is made available as a measured value.

Table 13-1: <expression> parameter

<expression>	Description
`"(SENS1)"`	Measured value of sensor A
`"(SENS2)"`	Measured value of sensor B
`"(SENS3)"`	Measured value of sensor C
With n and m = 1, 2, 3 or 4	

<expression>	Description
"(SENS4)"	Measured value of sensor D
"(SENSn-SENSm)"	Difference between the measured values of sensor n and sensor m
"(SENSn+SENSm)"	Sum of the values measured by sensor n and sensor m
"(SENSn /SENSm)"	Quotient of the values measured by sensor n and m
"SWR(SENSn,SENSm)"	Standing wave ratio. The output unit is set to percent (UNIT:RAT PCT). $\frac{1+\sqrt{SENSm / SENSn}}{1-\sqrt{SENSm / SENSn}}$ Sensor n measures the forward power of a wave, sensor m measures the reflected power.
"REFL(SENSn,SENSm)"	Reflection coefficient/transmission factor of a DUT. The output unit is set to percent (UNIT:RAT PCT). $\sqrt{SENSm / SENSn}$ Sensor n measures the forward power of a wave, sensor m measures the reflected/transmitted power.
"RLOS(SENSn,SENSm)"	Return loss/transmission loss of a DUT. The output unit is set to dB (UNIT:RAT DB). This function principally supplies the same result as "SENSn/SENSm". The difference is that the output unit is automatically set to dB. $-20\log_{10}\sqrt{SENSm / SENSn}$ Sensor n measures the forward power of a wave, sensor m measures the reflected/transmitted power.
With n and m = 1, 2, 3 or 4	

Suffix:
<Measurement> 1 to 4
Measurement channel

Parameters:
<expression> See Table 13-1.

*RST: Depends on the selected channel.
Default unit: Depends on <expression>.

Manual operation: See "Channel Calculation Function" on page 54

CALCulate<Measurement>:MATH[:EXPRession]:CATalog? [<expressions>]

Lists all supported calculation functions. All functions are sent in the form of strings which are allowed as parameters for the `CALCulate<Measurement>:MATH:EXPRession` command.

Suffix:
<Measurement> 1...100
Specifies the measurement.

Query parameters:
<expressions>

Usage: Query only

Manual operation: See "Channel Calculation Function" on page 54

13.5.2 Using a Calculation Function

The following commands combine several setting commands and thus simplify programming of the R&S NRX. They use parameter lists that differ for each measurement type.

- `CONFigure`
  Configures according to the parameter list, but does not start a measurement.
- `READ`
  Compares the parameter list to the current settings, starts a measurement and returns the result. If the parameter list does not match, a SCPI error is returned, and the command is aborted.
- `MEASure`
  Configures according to the parameter list, starts a measurement and returns the result. Thus, this command combines the `CONFigure` and `READ` commands.
- `FETCh`
  Returns the last valid measurement result.

13.5.2.1 Continuous Average Calculation Functions

Parameter list

For the calculation functions of the continuous average measurement, the following parameters are used.

- <expected_value>
  Optional. Value that is expected for the measurement.
- <resolution>
  Optional. Limit up to which the measurement result should be free of noise.
  Corresponds to `[SENSe<Sensor>:]AVERage:COUNt:AUTO:RESolution`.
- <source_list>
  Optional. Primary and secondary sensor. The number for each sensor is preceded by the character @. The entire expression is enclosed in parentheses.
  Example: (@3),(@2)
  Sensor C is the primary sensor, and sensor B is the secondary sensor.

CONFigure<Measurement>[:SCALar][:POWer][:AVG]? [<expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer][:AVG]? [<expected_value>, <resolution>, <source_list>]

READ<Measurement>[:SCALar][:POWer][:AVG]? [<expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer][:AVG]? [<expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENS1)"` to `"(SENS4)"`.

Measured average power measured by one power sensor. The used parameters are described in "Parameter list" on page 229.

Suffix:

<Measurement> 1 to 4
Measurement channel

Query parameters:

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer][:AVG]:RELative? [<expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer][:AVG]:RELative? [<expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer][:AVG]:RELative? [<expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer][:AVG]:RELative? [<expected_value>, <resolution>, <source_list>...]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative power measured by one power sensor. The used parameters are described in "Parameter list" on page 229.

Suffix:

<Measurement> 1 to 4
Measurement channel

Query parameters:

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer][:AVG]:DIFFerence? [<expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer][:AVG]:DIFFerence? [<expected_value>, <resolution>, <source_list>]

READ<Measurement>[:SCALar][:POWer][:AVG]:DIFFerence? [<expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer][:AVG]:DIFFerence? [<expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENSn-SENSm)"`.

Difference measured by two power sensors. The used parameters are described in "Parameter list" on page 229.

Suffix:

<Measurement> 1 to 4
Measurement channel

Query parameters:

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer][:AVG]:DIFFerence:RELative? [<expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer][:AVG]:DIFFerence:RELative? [<expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer][:AVG]:DIFFerence:RELative? [<expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer][:AVG]:DIFFerence:RELative? [<expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative difference measured by two power sensors. The used parameters are described in "Parameter list" on page 229.

Suffix:

<Measurement> 1 to 4
Measurement channel

Query parameters:

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer][:AVG]:SUM? [<expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer][:AVG]:SUM? [<expected_value>, <resolution>, <source_list>]

READ<Measurement>[:SCALar][:POWer][:AVG]:SUM? [<expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer][:AVG]:SUM? [<expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENSn+SENSm)"`.

Sum of the values measured by two power sensors. The used parameters are described in "Parameter list" on page 229.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer][:AVG]:SUM:RELative? [<expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer][:AVG]:SUM:RELative? [<expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer][:AVG]:SUM:RELative? [<expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer][:AVG]:SUM:RELative? [<expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative sum measured by two power sensors. The used parameters are described in "Parameter list" on page 229.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer][:AVG]:RATio? [<expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer][:AVG]:RATio? [<expected_value>, <resolution>, <source_list>]

READ<Measurement>[:SCALar][:POWer][:AVG]:RATio? [<expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer][:AVG]:RATio? [<expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENSn /SENSm)"`.

Ratio measured by two power sensors. The used parameters are described in "Parameter list" on page 229.

Suffix:

<Measurement> 1 to 4
Measurement channel

Query parameters:

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer][:AVG]:RATio:RELative? [<expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer][:AVG]:RATio:RELative? [<expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer][:AVG]:RATio:RELative? [<expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer][:AVG]:RATio:RELative? [<expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative ratio measured by two power sensor. The used parameters are described in "Parameter list" on page 229.

Suffix:

<Measurement> 1 to 4
Measurement channel

Query parameters:

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer][:AVG]:SWR? [<expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer][:AVG]:SWR? [<expected_value>, <resolution>, <source_list>]

READ<Measurement>[:SCALar][:POWer][:AVG]:SWR? [<expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer][:AVG]:SWR? [<expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"SWR(SENSn,SENSm)"`.

Standing wave ratio measurement of two power sensors. The used parameters are described in "Parameter list" on page 229.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer][:AVG]:REFLection? [<expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer][:AVG]:REFLection? [<expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer][:AVG]:REFLection? [<expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer][:AVG]:REFLection? [<expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"REFL(SENSn,SENSm)"`.

Reflection coefficient/transmission factor of a DUT, measured by two power sensors. The used parameters are described in "Parameter list" on page 229.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer][:AVG]:RLOSs? [<expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer][:AVG]:RLOSs? [<expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer][:AVG]:RLOSs? [<expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer][:AVG]:RLOSs? [<expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"RLOS(SENSn,SENSm)"`.

Return loss/transmission loss of a DUT, measured by two power sensors. The used parameters are described in "Parameter list" on page 229.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<expected_value>	
<resolution>	
<source_list>	<expr>

Usage: Query only

13.5.2.2 Continuous Average Calculation Functions with Buffering

Parameter list

The following parameters are used.

- <buffered_size>
  Mandatory. Number of requested measured values.
  Corresponds to `[SENSe<Sensor>:][POWer:][AVG:]BUFFer:SIZE`.
- <expected_value>
  Optional. Value that is expected for the measurement.
- <resolution>
  Optional. Limit up to which the measurement result should be free of noise.
  Corresponds to `[SENSe<Sensor>:]AVERage:COUNt:AUTO:RESolution`.
- <source_list>
  Mandatory. Primary and secondary sensor. The number for each sensor is preceded by the character @. The entire expression is enclosed in parentheses.
  Example: (@3),(@2)
  Sensor C is the primary sensor, and sensor B is the secondary sensor.

CONFigure<Measurement>:ARRay[:POWer][:AVG]? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
FETCh<Measurement>:ARRay[:POWer][:AVG]? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]

READ<Measurement>:ARRay[:POWer][:AVG]? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
MEASure<Measurement>:ARRay[:POWer][:AVG]? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENS1)"` to `"(SENS4)"`.

Measured average power measured by one power sensor with buffering. The used parameters are described in "Parameter list" on page 235.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<buffered_size>	<expr>
<expected_value>	
<resolution>	
<source_list>	<expr>
Usage:	Query only

CONFigure<Measurement>:ARRay[:POWer][:AVG]:DIFFerence? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
FETCh<Measurement>:ARRay[:POWer][:AVG]:DIFFerence? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
READ<Measurement>:ARRay[:POWer][:AVG]:DIFFerence? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
MEASure<Measurement>:ARRay[:POWer][:AVG]:DIFFerence? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENSn-SENSm)"`.

Difference measured by two power sensors with buffering. The used parameters are described in "Parameter list" on page 235.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<buffered_size>	<expr>
<expected_value>	
<resolution>	
<source_list>	<expr>
Usage:	Query only

CONFigure<Measurement>:ARRay[:POWer][:AVG]:DIFFerence:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
FETCh<Measurement>:ARRay[:POWer][:AVG]:DIFFerence:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
READ<Measurement>:ARRay[:POWer][:AVG]:DIFFerence:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
MEASure<Measurement>:ARRay[:POWer][:AVG]:DIFFerence:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative difference measured by two power sensors with buffering. The used parameters are described in "Parameter list" on page 235.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<buffered_size> <expr>

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>:ARRay[:POWer][:AVG]:RATio? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
FETCh<Measurement>:ARRay[:POWer][:AVG]:RATio? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
READ<Measurement>:ARRay[:POWer][:AVG]:RATio? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
MEASure<Measurement>:ARRay[:POWer][:AVG]:RATio? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENSn /SENSm)"`.

Ratio measured by two power sensors with buffering. The used parameters are described in "Parameter list" on page 235.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<buffered_size> <expr>

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>:ARRay[:POWer][:AVG]:RATio:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
FETCh<Measurement>:ARRay[:POWer][:AVG]:RATio:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
READ<Measurement>:ARRay[:POWer][:AVG]:RATio:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
MEASure<Measurement>:ARRay[:POWer][:AVG]:RATio:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative ratio measured by two power sensor with buffering. The used parameters are described in "Parameter list" on page 235.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<buffered_size>	<expr>
<expected_value>	
<resolution>	
<source_list>	<expr>

Usage: Query only

CONFigure<Measurement>:ARRay[:POWer][:AVG]:REFLection? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
FETCh<Measurement>:ARRay[:POWer][:AVG]:REFLection? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
READ<Measurement>:ARRay[:POWer][:AVG]:REFLection? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
MEASure<Measurement>:ARRay[:POWer][:AVG]:REFLection? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"REFL(SENSn,SENSm)"`.

Reflection coefficient/transmission factor of a DUT, measured by two power sensors with buffering. The used parameters are described in "Parameter list" on page 235.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<buffered_size>	<expr>
<expected_value>	
<resolution>	
<source_list>	<expr>

Usage: Query only

CONFigure<Measurement>:ARRay[:POWer][:AVG]:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
FETCh<Measurement>:ARRay[:POWer][:AVG]:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
READ<Measurement>:ARRay[:POWer][:AVG]:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
MEASure<Measurement>:ARRay[:POWer][:AVG]:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative power measured by one power sensor with buffering. The used parameters are described in "Parameter list" on page 235.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<buffered_size> <expr>

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>:ARRay[:POWer][:AVG]:RLOSs? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
FETCh<Measurement>:ARRay[:POWer][:AVG]:RLOSs? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
READ<Measurement>:ARRay[:POWer][:AVG]:RLOSs? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
MEASure<Measurement>:ARRay[:POWer][:AVG]:RLOSs? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"RLOS(SENSn,SENSm)"`.

Return loss/transmission loss of a DUT, measured by two power sensors with buffering. The used parameters are described in "Parameter list" on page 235.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<buffered_size> <expr>

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>:ARRay[:POWer][:AVG]:SUM? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
FETCh<Measurement>:ARRay[:POWer][:AVG]:SUM? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
READ<Measurement>:ARRay[:POWer][:AVG]:SUM? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
MEASure<Measurement>:ARRay[:POWer][:AVG]:SUM? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENSn+SENSm)"`.

Sum of the values measured by two power sensors with buffering. The used parameters are described in "Parameter list" on page 235.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<buffered_size> <expr>

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>:ARRay[:POWer][:AVG]:SUM:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
FETCh<Measurement>:ARRay[:POWer][:AVG]:SUM:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
READ<Measurement>:ARRay[:POWer][:AVG]:SUM:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
MEASure<Measurement>:ARRay[:POWer][:AVG]:SUM:RELative? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative sum measured by two power sensors with buffering. The used parameters are described in "Parameter list" on page 235.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<buffered_size> <expr>

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>:ARRay[:POWer][:AVG]:SWR? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
FETCh<Measurement>:ARRay[:POWer][:AVG]:SWR? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
READ<Measurement>:ARRay[:POWer][:AVG]:SWR? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]
MEASure<Measurement>:ARRay[:POWer][:AVG]:SWR? <buffered_size>[, <expected_value>, <resolution>, <source_list>...]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"SWR(SENSn,SENSm)"`.

Standing wave ratio measurement of two power sensors with buffering. The used parameters are described in "Parameter list" on page 235.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<buffered_size> <expr>

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

13.5.2.3 Burst Average Calculation Functions

Parameter list

For the calculation functions of the burst average measurement, the following parameters are used.

- <dtolerance>
  Mandatory. Length of a time interval during that the power level can drop below the trigger level without being interpreted as end of the power pulse.
  Corresponds to `[SENSe<Sensor>:][POWer:]BURSt:DTOLerance`.
- <start_exclude>
  Mandatory. Amount of time at the beginning of a timeslot or integration period that is not evaluated.
  Corresponds to `[SENSe<Sensor>:]TIMing:EXCLude:STARt`.
- <end_exclude>

Mandatory. Amount of time at the end of a timeslot or integration period that is not evaluated.
Corresponds to [SENSe<Sensor>:]TIMing:EXCLude:STOP.

- <expected_value>
  Optional. Value that is expected for the measurement.
- <resolution>
  Optional. Limit up to which the measurement result should be free of noise.
  Corresponds to [SENSe<Sensor>:]AVERage:COUNt:AUTO:RESolution.
- <source_list>
  Optional. Primary and secondary sensor. The number for each sensor is preceded by the character @. The entire expression is enclosed in parentheses.
  Example: (@3),(@2)
  Sensor C is the primary sensor, and sensor B is the secondary sensor.

CONFigure<Measurement>[:SCALar][:POWer]:BURSt? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>...]
FETCh<Measurement>[:SCALar][:POWer]:BURSt? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>...]
READ<Measurement>[:SCALar][:POWer]:BURSt? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>...]
MEASure<Measurement>[:SCALar][:POWer]:BURSt? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>...]

Used for CALCulate<Measurement>:MATH[:EXPRession] "(SENS1)" to "(SENS4)".

Power measured by one power sensor. The used parameters are described in "Parameter list" on page 241.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<dtolerance>	Default unit: s
<start_exclude>	Default unit: s
<end_exclude>	Default unit: s
<expected_value>	
<resolution>	
<source_list>	<expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:BURSt:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:BURSt:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:BURSt:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:BURSt:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative power measured by one power sensors. The used parameters are described in "Parameter list" on page 241.

Suffix:

<Measurement> 1 to 4
Measurement channel

Query parameters:

<dtolerance> Default unit: s

<start_exclude> Default unit: s

<end_exclude> Default unit: s

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:BURSt:DIFFerence? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:BURSt:DIFFerence? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:BURSt:DIFFerence? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:BURSt:DIFFerence? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession] "(SENSn-SENSm)"`.

Difference measured by two power sensors. The used parameters are described in "Parameter list" on page 241.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<dtolerance>	Default unit: s
<start_exclude>	Default unit: s
<end_exclude>	Default unit: s
<expected_value>	
<resolution>	
<source_list>	<expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:BURSt:DIFFerence:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:BURSt:DIFFerence:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:BURSt:DIFFerence:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:BURSt:DIFFerence:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative difference measured by two power sensors. The used parameters are described in "Parameter list" on page 241.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<dtolerance>	Default unit: s
<start_exclude>	Default unit: s
<end_exclude>	Default unit: s
<expected_value>	
<resolution>	
<source_list>	<expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:BURSt:SUM? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:BURSt:SUM? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:BURSt:SUM? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:BURSt:SUM? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENSn+SENSm)"`.

Sum measured by two power sensors. The used parameters are described in "Parameter list" on page 241.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<dtolerance>	Default unit: s
<start_exclude>	Default unit: s
<end_exclude>	Default unit: s
<expected_value>	
<resolution>	
<source_list>	<expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:BURSt:SUM:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:BURSt:SUM:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:BURSt:SUM:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:BURSt:SUM:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Sum measured by two power sensors. The used parameters are described in "Parameter list" on page 241.

Suffix:

<Measurement> 1 to 4
Measurement channel

Query parameters:

<dtolerance> Default unit: s

<start_exclude> Default unit: s

<end_exclude> Default unit: s

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:BURSt:RATio? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>...]
FETCh<Measurement>[:SCALar][:POWer]:BURSt:RATio? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:BURSt:RATio? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:BURSt:RATio? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENSn /SENSm)"`.

Ratio measured by two power sensors. The used parameters are described in "Parameter list" on page 241.

Suffix:

<Measurement> 1 to 4
Measurement channel

Query parameters:

<dtolerance> Default unit: s

<start_exclude> Default unit: s

<end_exclude> Default unit: s

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:BURSt:RATio:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:BURSt:RATio:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:BURSt:RATio:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:BURSt:RATio:RELative? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative ratio measured by two power sensors. The used parameters are described in "Parameter list" on page 241.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<dtolerance>	Default unit: s
<start_exclude>	Default unit: s
<end_exclude>	Default unit: s
<expected_value>	
<resolution>	
<source_list>	<expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:BURSt:SWR? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:BURSt:SWR? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:BURSt:SWR? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:BURSt:SWR? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"SWR(SENSn,SENSm)"`.

Standing wave ratio, measured by two power sensors. The used parameters are described in "Parameter list" on page 241.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<dtolerance>	Default unit: s
<start_exclude>	Default unit: s
<end_exclude>	Default unit: s
<expected_value>	
<resolution>	
<source_list>	<expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:BURSt:REFLection? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:BURSt:REFLection? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:BURSt:REFLection? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:BURSt:REFLection? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"REFL(SENSn,SENSm)"`.

Reflection coefficient/transmission factor of a DUT, measured by two power sensors. The used parameters are described in "Parameter list" on page 241.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<dtolerance>	Default unit: s
<start_exclude>	Default unit: s
<end_exclude>	Default unit: s
<expected_value>	
<resolution>	
<source_list>	<expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:BURSt:RLOSs? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:BURSt:RLOSs? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:BURSt:RLOSs? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:BURSt:RLOSs? <dtolerance>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"RLOS(SENSn,SENSm)"`.

Return loss/transmission loss of a DUT, measured by two power sensors. The used parameters are described in "Parameter list" on page 241.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<dtolerance>	Default unit: s
<start_exclude>	Default unit: s
<end_exclude>	Default unit: s
<expected_value>	
<resolution>	
<source_list>	<expr>

Usage: Query only

13.5.2.4 Time Slot Calculation Functions

Parameter list

For the calculation functions of the time slot measurement, the following parameters are used.

- <tslot_width>
  Mandatory. Width of a timeslot.
  Corresponds to `[SENSe<Sensor>:][POWer:]TSLot[:AVG]:WIDTh` on page 213.
- <no_slots>
  Mandatory. Number of timeslots to be measured.
  Corresponds to `[SENSe<Sensor>:][POWer:]TSLot[:AVG]:COUNt` on page 210.
- <start_exclude>

Mandatory. Amount of time at the beginning of a timeslot or integration period that is not evaluated.
Corresponds to `[SENSe<Sensor>:]TIMing:EXCLude:STARt`.

- <end_exclude>
  Mandatory. Amount of time at the end of a timeslot or integration period that is not evaluated.
  Corresponds to `[SENSe<Sensor>:]TIMing:EXCLude:STOP`.
- <expected_value>
  Optional. Value that is expected for the measurement.
- <resolution>
  Optional. Limit up to which the measurement result should be free of noise.
  Corresponds to `[SENSe<Sensor>:]AVERage:COUNt:AUTO:RESolution`.
- <source_list>
  Optional. Primary and secondary sensor. The number for each sensor is preceded by the character @. The entire expression is enclosed in parentheses.
  Example: (@3),(@2)
  Sensor C is the primary sensor, and sensor B is the secondary sensor.

CONFigure<Measurement>[:SCALar][:POWer]:TSLot? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:TSLot? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:TSLot? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:TSLot? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENS1)"` to `"(SENS4)"`.

Power measured by one power sensor. The used parameters are described in "Parameter list" on page 249.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<tslot_width>	Default unit: s
<no_slots>	Default unit: s
<start_exclude>	Default unit: s
<end_exclude>	Default unit: s
<expected_value>	
<resolution>	

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:TSLot:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:TSLot:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:TSLot:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:TSLot:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative power measured by one power sensor. The used parameters are described in "Parameter list" on page 249.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<tslot_width> Default unit: s

<no_slots> Default unit: s

<start_exclude> Default unit: s

<end_exclude> Default unit: s

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:TSLot:DIFFerence? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:TSLot:DIFFerence? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

READ<Measurement>[:SCALar][:POWer]:TSLot:DIFFerence? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:TSLot:DIFFerence? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENSn-SENSm)"`.

Power measured by two power sensors. The used parameters are described in "Parameter list" on page 249.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<tslot_width>	Default unit: s
<no_slots>	Default unit: s
<start_exclude>	Default unit: s
<end_exclude>	Default unit: s
<expected_value>	
<resolution>	
<source_list>	<expr>
Usage:	Query only

CONFigure<Measurement>[:SCALar][:POWer]:TSLot:DIFFerence:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:TSLot:DIFFerence:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:TSLot:DIFFerence:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:TSLot:DIFFerence:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative difference measured by two power sensors. The used parameters are described in "Parameter list" on page 249.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<tslot_width>	Default unit: s

<no_slots> Default unit: s

<start_exclude> Default unit: s

<end_exclude> Default unit: s

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:TSLot:SUM? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:TSLot:SUM? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:TSLot:SUM? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:TSLot:SUM? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENSn+SENSm)"`.

Sum measured by two power sensors. The used parameters are described in "Parameter list" on page 249.

Suffix:

<Measurement> 1 to 4
Measurement channel

Query parameters:

<tslot_width> Default unit: s

<no_slots> Default unit: s

<start_exclude> Default unit: s

<end_exclude> Default unit: s

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:TSLot:SUM:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:TSLot:SUM:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:TSLot:SUM:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:TSLot:SUM:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative sum measured by two power sensors. The used parameters are described in "Parameter list" on page 249.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<tslot_width>	Default unit: s
<no_slots>	Default unit: s
<start_exclude>	Default unit: s
<end_exclude>	Default unit: s
<expected_value>	
<resolution>	
<source_list>	<expr>
Usage:	Query only

CONFigure<Measurement>[:SCALar][:POWer]:TSLot:RATio? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:TSLot:RATio? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:TSLot:RATio? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:TSLot:RATio? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"(SENSn /SENSm)"`.

Ratio measured by two power sensors. The used parameters are described in "Parameter list" on page 249.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<tslot_width> Default unit: s

<no_slots> Default unit: s

<start_exclude> Default unit: s

<end_exclude> Default unit: s

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:TSLot:RATio:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:TSLot:RATio:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:TSLot:RATio:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:TSLot:RATio:RELative? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]`.

Relative ratio measured by two power sensors. The used parameters are described in "Parameter list" on page 249.

Suffix:
<Measurement> 1 to 4
Measurement channel

Query parameters:
<tslot_width> Default unit: s

<no_slots> Default unit: s

<start_exclude> Default unit: s

<end_exclude> Default unit: s

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:TSLot:SWR? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:TSLot:SWR? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:TSLot:SWR? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:TSLot:SWR? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"SWR(SENSn,SENSm)"`.

Standing wave ratio measured by two power sensors. The used parameters are described in "Parameter list" on page 249.

Suffix:

<Measurement> 1 to 4
Measurement channel

Query parameters:

<tslot_width> Default unit: s

<no_slots> Default unit: s

<start_exclude> Default unit: s

<end_exclude> Default unit: s

<expected_value>

<resolution>

<source_list> <expr>

Usage: Query only

CONFigure<Measurement>[:SCALar][:POWer]:TSLot:REFLection? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:TSLot:REFLection? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

READ<Measurement>[:SCALar][:POWer]:TSLot:REFLection? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:TSLot:REFLection? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"REFL(SENSn,SENSm)"`.

Reflection coefficient/transmission factor of a DUT, measured by two power sensors. The used parameters are described in "Parameter list" on page 249.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<tslot_width>	Default unit: s
<no_slots>	Default unit: s
<start_exclude>	Default unit: s
<end_exclude>	Default unit: s
<expected_value>	
<resolution>	
<source_list>	<expr>
Usage:	Query only

CONFigure<Measurement>[:SCALar][:POWer]:TSLot:RLOSs? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
FETCh<Measurement>[:SCALar][:POWer]:TSLot:RLOSs? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
READ<Measurement>[:SCALar][:POWer]:TSLot:RLOSs? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]
MEASure<Measurement>[:SCALar][:POWer]:TSLot:RLOSs? <tslot_width>, <no_slots>, <start_exclude>, <end_exclude>[, <expected_value>, <resolution>, <source_list>]

Used for `CALCulate<Measurement>:MATH[:EXPRession]` `"RLOS(SENSn,SENSm)"`.

Return loss/transmission loss of a DUT, measured by two power sensors. The used parameters are described in "Parameter list" on page 249.

Suffix:

<Measurement>	1 to 4 Measurement channel

Query parameters:

<tslot_width>	Default unit: s
<no_slots>	Default unit: s
<start_exclude>	Default unit: s
<end_exclude>	Default unit: s
<expected_value>	
<resolution>	
<source_list>	<expr>
Usage:	Query only

13.6 Configuring Sensors

13.6.1 Setting the Frequency

[SENSe<Sensor>:]FREQuency[:CW] <frequency>

Sets the carrier frequency of the applied signal. This value is used for frequency-response correction of the measurement result.

Parameters:

<frequency> Range: 0.0 to 110.0e9
*RST: 1.0e9
Default unit: Hz

Manual operation: See "[Freq]" on page 15

[SENSe<Sensor>:]FREQuency:FIXed <frequency>

See `[SENSe<Sensor>:]FREQuency[:CW]` on page 258.

Parameters:

<frequency> Range: 0.0 to 110.0e9
*RST: 1.0e9
Default unit: Hz

Example: `SENS1:FREQ 10 MHz`

[SENSe<Sensor>:]FREQuency:TRACk <state>

Enables or disables the frequency tracker of the power sensor, if available.

Parameters:

<state> *RST: OFF

13.6.2 Sensor Ports

Further information:

- Chapter 13.6.7.2, "NRT Correction Settings", on page 289

INPut<Sensor>:PORT:SOURce[:VALue] <val>

Defines the forward direction for the given input if the automatic assignment has been switched off by `INPut{Sensor{1...128}}:PORT:SOURce:AUTO OFF`.

Parameters:

<val> Range: 1 to 2
*RST: 1

INPut<Sensor>:PORT:SOURce:AUTO <auto>

This command switches the automatic assignment of the forward direction on or off.

Parameters:

<auto>
ON
With automatic assignment of the forward direction, the direction in which the greater power flows is taken as the forward direction.
OFF
If the automatic assignment is switched off, e.g. to obtain a clear assignment in the case that forward and reverse power are almost equal, the orientation of the sensor is to be defined with the `INPut<Sensor>:PORT:SOURce` command.
*RST: 0

Example: `INP2:PORT:SOUR:AUTO OFF`

INPut<undef>:TRIGger:IMPedance <impedance>

Sets termination resistance of the external trigger input. Choose the setting that fits the impedance of the trigger source to minimize reflections on the trigger signals.

Suffix:

<undef> 1..n

Parameters:

<impedance> HIGH | LOW
*RST: HIGH

13.6.3 Sensor Modes

CALCulate<Measurement>[:CHANnel<Channel>]:CORRection:DCYCle[:VALue] <duty_cycle>

Using the duty cycle correction, the average power of RF bursts is calculated from the average power of the whole signal. Essentially, the average power of the whole signal is divided by the set duty cycle.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<duty_cycle>	Range: 0.001 to 100.0 *RST: 50.0 Default unit: pct

Manual operation: See "Duty Cycle" on page 79

[SENSe<Sensor>:]CORRection:DCYCle[:VALue] <duty_cycle>

Available for measurement type "Continuous Average".

Sets the duty cycle for measuring pulse-modulated signals. The duty cycle defines the percentage of one period during which the signal is active. If the duty cycle is enabled, the connected sensor takes this percentage into account when calculating the signal pulse power from the average power

Parameters:

<duty_cycle>	Range: 0.001 to 100.00 *RST: 50.0 Default unit: pct

Manual operation: See "Duty Cycle" on page 79

CALCulate<Measurement>[:CHANNel<Channel>]:CORRection:DCYCle:STATe <state>

See [SENSe<Sensor>:]CORRection:DCYCle:STATe on page 261.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<state> *RST: OFF

Manual operation: See "Duty Cycle State" on page 79

[SENSe<Sensor>:]CORRection:DCYCle:STATe <state>

Switches duty cycle correction for the measured-value on or off.

Parameters:

<state> ON | OFF

*RST: OFF

Manual operation: See "Duty Cycle State" on page 79

CALCulate<Measurement>[:CHANNel<Channel>]:FEED "<string>"

Determines the data that are processed. The parameters depend on the measurement type.

The power sensor averages every measured value using a series of samples. If a `RANDom` feed is selected, the power sensor takes a random value from the samples and forwards it to the R&S NRX as a measured value. `PEAK` is the maximum of all samples in the measurement interval.

Suffix:

<Measurement> 1 to 4
Measurement channel

<Channel> 1 to 2
Depending on measurement type: 1 = primary sensor, 2 = secondary sensor or 1 = forward, 2 = refeflction (reverse)

<Channel> 1...2

Parameters:

"<string>" Available for continuous average, burst, timeslot, timegate

POWer:AVERage
Average value

POWer:PEAK
Peak value

	POWer:RANDom Randomly selected value from the measurement interval
"<string>"	Available for trace **POWer:TRACe** Measurement sequence **POWer:PEAK:TRACe** Peak value of the samples per test point **POWer:RANDom:TRACe** Randomly selected value **POWer:AVERage ON SWEep[1..4]** Average value in time gate 1, 2, 3 or 4 **POWer:PTAVerage ON SWEep[1..4]** Peak-to-average value in time gate 1, 2, 3 or 4 **POWer:PEAK ON SWEep[1..4]** Peak value in time gate 1, 2, 3 or 4
"<string>"	CCDF:TRACe | PDF:TRACe Available for statistics
"<string>"	POWer:FORWard:AVERage | POWer:FORWard:CCDFunction | POWer:FORWard:PEP | POWer:ABSorption:AVERage | POWer:CFACtor | POWer:ABSorption:PEP | POWer:FORWard:AVERage:BURSt | POWer:ABSorption:AVERage:BURSt Available for NRT, forward direction
"<string>"	POWer:OFF | POWer:REVerse | POWer:SWRatio | POWer:RLOSs | POWer:RCOefficient | POWer:RFRatio Available for NRT, reverse direction *RST: POWer:AVERage
Manual operation:	See "Forward" on page 75 See "Reflection" on page 76 See "Evaluate" on page 79

CALCulate<Measurement>[:CHANnel<Channel>][:POWer][:AVG]:APERture[:VALue] <value>

See `[SENSe<Sensor>:][POWer:][AVG:]APERture[:VALue]` on page 263.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value>	Range: 8.3e-9 to 30.0 *RST: 0.01 Default unit: s

Manual operation: See "Aperture" on page 80

[SENSe<Sensor>:][POWer:][AVG:]APERture[:VALue] <integration_time>

Determines the integration time for a single measurement in the ContAv mode. To increase the measurement accuracy, this integration is followed by a second averaging procedure in a window with a selectable number of values. The filter window is configured with the `[SENSe<[1]..4>]:AVERage` commands.

Parameters:

<integration_time> Range: 8.3e-9 to 30.0
*RST: 0.005
Default unit: s

Manual operation: See "Aperture" on page 80

CALCulate<Measurement>[:CHANnel<Channel>][:POWer][:AVG]:SMOothing[:STATe] <value>

To reduce result fluctuations caused by modulation, this parameter should always be activated if the aperture time cannot be exactly adjusted to the modulation period.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<value> *RST: OFF

Manual operation: See "Smoothing" on page 80

[SENSe<Sensor>:][POWer:][AVG:]SMOothing:STATe <state>

Activates/deactivates digital lowpass filtering of the sampled video signal.

The problem of instable display values due to a modulation of a test signal described under `SENS<Sensor>:SAMP` can also be eliminated by lowpass filtering of the video signal. The lowpass filter eliminates the variations of the display even in case of unperiodic modulation and does not require any other setting.

If modulation is periodic, setting the aperture time is the better method, since it allows shorter measurement times.

Parameters:

<state> ON | OFF
*RST: OFF

Manual operation: See "Smoothing" on page 80

CALCulate<Measurement>[:CHANnel<Channel>][:POWer]:BURSt:DTOLerance <value>

See [SENSe<Sensor>:][POWer:]BURSt:DTOLerance on page 264.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value> Range: 0.0 to 0.3
*RST: 0.0
Default unit: s

Manual operation: See "Dropout Tolerance" on page 81

[SENSe<Sensor>:][POWer:]BURSt:DTOLerance <tolerance>

The end of a burst (power pulse) is recognized when the signal level drops below the trigger level. Especially with modulated signals, this may also happen for a short time within a burst. To prevent the supposed end of the burst from being recognized too early or incorrectly at these positions, a time interval can be defined via `SENS<Sensor>:BURS:DTOL` (drop-out tolerance) in which the pulse end is only recognized if the signal level no longer exceeds the trigger level. This is shown in the figure below: The drop-out time, i.e. the time in which the signal remains below the trigger level, is shorter than the drop-out tolerance. The burst end is thus recognized correctly.

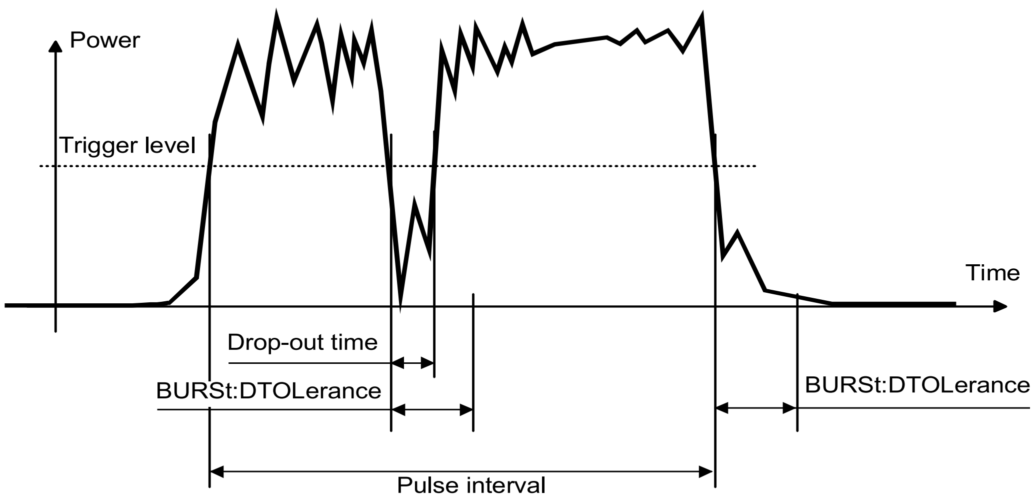


Figure 13-4: Meaning of drop-out TOLerance

Parameters:

<tolerance> Range: 0.00 to 0.30
*RST: 1.000e-6
Default unit: s

Manual operation: See "Dropout Tolerance" on page 81

CALCulate<Measurement>[:CHANnel<Channel>]:BURSt:TIMing:EXCLude:STARt <value>

The start and end of bursts can be excluded from the measurement. This means that signal overshoots can be omitted from measurements, for example.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value> Range: 0.0 to 15.0
*RST: 0.0
Default unit: s

Manual operation: See "Exclude from Start, Exclude from End" on page 81

CALCulate<Measurement>[:CHANnel<Channel>]:BURSt:TIMing:EXCLude:STOP <value>

See `CALCulate<Measurement>[:CHANnel<Channel>]:BURSt:TIMing:EXCLude:STARt` on page 265.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value> Range: 0.0 to 15.0
*RST: 0.0
Default unit: s

Manual operation: See "Exclude from Start, Exclude from End" on page 81

CALCulate<Measurement>[:CHANnel<Channel>]:SAMPling <value>

If the signal to be measured has modulation sections just above the video bandwidth of the sensor used, measurement errors might be caused due to aliasing effects. In this case, the sampling rate of the sensor can be set to a safe lower value (FREQ2). However, the measurement time required to obtain noise-free results is extended compared to the normal sampling rate (FREQ1).

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value> FREQ1 | FREQ2
*RST: FREQ1

Manual operation: See "Sampling Rate" on page 80

[SENSe<Sensor>:]SAMPling <sampling_rate>

If the signal to be measured has modulation sections just above the video bandwidth of the sensor used, measurement errors might be caused due to aliasing effects. In this case, the sampling rate of the sensor can be set to a safe lower value (`FREQ2`). However, the measurement time required to obtain noise-free results is extended compared to the normal sampling rate (`FREQ1`).

Parameters:

<sampling_rate> FREQ1 | FREQ2
*RST: FREQ1

Manual operation: See "Sampling Rate" on page 80

[SENSe<Sensor>:]TRACe:ESAMpling:AUTO <auto>

Enables the automatic equivalent sampling. With this setting, the sensor will – depending on certain parameters – superpose several successive measurements to facilitate a high-resolution trace representation. However, this requires a periodic measurement signal and has a negative effect on measurement speed.

Parameters:

<auto> *RST: ON

Manual operation: See "Equivalent Time Sampling " on page 81

CALCulate<Measurement>:STATistics:APERture <value>

Defines the aperture time (size of the acquisition interval).

Suffix:

<Measurement> 1...100

Parameters:

<value> Range: 10e-6 to 10.0
*RST: 0.01
Default unit: s

Manual operation: See "Aperture" on page 80

13.6.4 Sensor Corrections

CALCulate<Measurement>[:CHANnel<Channel>]:CORRection:OFFSet[:MAGNitude] <value>

Sets an offset correction value for the selected reference plane. This can correct the influence of cables etc. and does not influence measurement accuracy.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value> Range: -200.0 to 200.0
*RST: 0.0
Default unit: dB

Manual operation: See "Offset" on page 83

[SENSe<Sensor>:]CORRection:OFFSet[:VALue] <offset>

Sets a fixed offset that is added to correct the measured value.

Parameters:

<offset> Range: -200.00 to 200.00
*RST: 0.0
Default unit: dB

Manual operation: See "Offset" on page 83

CALCulate<Measurement>[:CHANnel<Channel>]:CORRection:OFFSet:RPLane <plane>

Selects the source (SOURce) or the load (LOAD) port as the reference plane for measurements.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<plane> SOURce | LOAD

*RST: SOURce

CALCulate<Measurement>[:CHANNel<Channel>]:CORRection:OFFSet:STATe <state>

Enables or disables a selected frequency dependent offset table per channel.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<state> *RST: OFF

Manual operation: See "Offset State" on page 82

[SENSe<Sensor>:]CORRection:OFFSet:STATe <state>

Enables or disables the offset correction.

Parameters:

<state> *RST: OFF

Manual operation: See "Offset State" on page 82

CALCulate<Measurement>[:CHANNel<Channel>]:CORRection:OFFSet:TABLe[:STATe] <state>

Activates/deactivates the frequency-dependent offset correction specified in the selected table.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Setting parameters:

<state> *RST: OFF

Usage: Setting only

Manual operation: See "Frequency dependent offset active" on page 83

CALCulate<Measurement>[:CHANNel<Channel>]:CORRection:OFFSet:TABLe:INDex <value>

Selects one of the available offset tables.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Setting parameters:

<value> Range: 1 to 10
*RST: 1

Usage: Setting only

Manual operation: See "Frequency dependent offset table" on page 83

CALCulate<Measurement>[:CHANnel<Channel>]:SGAMma:PHASe <value>

Sets the phase angle of the source reflection coefficient gamma in degrees.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<value> Range: -360.0 to 360.0
*RST: 0.0
Default unit: deg

Manual operation: See "Gamma Phase" on page 84

[SENSe<Sensor>:]SGAMma:PHASe <phase>

The R&S NRX can perform a measured-value correction taking the complex reflection coefficient (source gamma) of the signal source into account.
`SENS<Sensor>:SGAM:CORR:STAT ON` must be set. The phase angle of the reflection coefficient is set with `SENS<Sensor>:SGAM:PHAS`.

Parameters:

<phase> Range: -360.0 to 360.0
*RST: 0.0
Default unit: degree

CALCulate<Measurement>[:CHANnel<Channel>]:SGAMma:CORRection:STATe <value>

See `[SENSe<Sensor>:]SGAMma:CORRection:STATe` on page 270.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<value> *RST: OFF

Manual operation: See "Gamma Correction" on page 84

[SENSe<Sensor>:]SGAMma:CORRection:STATe <state>

Activates/deactivates the measured-value correction of the reflection coefficient effect of the source gamma.

Parameters:

<state>	ON | OFF	
	*RST:	OFF

CALCulate<Measurement>[:CHANnel<Channel>]:SGAMma[:MAGNitude] <value>

Sets the magnitude of the source reflection coefficient gamma.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value>	Range:	0.0 to 1.0
	*RST:	0.0
	Default unit:	-

Manual operation: See "Gamma Magnitude" on page 84

[SENSe<Sensor>:]SGAMma[:MAGNitude] <magnitude>

Sets the magnitude of the reflection coefficient.

The R&S NRX can perform a measured-value correction taking the complex reflection coefficient (source gamma) of the signal source into account if `[SENSe<Sensor>:]SGAMma:CORRection:STATe` `ON` is set.

Parameters:

<magnitude>	Range:	0.0 to 1.0
	*RST:	0.0

[SENSe<Sensor>:]RGAMma:PHASe <phase_angle>

Parameters:

<phase_angle>	Range:	0.0 to 360.0
	*RST:	0.0

[SENSe<Sensor>:]RGAMma[:MAGNitude] <magnitude>

Parameters:

<magnitude>	Range:	-200.0 to 200.0
	*RST:	0.0
	Default unit:	-

[SENSe<Sensor>:]CORRection:SPDevice:LIST?

Lists the titles of all downloaded S-parameter correction sets.

Usage: Query only

Manual operation: See "S-Parameter List" on page 83

[SENSe<Sensor>:]CORRection:SPDevice:SELect <num>

Several S-parameter tables can be stored in a sensor.

`[SENSe<Sensor>]:CORRection:SPDevice:SELect` selects one of these tables. The `[SENSe<Sensor>]:CORRection:SPDevice:STATe ON` command activates measured-value correction.

Parameters:

<num> Range: 1 to 1999
*RST: 1

Manual operation: See "S-Parameter List" on page 83

[SENSe<Sensor>:]CORRection:SPDevice:STATe <state>

Instructs the sensor to perform a measured-value correction by means of one of the stored S-parameter tables (S-parameter device).

Parameters:

<state> ON | OFF
*RST: OFF

Manual operation: See "S-Parameter List" on page 83

[SENSe<Sensor>:]CORRection:DCYCle[:INPut][:MAGNitude] <duty_cycle>

Parameters:

<duty_cycle>

[SENSe<Sensor>:]CORRection:FDOFfset[:INPut][:MAGNitude]?

Usage: Query only

[SENSe<Sensor>:]CORRection:FDOTable:STATe <state>

Parameters:

<state>

[SENSe<Sensor>:]CORRection:FDOTable[:SELect] <table_name>

Parameters:
<table_name>

13.6.5 Sensor Filters

Further information:

- Chapter 8.3, "Filter Settings", on page 84

CALCulate<Measurement>[:CHANnel<Channel>]:AVERage[:STATe] <value>

See `[SENSe<Sensor>:]AVERage[:STATe]` on page 273.

Suffix:
<Measurement> 1...100

<Channel> 1...2

Parameters:
<value> *RST: ON

Manual operation: See "Averaging Mode" on page 96

[SENSe<Sensor>:]AVERage[:STATe] <state>

Activates or deactivates the filter function of a sensor. If the filter is switched on, the individual measured values set with `SENSe<Sensor>]:AVERage:COUNt` are averaged. This reduces the impact of noise and helps to achieve measured values that are more stable.

Parameters:
<state> ON | OFF
*RST: ON

CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt:AUTO[:STATe] <state>

If enabled, determins the average count automatically from the level of the input signal.

Suffix:
<Measurement> 1...100

<Channel> 1...2

Parameters:
<state> *RST: ON

Manual operation: See "Filter State" on page 86
See "Recalc Filter Length" on page 86

[SENSe<Sensor>:]AVERage:COUNt:AUTO[:STATe] <state>

Enables auto averaging mode.

Parameters:
<state> *RST: ON

Manual operation: See "Filter State" on page 86
See "Recalc Filter Length" on page 86

CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt[:VALue] <value>

Sets the filter length i.e. the number of readings to be averaged for one measured value. The higher the count the lower the noise and the longer it takes to obtain a measured value.

Suffix:
<Measurement> 1...100

<Channel> 1...2

Parameters:

<value> Range: 1 to 1048576
*RST: 4

Manual operation: See "Filter Length" on page 86
See "Averaging Count" on page 96

[SENSe<Sensor>:]AVERage:COUNt[:VALue] <count>

Sets the filter length, i.e. the number of readings that are averaged for one measured value. The higher the count, the lower the noise, and the longer it takes to obtain a measured value.

Parameters:

<count> Range: 1 to 1048576
*RST: 4

Manual operation: See "Filter Length" on page 86

CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt:AUTO:MTIMe <value>

If the R&S NRX has to determine the filter length automatically, the filter length can become large and thus also the measurement time.

With this command, you can set an upper time limit (maximum time). It should never be exceeded. Undesired long measurement times can thus be prevented (in the `SENS:AVER:COUN:AUTO:TYPE NSR` mode) if the automatic filter length switchover is on.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<value> Range: 0.1 to 1000.0
*RST: 1.0
Default unit: s

Manual operation: See "Maximum Settling Time" on page 87

[SENSe<Sensor>:]AVERage:COUNt:AUTO:MTIMe <maximum_time>

See `CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt:AUTO:MTIMe` on page 274

Parameters:

<maximum_time> Range: 0.01 to 1000.0
*RST: 4.00
Default unit: s

Manual operation: See "Maximum Settling Time" on page 87

CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt:AUTO:NSRatio <value>

See [SENSe<Sensor>:]AVERage:COUNt:AUTO:NSRatio on page 275.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<value> Range: 100e-6 to 1.0
*RST: 1.0
Default unit: dB

Manual operation: See "Noise Content" on page 87

[SENSe<Sensor>:]AVERage:COUNt:AUTO:NSRatio <nsr>

Indicates the maximum noise ratio in the measurement result. Achieving the same result by filter length setting is attempted only if

`SENS<Sensor>:AVER:COUN:AUTO ON` and
`SENS<Sensor>:AVER:COUN:AUTO:TYPE NSR` are set.

Parameters:

<nsr> Range: 100e-6 to 1.0
*RST: 0.01
Default unit: dB

Manual operation: See "Noise Content" on page 87

[SENSe<Sensor>:]AVERage:COUNt:AUTO:RESolution <resolution>

Defines the number of significant places for linear units and the number of decimal places for logarithmic units which should be free of noise in the measurement result.

The setting is only taken into account, if `SENS:AVER:COUN:AUTO:TYPE` is set to `RES` and `SENS:AVER:COUN:AUTO` is `ON`.

However, `SENS<SENSOR>:AVER:COUN:AUTO:RES` does not affect the `DISPlay` command. The parameters of the two commands are different but have the same meaning.

SENS<SENSOR>:AVER:COUN:AUTO:RES	1	2	3	4
DISP<SENSOR>:RES	1	0.1	0.01	0.001

Parameters:

<resolution> Range: 1 to 4
*RST: 3

CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt:AUTO:SLOT <value>

See [SENSe<Sensor>:]AVERage:COUNt:AUTO:SLOT on page 276.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value> Range: 1 to 128
*RST: 1

Manual operation: See "Timeslot" on page 87

[SENSe<Sensor>:]AVERage:COUNt:AUTO:SLOT <slot>

Sets a timeslot whose measured value is used to automatically determine the filter length.

Parameters:

<slot> Range: 1 to 128
*RST: 1

Manual operation: See "Timeslot" on page 87

CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt:AUTO:TYPE <value>

Sets the automatic averaging filter mode.

RESolution The usual mode for the power sensors. NSRatio

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value> RESolution | NSRatio

RESolution
Sets the usual mode for the power sensors.

NSRatio
Predefines the compliance to an exactly defined noise component.

*RST: RESolution

[SENSe<Sensor>:]AVERage:COUNt:AUTO:TYPE <type>

Selects a method by which the automatic filter length switchover can operate:

Parameters:

<type> RESolution | NSRatio

RESolution
Takes setting `SENS<SENSOR>:AVER:COUN:AUTO:RES` into account.

NSRatio
Takes setting `SENS<SENSOR>:AVER:COUN:AUTO:NSR` into account.

*RST: RESolution

Manual operation: See "Fixed Noise Mode" on page 87

CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:COUNt:ENUM <value>

Sets the filter length i.e. the number of readings to be averaged for one measured value as enumeration. The higher the count the lower the noise and the longer it takes to obtain a measured value.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<value> E1 | E2 | E4 | E8 | E16 | E32 | E64 | E128 | E256

*RST: E4

Manual operation: See "Filter Length" on page 86

[SENSe<Sensor>:]AVERage:COUNt:ENUM <value>

Sets the number of readings that are averaged for one measured value. The higher the count, the lower the noise, and the longer it takes to obtain a measured value.

Parameters:

<value> E1 | E2 | E4 | E8 | E16 | E32 | E64 | E128 | E256

*RST: E4

Manual operation: See "Filter Length" on page 86

CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:TCONtrol[:ENUM] <mode>

See `[SENSe<Sensor>:]AVERage:TCONtrol` on page 278.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<mode> MOVing | REPeat

*RST: MOVing

[SENSe<Sensor>:]AVERage:TCONtrol <mode>

If enabled, outputs intermediate values to facilitate early detection of changes in the measured quantity. In the settled state, that means when the number of measurements specified by the average count has been performed, a moving average is output.

Parameters:

<mode> MOVing | REPeat

*RST: REPeat

Manual operation: See "Moving Average" on page 87

CALCulate<Measurement>[:CHANNel<Channel>]:AVERage:TCONtrol:AUTO <state>

Defines if the output of measurement results is configured manually or automatically.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<state> *RST: ON

Manual operation: See "Moving Average" on page 87

CALCulate<Measurement>[:CHANNel<Channel>]:TRACe:AVERage[:STATe] <value>

See `[SENSe<Sensor>:]TRACe:AVERage[:STATe]` on page 279.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<value> *RST: ON

Manual operation: See "Filter State" on page 86

[SENSe<Sensor>:]TRACe:AVERage[:STATe] <state>

Switches the filter function of a sensor on or off for the Trace mode. When the filter is switched on, the number of measured values set with `[SENSe<Sensor>]:AVERage:COUNt` is averaged. This reduces the effect of noise so that more reliable results are obtained.

Parameters:

<state> ON | OFF

*RST: ON

Manual operation: See "Filter State" on page 86

CALCulate<Measurement>[:CHANnel<Channel>]:TRACe:AVERage:COUNt[:VALue] <value>

See `[SENSe<Sensor>:]TRACe:AVERage:COUNt` on page 279.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<value> Range: 1 to 65536
*RST: 4

Manual operation: See "Filter Length" on page 86

[SENSe<Sensor>:]TRACe:AVERage:COUNt <filter length>

Sets the length of the filter for the Trace mode. The wider the filter, the lower the noise and the longer it takes to obtain a measured value.

Parameters:

<filter length> The filter length can only be 1, 2, 4, 8, 16,..., 2^n. If the entered filter length is not a power of two, the value is rounded to the next 2^n value without an error message.

Range: 1 to 65536
*RST: 4

Manual operation: See "Filter Length" on page 86

[SENSe<Sensor>:]AVERage:RESet

Initializes the digital filter by deleting the stored measured values.

Usage: Event

Manual operation: See "Clear Filter Buffer" on page 87

[SENSe<Sensor>:]TRACe:AVERage:TCONtrol <mode>

Available in trace mode.

Defines how the measurement results are output. This is called termination control.

Parameters:

<mode> MOVing | REPeat

MOVing
Outputs intermediate values to facilitate early detection of changes in the measured quantity. In the settled state, that means when the number of measurements specified by the average count has been performed, a moving average is output.

REPeat
Specifies that a measurement result is not output until the entire measurement has been completed. This means that the number of measurement cycle repetitions is equal to the set average count. If the average count is large, the measurement time can be very long.
The average count is set using `[SENSe<Sensor>:]TRACe:AVERage:COUNt` on page 279.

*RST: REPeat

Manual operation: See "Moving Average" on page 87

CALCulate<Measurement>[:CHANnel<Channel>]:TRACe:AVERage:TCONtrol[:ENUM] <mode>

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<mode> MOVing | REPeat

*RST: MOVing

CALCulate<Measurement>[:CHANnel<Channel>]:TRACe:AVERage:TCONtrol:AUTO <state>

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<state> *RST: ON

Manual operation: See "Moving Average" on page 87

CALCulate<Measurement>[:CHANnel<Channel>]:TRACe:ESAMpling <value>

Activates or deactivates the equivalent sampling mode, which allows for high resolution measurements.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value>	*RST: OFF

CALCulate<Measurement>[:CHANnel<Channel>]:AVERage:TYPE <type>

See `[SENSe<Sensor>:]AVERage:TYPE` on page 281.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<type>	POWer | VIDeo | LINear *RST: POWer

Manual operation: See "Fixed Noise Mode" on page 87
See "Averaging Domain" on page 88

[SENSe<Sensor>:]AVERage:TYPE <type>

Available in continuous average and trace mode. Sets the averaging domain.

Parameters:

<type>	POWer | VIDeo | LINear *RST: POWer

Manual operation: See "Averaging Domain" on page 88

CALCulate<Measurement>[:CHANnel<Channel>][:POWer]:NCORrection[:STATe] <state>

Enables or disables the noise cancellation.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<state>	*RST: OFF

[SENSe<Sensor>:][POWer:]NCORrection[:STATe] <state>

Enables or disables the noise cancellation.

Parameters:
<state> *RST: OFF

13.6.6 Sensor Ranges

CALCulate<Measurement>[:CHANnel<Channel>]:INPut:ATTenuation:AUTO <auto>

Specifies if the attenuator is set manually or automatically.

Suffix:
<Measurement> 1...100

<Channel> 1...2

Parameters:
<auto> OFF | ON | ONCE
*RST: OFF

Manual operation: See "Attenuator Mode" on page 90

[SENSe<Sensor>:]INPut:ATTenuation:AUTO <auto>

Configures the automatic setting of the input attenuation.

Parameters:

<auto> OFF | ON | ONCE

ONCE
Adjusts the input attenuation one time, then disables the automatic setting.

*RST: OFF

Manual operation: See "Attenuator Mode" on page 90

CALCulate<Measurement>[:CHANnel<Channel>]:INPut:ATTenuation[:VALue] <value>

Specifies the attenuation value.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value> Only two values are possible, 0 dB and 30 dB.
For values < 15 dB, the attenuator is set to 0 dB.
For values ≥ 15 dB, the attenuation is set to 30 dB.

Range: 0.0 to 30.0
*RST: 30.0
Default unit: dB

Manual operation: See "Attenuation" on page 90

[SENSe<Sensor>:]INPut:ATTenuation[:VALue] <value>

Sets the input attenuation.

Parameters:

<value> Only two values are possible, 0 dB and 30 dB.
For values < 15 dB, the attenuator is set to 0 dB.
For values ≥ 15 dB, the attenuation is set to 30 dB.

Range: 0.0 to 30.0
*RST: 30.0
Default unit: dB

Manual operation: See "Attenuation" on page 90

CALCulate<Measurement>[:CHANnel<Channel>][:POWer][:AVG]:RANGe:CLEVel:STATe <value>

Activates a shift of the transition region(s).

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value> *RST: OFF

Manual operation: See "User Defined Transition" on page 89

CALCulate<Measurement>[:CHANnel<Channel>][:POWer][:AVG]:RANGe:CLEVel[:VALue] <value>

Sets the cross-over level. Shifts the transition ranges between the measurement ranges. This may improve the measurement accuracy for special signals, i.e. signals with a high crest factor.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<value> Range: -20.0 to 0.0
*RST: 0.0
Default unit: dB

Manual operation: See "Offset" on page 90

[SENSe<Sensor>:]RANGe:CLEVel <level>

Reduces the transition range between the measurement paths, 0 -> 1 and 1 -> 2, by the set value. Thus, you can improve the measurement accuracy for signals with a high peak-to-average ratio, since the headroom for modulation peaks becomes larger. However, the S/N ratio is reduced at the lower limits of the transition ranges.

Parameters:

<level> Range: -20.00 to 0.00
*RST: 0.00
Default unit: dB

Manual operation: See "Offset" on page 90

CALCulate<Measurement>[:CHANnel<Channel>][:POWer][:AVG]:RANGe:AUTO <value>

Turns the "Auto" range function on/off.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<value> *RST: ON

Manual operation: See "Range State" on page 89

[SENSe<Sensor>:]RANGe:AUTO <state>

Enables automatic measurement path selection.

Parameters:

<state> *RST: ON

Manual operation: See "Range State" on page 89

CALCulate<Measurement>[:CHANnel<Channel>][:POWer][:AVG]:RANGe[:VALue] <value>

Selects a measurement range in which the corresponding sensor is to perform a measurement.

Suffix:

<Measurement> 1...100

<Channel> 1...2

Parameters:

<value> LOW | MID | HIGH

*RST: MID

Manual operation: See "Range" on page 89

[SENSe<Sensor>:]RANGe[:VALue] <range>

Selects manually the active measurement path.

Parameters:

<range> Range: 0 to 2
*RST: 1

Manual operation: See "Range" on page 89

[SENSe<Sensor>:]POWer[:POWer]:RANGe:AUTO <state>

This command switches the automatic adaptation of the bargraph scaling to the measured power value on or off.

Parameters:

<state> **ON**
If auto-ranging has been selected, the scale limits of the bargraphs are automatically adapted to the current measured value.

OFF
If auto-ranging is switched off, the limits and hence the scale remain fixed.

*RST: 1

Example: `SENS1:POW:RANG:AUTO OFF`

[SENSe<Sensor>:]POWer[:POWer]:RANGe:LIMit:DETect <value>

This command defines the conditions for a logic high level (> 2.7 V) being output at the AUX TTL connector if this connector has been defined as a monitoring output for the power indication (eg with the command `SENSe<n>:POWer:RANGe:LIMit ON`).

Parameters:

<value> INBound | OUTBound | HIGH

INBound
A high level is output if the measured power is within the range specified by the scale limits of the lefthand bargraph.

OUTBound
A high level is output if the measured power is out of the range specified by the scale limits of the lefthand bargraph.

HIGH
A high level is output if the measured power exceeds the upper scale limit of the lefthand bargraph.

*RST: HIGH

Example: `SENS1:POW:RANG:LIM:DET INB`

[SENSe<Sensor>:]POWer[:POWer]:RANGe:LIMit[:STATe] <state>

This command can be used to define the AUX TTL connector as a monitoring output for the power indication (ON state). In OFF state, the connector may be defined either as a monitoring output for the matching or as a trigger input.

If the AUX TTL connector is assigned more than one function, the error message –221 "Settings conflict“ is generated and the first setting retained.

Parameters:

<state> Range: "ON", "OFF"
*RST: OFF

Example:

```
TRIG:SOUR INT
SENS1:POW:REFL:RANG:LIM OFF
SENS1:POW:RANG:LIM ON
```

[SENSe<Sensor>:]POWer[:POWer]:RANGe:LOWer <lower>

This command defines the lower scale limit for the lefthand bargraph (power indication).

Since the entry is made without unit, the following should be observed:

- The selected unit is decisive for the absolute value of the scale limit.
- The entered numeric value remains the same when another unit is selected (W, dBm, %, dB) so that a change of the unit also causes a change of the scale limit.
- For the entered scale limit to become effective, the automatic scaling of the bargraph has to be switched off.

Parameters:

<lower>	Range:	-1999.0 to 1999.0
	*RST:	0.0

Example: A lower scale limit of 150 mW is set with the following commands:

```
SENS1:POW:RANG:AUTO OFF
SENS1:POW:RANG:LOW 0.15
UNIT1:POW W
```

[SENSe<Sensor>:]POWer[:POWer]:RANGe[:UPPer] <upper>

This command defines the upper scale limit for the lefthand bargraph (power indication). The entry is made without unit. For details, see SENSe<Sensor>:POWer[:POWer]:RANGe:LOWer.

Parameters:

<upper>	Range:	-1999.0 to 1999.0
	*RST:	1.0

Example: An upper scale limit of 35.7 dBm is set with the following commands:

```
SENS1:POW:RANG:AUTO OFF
SENS1:POW:RANG 35.7
UNIT1:POW DBM
```

13.6.7 For NRT Measurement Type

13.6.7.1 NRT Mode Settings

Further information:

- Chapter 8.5.1, "NRT Mode Settings", on page 90

CALCulate<Measurement>[:CHANnel<Channel>]:NRT:BURSt:MODE <mode>

Defines the mode for average burst power results, either calculated (USER) or measured (AUTO).

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<mode> AUTO | USER

*RST: AUTO

Manual operation: See "Burst Mode" on page 91

CALCulate<Measurement>[:CHANnel<Channel>]:NRT:BURSt:PERiod <value>

Period of a burst sequence (for selected burst USER mode).

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value> Range: 0.0 to 1.0
*RST: 0.1
Default unit: s

Manual operation: See "Burst Period" on page 91

CALCulate<Measurement>[:CHANnel<Channel>]:NRT:BURSt:WIDTh <value>

Burst width (for selected burst USER mode).

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value> Range: 0.0 to 1.0
*RST: 0.01
Default unit: s

Manual operation: See "Burst Width" on page 92

CALCulate<Measurement>[:CHANnel<Channel>]:NRT:CCDF:THReshold <value>

Defines a threshold power level used for CCDF, where the probability is measured that the envelope power exceeds a given threshold.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value>	Range: 0.0 to 100e6 *RST: 0.001 Default unit: W

Manual operation: See "CCDF Threshold" on page 92

CALCulate<Measurement>[:CHANnel<Channel>]:NRT:DIRection <direction>

Selects the direction of forward power relative to defined ports 1 and 2. In `AUTO` mode the port with the greater measured power is interpreted as forward power.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<direction>	AUTO | FORWard | REVerse *RST: AUTO

Manual operation: See "Direction" on page 92

CALCulate<Measurement>[:CHANnel<Channel>]:NRT:PEP:HOLD:TIME <value>

Specifies the hold time of the peak hold circuit. If the entry is valid, the `USER` mode is automatically switched on and the default setting is switched off.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value>	Range: 1e-3 to 1e-1 *RST: 0.01 Default unit: s

Manual operation: See "PEP Hold Time" on page 92

13.6.7.2 NRT Correction Settings

Further information:

- Chapter 8.5.2, "NRT Correction Settings", on page 92

INPut<Sensor>:PORT:OFFSet <offs>

This command allows the transmission loss in a cable connecting the desired measurement point and the sensor to be taken into account. If the measurement position is set to LOAD, i.e. `INPut<n>:PORT:POSition LOAD`, the cable is assumed to be connected between the sensor and the load, otherwise between the sensor and the source.

Parameters:

<offs> Range: 0.0 to 100.0
*RST: 0.0
Default unit: dB

Example: `INP1:PORT:OFFS 1.25`

Manual operation: See "Offset" on page 93

INPut<Sensor>:PORT:POSition <pos>

This command selects the reference plane. It defines the sensor port to which the measurement results are to be referred to.

Parameters:

<pos> SOURce | LOAD

SOURce
Referred to source.

LOAD
Referred to load.

*RST: SOURce

Example: `INP2:PORT:POS SOUR`

Manual operation: See "Offset Reference Plane" on page 93

[SENSe<Sensor>:]DM:STANdard <standard>

This command selects the communication standard. Which settings are available depends on the sensor used. The settings are valid only if the modulation correction is switched on via the `SENSe<n>:DM:STATe ON` command.

Parameters:

<standard> IS95 | WCDMa | DVBT | DAB
*RST: IS95

Example: `SENS1:DM:STAN IS95`

Manual operation: See "Modulation" on page 94

[SENSe<Sensor>:]DM:WCDMa:CRATe <value>

This command defines the chip rate for the communication standard WCDMA. The allowed range is sensor-dependent; the value is always entered without the unit (s^{-1}).

Parameters:

<value>	Range: 0.0 to 8.2e6 *RST: 1.0e6 Default unit: Hz

Example: `SENS1:DM:WCDM:CRAT 4.096E6`

Manual operation: See "WCDMA Chip Rate" on page 94

13.6.7.3 NRT Filter Settings

Further information:

- Chapter 8.5.3, "NRT Filter Settings", on page 94

CALCulate<Measurement>[:CHANnel<Channel>]:NRT:APERture[:VALue] <value>

Defines the integration time if the `Aperture` mode is set to USER.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value>	Range: 0.005 to 0.111 *RST: 0.037 Default unit: s

Manual operation: See "Integration Time" on page 95

CALCulate<Measurement>[:CHANnel<Channel>]:NRT:APERture:MODE <mode>

Selects a user-defined value (USER) or the default (DEFault) value for the integration time.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<mode>	DEFault | USER *RST: DEFault

Manual operation: See "Integration Time Mode " on page 95

CALCulate<Measurement>[:CHANNel<Channel>]:NRT:VBWidth[:VALue] <value>

Selects a certain video bandwidth filter (0..2). The actual filter bandwidth is sensor-specific.

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value> Range: 0 to 2
*RST: 2

Manual operation: See "Video Bandwidth" on page 77

CALCulate<Measurement>[:CHANNel<Channel>][:POWer]:VBWidth:ENUM <value>

Suffix:

<Measurement>	1...100
<Channel>	1...2

Parameters:

<value> EFULl | E5M | E1M5 | E0M3
*RST: EFULl

13.6.8 Further Sensor Settings

[SENSe<Sensor>:]ADD <sensor>

Setting parameters:
<sensor>

Usage: Setting only

[SENSe<Sensor>:]BANDwidth:VIDeo <mode>
[SENSe<Sensor>:]BWIDth:VIDeo <mode>
Parameters:
<mode>

[SENSe<Sensor>:]BANDwidth:VIDeo:FNUMber <fnum>

Sets the video bandwidth for the Trace mode.

Parameters:

<fnum>	Range:	"FULL", "5 MHz", "1.5 MHz", "300 kHz"
	*RST:	depending on sensor

[SENSe<Sensor>:]BANDwidth:VIDeo:LIST?
[SENSe<Sensor>:]BWIDth:VIDeo:LIST?
Usage: Query only

[SENSe<Sensor>:]BANDwidth[:RESolution]:TYPE:AUTO[:STATe] <state>

Effective if `[SENSe<Sensor>:]BANDwidth:TYPE RESolution` is set.

If enabled, sets the filter type suitable for the currently chosen measurement mode and bandwidth. You can query the selected filter type using
`[SENSe<Sensor>:]BANDwidth:RESolution:TYPE`

Parameters:

<state>	*RST:	ON

[SENSe<Sensor>:]BANDwidth[:RESolution]:TYPE[:VALue] <value>

Effective if `[SENSe<Sensor>:]BANDwidth:TYPE RESolution` is set.

Sets the filter type for resolution bandwidth filter. The filter bandwidth is not affected.

If you want to set the filter type automatically, use `[SENSe<Sensor>:]BANDwidth[:RESolution]:TYPE:AUTO[:STATe]` on page 293.

Parameters:

<value>	FLAT | NORMal | LTE | W3GPp	
	*RST:	FLAT

[SENSe<Sensor>:]BANDwidth[:RESolution][:VALue] <value>

Effective if `[SENSe<Sensor>:]BANDwidth:TYPE RESolution` is set.

Sets the resolution bandwidth as floating point value.

Parameters:

<value>	Range:	10.0 to 400.0e6
	*RST:	25.0e6
	Default unit:	Hz

[SENSe<Sensor>:]BWIDth:VIDeo:FNUMber <fnum>

Sets the video bandwidth for the Trace mode.

Parameters:

<fnum>	Range:	"FULL", "5 MHz", "1.5 MHz", "300 kHz"
	*RST:	depending on sensor

Example: `SENS1:BAND:VID:FNUM 3`

[SENSe<Sensor>:]DATA? [<function>]

This command provides access to the results of the current measurement(s). It is possible to request the result of a certain measurement function or to query the results of all measurement functions switched on. The measurement functions are configured with the `SENS<n>:FUNC...` commands.

The responses are output in the unit selected for the corresponding function. For some functions, the unit can be selected.

By defining the measurement function, the result of a special measurement function is requested. Without this specification the results of all active functions are queried. The responses are given in the sequence of the measurement functions listed under `[SENS<n>:]FUNC:ON`.

The command is a query and therefore has no *RST value.

Query parameters:

<function>

Example: `SENS2:DATA? "POW:FORW:AVER"`
Returns the measured result for the average forward power.

Usage: Query only

[SENSe<Sensor>:]DM:STATe <state>

This command switches the correction of the measurement value for modulated signals on or off. Selection of a communication standard, see `[SENSe<Sensor>:]DM:STANdard` on page 290, is enabled only if the correction is switched on.

Parameters:
<state> Range: "ON", "OFF"
*RST: 0

Example: `SENS1:DM:STAT ON`

[SENSe<Sensor>:]INFormation?

This command returns the condensed data of the sensor in form of an ASCII string.

Example: `SENS2:INF?`

Usage: Query only

[SENSe<Sensor>:]NAME <name>

Set a user selectable name for the sensor. This has no further influence on other functions. It exists for naming a sensor according to user requirements.

Parameters:
<name>

[SENSe<Sensor>:]POWer:CCDFunction:REFerence <ref>

This command defines the threshold for the cumulative distribution function (CCDF). The distribution function states the probability (in %) of the envelope power lying above the threshold. Units W or dB or dBm.

Parameters:
<ref> Range: 0.0 to 100.0e6
*RST: 1.0e-3
Default unit: W

Example: `SENS2:POW:CCDF:REF 10W`

[SENSe<Sensor>:]POWer:PEP:HOLD <time>

Sets the hold time of the peak hold circuit of the sensor.

Parameters:

<time> Range: 1.0e-3 to 1.0e-1
*RST: 6.0e-2
Default unit: s

[SENSe<Sensor>:]POWer:REFerence <ref>

Enters the reference values (in W or dBm) for the relative power indication (in %, dB, or dBm). Units: Watt or dBm.

Parameters:

<ref> Range: 0.0 to 100.0e6
*RST: 1.0
Default unit: W

[SENSe<Sensor>:]POWer:REFLection:RANGe:AUTO <state>

This command switches the automatic adaptation of the bargraph scaling for the reflection indication on or off.

Parameters:

<state>

ON
If auto-ranging is switched on, the scale limits of the bargraphs are automatically adapted to the current measured value.

OFF
If it is switched off, the scale limits remain fixed.

*RST: 1

Example: `SENS1:POW:REFL:RANG:AUTO OFF`

[SENSe<Sensor>:]POWer:REFLection:RANGe:LIMit:DETect <value>

This command defines the conditions for a logic high level (> 2.7 V) being output at the AUX TTL connector if this connector has been defined as a monitoring output for the power indication (e.g. with the command `SENSe<n>:POWer:RANGe:LIMit ON`).

Parameters:

<value> INBound | OUTBound | HIGH

INBound
A high level is output if the measured power is within the range specified by the scale limits of the lefthand bargraph.

OUTBound
A high level is output if the measured power is out of the range defined by the scale limits of the lefthand bargraph.

HIGH
A high level is output if the measured power exceeds the upper scale limit of the lefthand bargraph.

*RST: HIGH

Example: `SENS1:POW:RANG:LIM:DET INB`

[SENSe<Sensor>:]POWer:REFLection:RANGe:LIMit[:STATe] <state>

This command can be used to define the AUX TTL connector as a monitoring output for the reflection (ON state). In the OFF state, the connector may be defined either as a monitoring output for the power indication or as a trigger input. If the AUX TTL connector is assigned more than one function, the error message –221 "Settings conflict“ is generated and the first setting retained.

Parameters:

<state> Range: "ON", "OFF"
*RST: OFF

Example:

```
TRIG:SOUR INT
SENS1:POW:RANG:LIM OFF
SENS1:POW:REFL:RANG:LIM ON
```

[SENSe<Sensor>:]POWer:REFLection:RANGe:LOWer <lower>

This command defines the lower scale limit for the righthand bargraph (power indication).

Since the entry is made without unit, the following should be observed:

- The meaning of the entered numeric value depends on the display mode selected. The value 1.0 may mean matching (SWR indication) or total mismatch (indication of reflection coefficient).
- The entered numeric value remains the same when another display mode is selected (SWR, return loss, reflection coefficient or reverse power) so that a change of the display mode also changes the meaning of the scale limit.
- For the entered scale limit to become effective, the automatic scaling of the bargraph has to be switched off.

Parameters:

<lower> Range: -1999.0 to 1999.0
*RST: 0.0

Example: The following commands set the lower scale limit to an SWR of 1.0:

```
SENS1:POW:REFL:RANG:AUTO OFF
SENS1:POW:REFL:RANG:LOW 1.0
SENS1:FUNC "POW:REFL"
UNIT1:POW:REFL SWR
```

[SENSe<Sensor>:]POWer:REFLection:RANGe[:UPPer] <upper>

This command defines the upper scale limit for the righthand bargraph (reflection indication). The entry is made without unit. For further details, see `[SENSe<Sensor>:]POWer:REFLection:RANGe:LOWer` on page 297.

Parameters:

<upper> Range: -1999.0 to 1999.0
*RST: 1.0

Example: The following commands set the upper scale limit to a reverse power of 100 W:

```
SENS1:POW:REFL:RANG:AUTO OFF
SENS1:POW:REFL:RANG 100
SENS1:FUNC "POW:REV"
UNIT1:POW W
```

[SENSe<Sensor>:]ROSCillator:REFio:FREQuency <value>

Only effective for [SENSe<Sensor>:]ROSCillator:SOURce on page 298REFio.

Sets the frequency of the reference clock signal that is supplied at the REF connector.

Parameters:

<value> Range: 1.0e+7 to 1.2e+8
*RST: 1.0e+7
Default unit: Hz

[SENSe<Sensor>:]ROSCillator:REFio:OUTPut[:STATe] <value>

If the REF connector is used as an output, enables or disables the output signal.

Parameters:

<value> *RST: OFF

[SENSe<Sensor>:]ROSCillator:SOURce <value>

Sets the source of the reference oscillator.

Parameters:

<value> HOST | INTernal | REFio
*RST: INTernal

[SENSe<Sensor>:]RRESolution <rres>

This command changes the measurement resolution. This has an effect on the accuracy of the measurement, its duration, and on the number of digits indicated in the display.

Parameters:

<rres> LOW | HIGH
*RST: LOW

Example: `SENS1:RRES LOW`

[SENSe<Sensor>:]SWR:LIMit <limit>

This command sets the limit value for the SWR at which an alarm is triggered. For an alarm signal to be output, the forward power must also exceed a preset threshold THReshold.

Parameters:

<limit>	Range:	1.0 to 100.0
	*RST:	3.0

Example: `SENS1:SWR:LIM 1.5`

[SENSe<Sensor>:]SWR:SIGNal[:TTLSignal]:LEVel <level>

This command is used to define the logic level of the SWR alarm at the AUX TTL connector.

Parameters:

<level> LOW | HIGH

*RST: HIGH

Example: `SENS1:SWR:SIGN:LEV HIGH`

[SENSe<Sensor>:]SWR:SIGNal[:VALue] <value>

This command controls the output of the SWR alarm.

Parameters:

<value> NONE | BEEPer | TTLSignal | BOTH

BEEPer
Generates an acoustic output.

TTLSignal
Outputs an electrical signal via rear-panel connector AUX TTL.

BOTH
Outputs an acoustic and electrical alarm.

NONE
No alarm is generated.

*RST: BEEPer

[SENSe<Sensor>:]SWR:THReshold <threshold>

Sets a threshold for the forward power, below which no automatic alarm is given even if the SWR limit value has been exceeded.

Parameters:

<threshold>	Range:	0.0 to 100.0e6
	*RST:	100.0e6
	Default unit:	W

[SENSe<Sensor>:]TYPE?

Shows the sensor type.

Usage: Query only

13.7 Configuring a Test Generator

If the sensor check source (R&S NRX-B1) is installed, a test generator to check the correct function and calibration of the sensors can be connected.

Further Information:

- Chapter 2.1.2, "Module Bay", on page 14

OUTPut:SOURce:STATe <state>
SOURce:OUTPut:STATe <state>

Requires sensor check source (R&S NRX-B1)

Activates the signal output.

Parameters:

<state> *RST: 0

SOURce:POWer[:VALue] <value>

Requires sensor check source (R&S NRX-B1)

Sets the output level.

Parameters:

<value> Range: 1.0e-7 to 0.1
*RST: 0.001
Default unit: W

SOURce:PULM:STATe <state>

Requires sensor check source (R&S NRX-B1)

Activates pulse modulation..

Parameters:

<state> *RST: 0

SOURce[:RF]:FREQuency[:VALue] <freq>

Requires sensor check source (R&S NRX-B1)

Sets the frequency.

Parameters:

<freq>	Range: 50.0e6 to 1.0e9 *RST: 50.0e6 Default unit: Hz

13.8 Configuring a Generator

The OUTPut system serves for generator configuration.

OUTPut:LIMit:FAIL <mode>

Specifies the value which should be applied to output 1 if the measured value causes a limit violation and the outout is in TTL mode (`OUTPut:MODE<output>` on page 301).

Parameters:

<mode>	LOW | HIGH **HIGH** Corresponds to an output voltage of 2.5 V, if a limit is violated. *RST: LOW

OUTPut:MODE<output> <mode>

Switches the operating mode of the I/O connector.

Connector 1 can be configured as analog output. Analog output may be a DA conversion of a measurement result or a signaling of a limit violation (0 V or 2.5 V).

Connector 2 can be configured as analog output or as trigger input.

Suffix:
<output> 1...2

Setting parameters:
<mode> OFF | RECorder | FRECorder | RRECorder | LIMit | FLIMit | RLIMit | TOUT | TIN

OFF
The connector is disabled.

FRECorder
The output voltage of the connector follows the forward power of the measurement.

RRECorder
The output voltage of the connector follows the reflection power of the measurement.

FLIMit
TTL mode of connector 1. Output is either 0 V or 2.5 V depending on the measured forward power and the setting of `OUTPut:LIMit:FAIL` on page 301 (connector 1 only).

RLIMit
TTL mode of connector 1. Output is either 0 V or 2.5 V depending on the measured reflection power and the setting of `OUTPut:LIMit:FAIL` on page 301 (connector 1 only).

TIN
Connector is configured as trigger input (connector 2 only).

*RST: OFF

Usage: Setting only

OUTPut:RECorder<output>:LIMit:LOWer:RATio[:VALue] <value>

Specifies the lower power limit of the characteristic for one of the two analog outputs if the associated calculate block returns a power ratio (unit `DB`, `DPCT` or `O`) as the measured value.

Unit:DB | DPCT | O

Suffix:
<output> 1...2

Parameters:
<value> Range: 1e-18 to 1e18
*RST: 1.0
Default unit: -

OUTPut:RECorder<output>:LIMit:LOWer[:POWer] <value>

Specifies the lower power limit of the characteristic for one of the two analog outputs if the associated calculate block returns a power as measured value.

Suffix:

<output>	1...2

Parameters:

<value>	Range:	1e-21 to 1e18
	*RST:	1e-6
	Default unit:	W

OUTPut:RECorder<output>:LIMit:UPPer:RATio[:VALue] <value>

Specifies the upper power limit of the characteristic for one of the two analog outputs if the associated calculate block returns a power ratio (unit `DB`, **DPCT** or `O`) as the measured value.

Unit:DB | DPCT | O

Suffix:

<output>	1...2

Parameters:

<value>	Range:	1e-18 to 1e18
	*RST:	10.0
	Default unit:	-

OUTPut:RECorder<output>:LIMit:UPPer[:POWer] <value>

Specifies the upper power limit of the characteristic for one of the two analog outputs if the associated calculate block returns a power as the measured value.

Suffix:

<output>	1...2

Parameters:

<value>	Range:	1e-21 to 1e18
	*RST:	1.0
	Default unit:	W

OUTPut:RECorder<output>:LIMit:LOWer:CCDF <value>

Specifies the lower limit of the characteristic for one of the two analog outputs. Below this limit, the output is set to 0 V.

Suffix:

<output>	1...2

Parameters:

<value> Range: -1e18 to 1e18
*RST: 0.0
Default unit: pct

OUTPut:RECorder<output>:LIMit:LOWer:RATio:RCOefficient <value>

Specifies the lower limit of the characteristic for one of the two analog outputs. Below this limit, the output is set to 0 V.

Suffix:

<output> 1...2

Parameters:

<value> Range: -1e18 to 1e18
*RST: 0.0
Default unit: -

OUTPut:RECorder<output>:LIMit:LOWer:RATio:RFRatio <value>

Specifies the lower limit of the characteristic for one of the two analog outputs. Below this limit, the output is set to 0 V.

Suffix:

<output> 1...2

Parameters:

<value> Range: -1e18 to 1e18
*RST: 0.0
Default unit: pct

OUTPut:RECorder<output>:LIMit:LOWer:RATio:RLOSs <value>

Specifies the lower limit of the characteristic for one of the two analog outputs. Below this limit, the output is set to 0 V.

Suffix:

<output> 1...2

Parameters:

<value> Range: -180.0 to 180.0
*RST: 0.0
Default unit: dB

OUTPut:RECorder<output>:LIMit:LOWer:RATio:SWR <value>

Specifies the lower limit of the characteristic for one of the two analog outputs. Below this limit, the output is set to 0 V.

Suffix:

<output> 1...2

Parameters:

<value>	Range: -1e18 to 1e18 *RST: 1.0 Default unit: -

OUTPut:RECorder<output>:LIMit:UPPer:CCDF <value>

Specifies the upper limit of the characteristic for one of the two analog outputs. Above this limit, the output is set to 2.5 V.

Suffix:

<output>	1...2

Parameters:

<value>	Range: -1e18 to 1e18 *RST: 1.0 Default unit: pct

OUTPut:RECorder<output>:LIMit:UPPer:RATio:RCOefficient <value>

Specifies the upper limit of the characteristic for one of the two analog outputs. Above this limit, the output is set to 2.5 V.

Suffix:

<output>	1...2

Parameters:

<value>	Range: -1e18 to 1e18 *RST: 1.0 Default unit: -

OUTPut:RECorder<output>:LIMit:UPPer:RATio:RFRatio <value>

Specifies the upper limit of the characteristic for one of the two analog outputs. Above this limit, the output is set to 2.5 V.

Suffix:

<output>	1...2

Parameters:

<value>	Range: -1e18 to 1e18 *RST: 100.0 Default unit: pct

OUTPut:RECorder<output>:LIMit:UPPer:RATio:RLOSs <value>

Specifies the upper limit of the characteristic for one of the two analog outputs. Above this limit, the output is set to 2.5 V.

Suffix:

<output>	1...2

Parameters:

<value> Range: -180.0 to 180.0
*RST: 10.0
Default unit: dB

OUTPut:RECorder<output>:LIMit:UPPer:RATio:SWR <value>

Specifies the upper limit of the characteristic for one of the two analog outputs. Above this limit, the output is set to 2.5 V.

Suffix:

<output> 1...2

Parameters:

<value> Range: -1e18 to 1e18
*RST: 10.0
Default unit: -

OUTPut:LIMit:FEED:INDex <index>

If the BNC output is set to limit monitoring (`OUTP:MODE LIM`), this command specifies the measurement to be monitored.

Parameters:

<index>

OUTPut:RECorder<output>:FEED:INDex <index>

If one of the two BNC connectors is configured as analog output (`OUTP:MODE REC`), this command specifies the measurement, whose results are output.

Suffix:

<output> 1...2

Parameters:

<index>

OUTPut:TRIGger:SOURce <source>

If the BNC output is configured as trigger output (`OUTP: MODE TOUT`), this command specifies the trigger source.

Parameters:

<source> SENS1 | SENS2 | SENS3 | SENS4 | EXTernal | CHKSource
*RST: EXTernal

13.9 Calibrating and Zeroing

Further Information:

- Chapter 10, "Zeroing Sensors", on page 99

CALibration<undef>:ALL:ZERO:AUTO <auto>
CALibration<Sensor>:ZERO:AUTO <auto>

Performs zeroing using the signal at the sensor input(s). The sensor(s) must be disconnected from all power sources.

While zero calibration is in progress, no queries or other setting commands are allowed, since the command is synchronous. Any communication attempt can run into a timeout.

Setting parameters:

<auto> **ONCE**
Only valid parameter for this command.
0
Return value if no calibration is in progress.

Usage: Setting only

CALibration<undef>:ALL:ZERO:FAST:AUTO <auto>
CALibration<Sensor>:ZERO:FAST:AUTO <auto>

Perform fast zeroing. However, the commands cannot be called unless the sensor(s) is(are) in the Trace mode. Since the commands are processed very quickly, they are not overlapping.

The queries therefore always return OFF.

Setting parameters:

<auto>

Usage: Setting only

CALibration<Sensor>:ZERO

This command causes zeroing to be carried out for the sensor connected to port <sensor>. No RF power shall be applied to the sensor during zeroing.

Zeroing must be completed before a new measurement can be started. The command `*WAI` allows to recognize the end of a zeroing procedure.

Example: `CAL2:ZERO`

Usage: Event

13.10 Running Selftests

Used for testing the connected power sensors and the R&S NRX.

Further information:

- Chapter 11.4, "Test", on page 122

TEST:SENSor<Sensor>?

Starts a selftest of the active power sensor. In contrast to `*TST?`, this command returns detailed information that you can use for troubleshooting.

The response is sensor-dependent. It always contains an identification string for the power sensor with the type name and the firmware version number. If an error has occurred, the response also contains the error message in plain text.

Usage: Query only

TEST:DEVice[:ALL] [<argument>]

With this command the tests for the keyboard, display and touch panel can be performed.

Parameters:

<argument> The tests can be performed as single tests or as combined test.

"SubSystemGui:KeyboardTest"
Starts the keyboard test on the front side of the device.

"SubSystemGui:DisplayTest"
Starts the display test for the device.

"SubSystemGui:TouchTest"
Starts the touch test for the device.

Example: Syntax for a combined test.

```
:TEST:DEV "SubSystemGui:
KeyboardTest;DisplayTest;TouchTest";*opc
```

TEST:DEVice:RESult?

Returns the results of tests for the keyboard, display and touch panel.

Usage: Query only

TEST:USB:STORage? [<argument>]

Checks the connected memory stick.

Query parameters:
<argument>

Usage: Query only

DIAGnostic:INFO:OTIMe?

Returns the count of the built-in elapsed-time meter. The count is always output in hours [h] and cannot be changed from outside.

Example: `DIAG:INFO:OTIM?`

Usage: Query only

13.11 Managing Data

The `MEMory` system is used to manage data and files, for example the frequency-dependent correction tables.

MMEMory:ALIases? {<alias>, <path>}...

Reads the current list of predefined path aliases to be used with the MMEM commands. In case there are no aliases defined, a single empty string is returned.

Return values:

<alias> The token to be used instead of a given path.

<path> The path that is expanded in MMEM commands for the associated alias definition.

Usage: Query only

MMEMory:ATTRibute <path_name>, <attributes>
MMEMory:ATTRibute? <path_name>

This instruction permits a setting and/or a resetting of file attributes.

The indication of path depends on Windows conventions for file names and can contain Wildcards.

Note: This commands is limited to files (does not function for listings).

Setting parameters:

<attributes> String, which contains the information for the setting/resetting of attributes.

+
Sets an attribute.
Permissible syntax of the string for the setting/deletion of attributes: For everyone of the attributes which can be treated must be placed in front his letter "+" for setting and/or "-" for deletion.

-
Deletes an attribute.

R
Attribute for write protected file.

A
Attribute for archiving file.

S
Attribute for system file.

H
Attribute for hid file.

*RST: -

Parameters for setting and query:

<path_name> Path indication

Return values:

<file_entry> Response string containing <file_name>,<attributes>

Example: `MMEM:ATTR 'D:\USER\DATA\*.LOG', '-R -A'`
Deletes the attribute for write protected file and the attribute for archiving file for all `*.LOG` files in the `D:\USER\DATA` directory.

Example: `MMEM:ATTR? 'D:\USER\DATA\*.*'`
Returns a list of all files and their attributes in the `D:\USER\DATA` directory.

MMEMory:CATalog? <path_name>[, <format>]

Returns the subdirectories and files in the specified directory. If no directory and no drive are specified, the subdirectories and files in the default directory on the default drive are returned.

Query parameters:
<path_name>

<format> ALL | WTIMe

Return values:
<used_memory> Response string: used bytes in this directory

<free_memory>

<file_entry> Response string: "<file_name>,<file_type>,<filesize_in_bytes>"

Example: `MMEM:CAT? '\\Server\DATA\*.LOG'`
Returns all files in the `\\Server\DATA` directory with the `*.LOG` extension.

Example: `MMEM:CAT? 'D:\user'`
Returns all files at the highest directory level of the memory stick.
`127145265,175325184, "test,DIR,0", "temp,DIR,0", "readme.txt,ASC,1324", "state.savracl,STAT,5327", "waveform.wv,BIN, 2342"`
Response: The `D:\user` directory contains the `test` and `temp` subdirectories as well as the `readme.txt`, `state.savrcl` and `waveform.wv` files which have different file types.

Usage: Query only

MMEMory:CATalog:LENGth? [<path_name>]

Returns the number of files in the specified directory. If no directory and no drive are specified, the number of files in the default directory on the default drive are returned.

Query parameters:
<path_name>

Return values:
<count>

Example: `MMEM:CAT:LENG? 'E:\'`
Returns the number of files at the highest directory level of the memory stick.
`1`
Response: There is 1 file at the highest directory level of the memory stick.

Usage: Query only

MMEMory:CDIRectory [<directory_name>]
MMEMory:CDIRectory? [<directory_name>]

Changes the default directory. This directory is used for all `MMEM` commands if no path is specified. It is also possible to change to a higher directory using two dots '..' .

Parameters:
<directory_name> *RST: D:\

Example: `MMEM:CDIR 'test'`
Changes from the current directory level to the `test` subdirectory.

MMEMory:COPY <file_source>[, <file_destination>]

Copies the specified file or directory (first parameter) to the specified destination (second parameter).

Setting parameters:
<file_source>

<file_destination> If the file destination not specified, <file_source> is copied to the default directory on the default drive.
Files with the same name that already exist in the destination directory are overwritten without an error message.

Example: `MMEM:COPY 'D:\user\test1.savrcl','E:'`
Copies the `test1.savrcl` file in the `user` directory on the `D:` drive to the memory stick without changing the file name.

Usage: Setting only

MMEMory:DATA <file_name>, <data>[, <append>]
MMEMory:DATA? <file_name>

Writes the <data> to the file identified by <file_name>. The IEC/IEEE bus terminator should be set to EOI in order to ensure correct data transfer.

The associated query transfers the specified file from the R&S NRX to the control computer. Make sure that the intermediate memory on the control computer is large enough to receive the file. In this case, the setting for the IEC/IEEE bus terminator is irrelevant.

This command can be used to read or transfer stored instrument settings or waveforms directly from/to the instrument.

Parameters:

<data> <block>

The binary data block has the following structure:
#234<block_data>

#
Always comes first in the binary block.

<number>
Indicates how many digits the subsequent length entry has (2 in example).

<number>
Indicates the number of subsequent bytes (34 in example).

<block data>
Block data for the specified length.

*RST: -

Setting parameters:

<append> APPend

Parameters for setting and query:

<file_name>

Example: `"MMEM:DATA 'TEST1.WV',#3767<block_data>"`
Writes the block data to the `test1.wv` file.
`MMEM:DATA? 'TEST1.WV'`
Sends the data of the `Test1.wv` file from the R&S NRX to the control computer in the form of a binary block.

MMEMory:DCATalog? [<path_name>]

Returns the subdirectories of the specified directory in a list. The subdirectory names are separated by commas. If no directory is specified, the default directory is read out.

Query parameters:

<path_name>

Return values:

<file_entry> Response string: subdirectory name

Example: `MMEM:DCAT?`
Returns the subdirectories of the default directory.
`'test', 'wave', 'digital'`
Response: The `test`, `wave` and `digital` subdirectories exist in the default directory.

Usage: Query only

MMEMory:DCATalog:LENGth? [<path_name>]

Returns the number of subdirectories in the specified directory. If no directory is specified, the default directory is read out.

Query parameters:
<path_name>

Return values:
<file_entry_count> Response string: number of subdirectories.

Example: `MMEM:DCAT:LENG`
Returns the number of subdirectories in the current directory.
`3`
Response: There are 3 subdirectories in the current directory.

Usage: Query only

MMEMory:DELete <file_name>

Deletes the specified file.

Setting parameters:
<file_name>

Example: `MMEM:DEL 'D:\user\test1.savrcl'`
Deletes the `test1.savrcl` file in the `user` directory on the internal hard disk.

Usage: Setting only

MMEMory:DRIVes?

Returns a list of the logical drive assembly designators.

Return values:
<drive>

Example:
```
MMEM:DRIVes?
"A:\", "C:\", "D:\", "E:\", "H:\", "I:\", "J:
\", "K:\", "M:\", "N:\", "O:\", "P:\", "Q:
\", "S:\", "T:\", "U:\", "V:\", "W:\", "X:
\", "Y:\", "Z:\"
```
Response: List of the drive assemblies.

Usage: Query only

MMEMory:LOAD:ITEM <item_path>, <file_name>

Loads a specific part of a system application. This is also called a partial recall.

Setting parameters:
<item_path>

<file_name>

Usage: Setting only

MMEMory:LOAD:MACRo <label>, <file_name>[, <msus>]

Loads a remote macro from file.

Setting parameters:
<label>

<file_name>

<msus>

Usage: Setting only

MMEMory:LOAD:STATe <memory_number>, <file_name>[, <msus>]

Loads the instrument settings from a file into one of the intermediate memories, or recalls the instrument settings directly from a file.

Setting parameters:

<memory_number> Number of the intermediate memory
0: Recalls the instrument settings directly from the file.
≠ 0: Loads the instrument settings into this intermediate memory.
To recall the instrument settings, use `*RCL`.

<file_name> Path and filename including the extension. If the path is omitted, the current directory is used.

<msus>

Example: `MMEM:LOAD:STAT 4,'D:\data\test4.savrcl'`
Loads the instrument settings from the `test4.savrcl` file into the intermediate memory 4.

Usage: Setting only

MMEMory:MDIRectory <directory_name>

Creates a new subdirectory or a directory tree in the specified directory. If no directory is specified, the subdirectory/directory tree is created in the default directory.

Setting parameters:
<directory_name>

Example: `MMEM:MDIR 'carrier'`
Creates the `carrier` subdirectory in the default directory.

Usage: Setting only

MMEMory:MOVE <file_source>, <file_destination>

If no path is specified for <file_destination>, renames <file_source>.

If a path is specified for <file_destination>, moves <file_source> to the specified path and stores it under its original file name or, if specified, under a new file name.

Setting parameters:

<file_source> File that is moved and/or renamed.

<file_destination> File destination and, if you want to rename the file, new file name.

Example: `MMEM:MOVE 'test1.savrcl','keep1.savrcl'`
Renames the `test1.savrcls` file as `keep1.savrcl`.
`MMEM:MOVE 'test1.savrcl','\test\keep1.savrcl'`
Moves the `test1.savrcls` file to the `test` subdirectory and stores it there under the name `keep1.savrcl`.

Usage: Setting only

MMEMory:MSIS [<msus>]

Sets the drive or network resource in the case of networks (MSIS = mass storage identification string). This setting is effective for all `MMEMory` commands where the drive is not explicitly specified.

Parameters:

<msus> *RST: D:\

Example: `MMEM:MSIS 'E:'`
Selects the memory stick as the default drive.

MMEMory:RCL <file_name>[, <msus>]

Recalls the instrument settings from the specified file.

Alternative to `*RCL` or `MMEMory:STORe:STATe`.

Setting parameters:

<file_name> Path and filename including the extension. If the path is omitted, the current directory is used.

<msus>

Usage: Setting only

MMEMory:SAV <file_name>[, <msus>]

Saves the current instrument settings in the specified file.

Alternative to `*SAV` or `MMEMory:LOAD:STATe`.

Setting parameters:

<file_name> Path and filename including the extension. If the path is omitted, the current directory is used.

<msus>

Usage: Setting only

MMEMory:RDIRectory <directory_name>

Deletes the specified subdirectory in the specified directory. If no directory is specified, the specified subdirectory is deleted in the default directory.

Setting parameters:

<directory_name>

Example: `MMEM:RDIR 'carrier'`

Deletes the `carrier` subdirectory in the default directory.

Usage: Setting only

MMEMory:STORe:ITEM <item_name>, <file_name>

Implements the partial save of specific application data.

Setting parameters:

<item_name>

<file_name>

Usage: Setting only

MMEMory:STORe:MACRo <label>, <file_name>[, <msus>]

Store remote macro definition to file.

Setting parameters:

<label>

<file_name>

<msus>

Usage: Setting only

MMEMory:STORe:STATe <memory_number>, <file_name>[, <msus>]

Saves the instrument settings from one of the intermediate memories in a file, or saves the current instrument settings directly in a file.

Setting parameters:

<memory_number> Number of the intermediate memory
0: Saves the current instrument settings directly in a file.

≠ 0: Saves the instrument settings from this intermediate memory.
To save the current instrument settings in one of the intermediate memories, use *SAV.

<file_name> Path and filename including the extension. If the path is omitted, the current directory is used.

<msus>

Example:
```
MMEM:STOR:STAT 4,'D:\data\test4.savrcl'
*SAV 4
```
Saves the instrument settings from intermediate memory 4 in the `test4.savrcl` file.

Usage: Setting only

13.12 Configuring the System

The SYSTem subsystem contains a series of commands for general functions that do not directly affect the measurement.

Further Information:

- Chapter 11, "System Settings", on page 101

SYSTem:COMMunicate:GPIB[:SELF]:ADDRess <address>

Sets the address with which the R&S NRX can be addressed via the IEC/IEEE bus. The address is factory-set to 12 and is not changed by a reset.

Parameters:

<address> int_value

Range: 1 to 30
*RST: 12

Manual operation: See "GPIB Address" on page 106

SYSTem:COMMunicate:INET[:SELF]:MODE <state>
SYSTem:COMMunicate:NETWork[:IPADdress]:MODE <mode>

Selects if the IP address is assigned automatically or manually.

Parameters:

<mode> AUTO | STATic

AUTO
Assigns the IP address automatically, provided the network supports DHCP.

STATic
Enables assigning the IP address manually.

*RST: AUTO

Example: `:SYST:COMM:NETW:IPAD:MODE AUTO`
The IP address is assigned automatically.

Manual operation: See "Address Mode" on page 103

SYSTem:COMMunicate:INET[:SELF]:ADDRess <IPaddress>
SYSTem:COMMunicate:NETWork[:IPADdress][:ADDRess] <IPaddress>

Sets the IP address of the R&S NRX if the address mode is set to `STATic`.

Note: Choosing an invalid IP-Address may disturb the traffic on your LAN. If you are not sure how to configure these settings, please ask your network administrator.

Parameters:

<IPaddress> The four parameter form the IP address x.y.z.a.

Range: 0...255 for each part of the IP address
*RST: This setting is not changed by *RST.

Example: `SYSTem:COMMunicate:NETWork:IPADress:ADDRess 108.0.0.255`
Sets the IP address to 104.0.0.255

Manual operation: See "IPv4 Address" on page 104

SYSTem:COMMunicate:INET[:SELF]:GATeway:ADDRess <Gateway>
SYSTem:COMMunicate:NETWork[:IPADdress]:GATeway <Gateway>

Sets the IP address of the default gateway, if the address mode is set to `STATic`.

Note: Choosing an invalid IP-Address may disturb the traffic on your LAN. If you are not sure how to configure these settings, please ask your network administrator.

Parameters:

<Gateway> The four parameter form the IP address x.y.z.a.

Range: 0 to 255
*RST: This setting is not changed by *RST.

Example: `SYSTem:COMMunicate:NETWork:IPADdress:GATeway '192.168.10.254'`
Sets the IP address of the default gateway to `192.168.10.254`.

Manual operation: See "Default Gateway" on page 104

SYSTem:COMMunicate:INET[:SELF]:SUBNetmask:ADDRess <Mask>
SYSTem:COMMunicate:NETWork[:IPADdress]:SUBNet:MASK <Mask>

Sets the subnet mask, if the address mode is set to `STATic`.

Note: Choosing an invalid IP-Address may disturb the traffic on your LAN. If you are not sure how to configure these settings, please ask your network administrator.

Parameters:

<Mask> The four parameter form the IP address x.y.z.a.

Range: 0 to 255
*RST: This setting is not changed by *RST.

Example: `SYSTem:COMMunicate:NETWork:IPADdress:SUBNet:MASK '255.255.255.0'`
Sets the subnet mask IP address to 255.255.255.0.

Manual operation: See "Subnet Mask" on page 104

SYSTem:COMMunicate:INET[:SELF]:DNS:ADDRess <server>
SYSTem:COMMunicate:NETWork[:IPADdress]:DNS <server>

Sets the IP address of the network DNS server if the address mode is set to `STATic`.

Parameters:

<server> The four parameter form the IP address x.y.z.a.

Range: o to 255
*RST: This setting is not changed by *RST.

Example: `SYST:COMM:NETW:IPAD:DNS 123.456.0.1`
Sets the IP address of the DNS server to 123.456.0.1.

Manual operation: See "DNS Server" on page 104

SYSTem:COMMunicate:INET[:SELF]:DNS:SUFFix <Domain>
SYSTem:COMMunicate:NETWork[:COMMon]:DOMain <Domain>

Sets the primary DNS (Domain Name System) suffix, that means the DNS name without the hostname part. The DNS system uses the suffix for registration and name resolution for unique identification of the instrument in the entire network.

Parameters:
<Domain>

Example: `SYSTem:COMMunicate:NETWork:COMMon:DOMain ABC.DE`
Sets the domain of the network to ABC.DE.

Manual operation: See "DNS Suffix" on page 104

SYSTem:COMMunicate:NETWork[:COMMon]:HOSTname <Hostname>

Sets the individual hostname of the R&S NRX.

In a LAN that uses a DNS server (domain name system server), you can access each connected instrument using a unique hostname instead of its IP address. The DNS server translates the hostname to the IP address. Using a hostname is especially useful if a DHCP server is used, as a new IP address can be assigned each time the instrument is restarted.

The R&S NRX performs the change of the hostname immediately after the command is sent. For this purpose, the sensor restarts its connection to the network, which can take several seconds. During this time, you cannot address the sensor. After the restart, you can only address the sensor using the newly set hostname.

Note: It is recommended that you do not change the default hostname to avoid problems with the network connection. However, if you change the hostname, be sure to use a unique name.

Parameters:
<Hostname>

Example: `SYST:COMM:NETW:COMM:HOST 'power_meter_2'`
Sets *power_meter_2* as new hostname.

Manual operation: See "Host Name" on page 102

SYSTem:COMMunicate:NETWork:RESTart

Restarts the network connection to the instrument, i.e. terminates the connection and sets it up again.

Usage: Event

SYSTem:COMMunicate:NETWork:STATus?

Queries the network configuration state.

Example: `SYSTem:COMMunicate:NETWork:STATus?`
`Response: UP`
The network is active.

Usage: Query only

SYSTem:COMMunicate:NETWork:MACaddress?

Queries the MAC address of the network adapter.

Parameters:

<MacAddress> string

Usage: Query only

SYSTem:DATE <year>, <month>, <day>

Sets the date for the instrument-internal calendar in coordinated universal time (UTC).

This parameter is protected, in order to prevent accidental changes.

Parameters:

<year> YYYY

<month> Range: 1 to 12

DD Range: 1 to 31

Manual operation: See "Date" on page 114

SYSTem:DATE:LOCal <year>, <month>, <day>

Sets the local date.

Parameters:

<year> YYYY

<month> Range: 1 to 12

<day> Range: 1 to 31

SYSTem:DATE:UTC <year>, <month>, <day>

Sets the date in the coordinated universal time (UTC).

Parameters:

<year> YYYY

<month> Range: 1 to 12

<day> Range: 1 to 31

SYSTem:DEVice:ID?

Queries the Rohde & Schwarz device ID.

Return values:
<DeviceID>

Usage: Query only

SYSTem:DFPRint [<Path>]

Generate device footprint.

Setting parameters:
<Path>

Return values:
<XMLDeviceFootprint><dblock>

SYSTem:DFPRint:HISTory:COUNt?

Request the number of device footprints in history.

Return values:
<Count>

Usage: Query only

SYSTem:DFPRint:HISTory:ENTRy? <index>

Return a device footprint from the history. Index "0" returns the most recent one.

Query parameters:
<index>

Return values:
<XmlDeviceFootprint><dblock>

Usage: Query only

SYSTem:DID?

Get R&S device ID.

Return values:
<DeviceID>

Usage: Query only

SYSTem:INFO[:INFO]? [<argument>]

Returns information about the system.

If queried without parameters, the command returns all available information in the form of a list of strings separated by commas.

If you want to query specific information, add the query parameter:

```
SYST:INFO? "<string>"
```

Query parameters:

<argument> 'Manufacturer', 'Type', 'Stock Number', 'Serial', 'SW Build', 'MAC Address', 'Hostname', 'IP Address', 'Domain', 'Subnetmask', 'Gateway', 'Mode', 'Status', 'Sensor Name', 'Technology', 'Function', 'MinPower', 'MaxPower', 'MinFreq', 'MaxFreq', 'Impedance', 'Coupling', 'Uptime', 'Cal. Misc.', 'Cal. Abs.', 'Cal. Refl.', 'Cal. Temp.', ' Cal. Lin.', 'Cal. S-Para.', 'Cal. S-Para. (User)', 'SPD Mnemonic', 'Cal. Due Date', 'Certificate No', 'Limit', 'TestLimit', 'TestLimit pd'

Usage: Query only

SYSTem:LANGuage <language>

Sets an emulation of a remote command set of the predecessors or other power meters.

Parameters:

<language> character_data

NRP | NRP2 | HP436A | HP437B | HP438A | E4418B | E4419B | N1911A | N1912A

Manual operation: See "Language" on page 107

SYSTem:IDN:MODE <mode>

Selects if the automatically created instrument identification string is used or a user-defined option string can be created and used.

Parameters:

<mode> AUTO | USER

AUTO
The automatically instrument identification string is used.

USER
The user-defined instrument identification string is used. The user-defined instrument identification string is defined with command `SYSTem:IDN:ANSWer` on page 326.

*RST: AUTO

Manual operation: See "Customization of *IDN?" on page 107

SYSTem:IDN:ANSWer <string>

Defines the return value for the `*IDN` query. The maximum string length is 128 characters.

Parameters:

<string> The string entered is returned with query `*IDN?`.

Example:
`SYST:IDN:MODE USER`
Selects user-defined identification
`SYST:IDN:ANSW "Test Device"`
Defines the identification string 'Test Device'
`*IDN?`
Response: `'Test Device'`

Manual operation: See "Custom IDN String" on page 108

SYSTem:IDN:AUTO <state>

Activates/deactivates the return of a user-defined string for the `*IDN` query.

Parameters:

<status> ON | OFF

*RST: 1

SYSTem:OPT:MODE <mode>

Selects if the automatically created option identification string is used or a user-defined option string can be created and used.

Parameters:

<mode> AUTO | USER

AUTO
The automatically option identification string is used.

USER
The user-defined option string is used. The user-defined option string is defined with command `SYSTem:OPT:ANSWer` on page 326.

*RST: AUTO

Manual operation: See "Customization of *OPT?" on page 107

SYSTem:OPT:ANSWer <string>

Defines the return value for the `*OPT` query. The maximum string length is 128 characters.

Parameters:

<string> The string entered is returned with query `*OPT?`.

Example: `SYST:OPT:MODE USER`
Selects user-defined identification
`SYST:OPT:ANSW "Test Option"`
Defines the option string 'Test Option'
`*OPT?`
Response: `'Test Option'`

Manual operation: See "Custom OPT String" on page 108

SYSTem:OPT:AUTO <state>

Activates/deactivates the return of a user-defined string for the `*OPT` query.

Parameters:
<status> ON | OFF
*RST: 1

SYSTem:RESet [<ApplnameAndLinumber>]
SYSTem:PRESet <preset>

Sets the R&S NRX to a defined initial state.

This command corresponds to the `*RST` command.

Usage: Event

Manual operation: See "Preset" on page 98

SYSTem:RESet:ALL
SYSTem:PRESet:ALL

Sets the R&S NRX and the connected R&S power sensors to a defined initial state.

Usage: Event

SYSTem:RESet:BASE
SYSTem:PRESet:BASE

Sets the R&S NRX to a defined initial state.

Usage: Event

SYSTem:REBoot

Reboots the R&S NRX.

Usage: Event

SYSTem:ERRor:ALL?

Queries all unread entries in the error/event queue and removes them from the queue. The response is a comma-separated list of error numbers and a short description of the error in the first in first out order.

Positive error numbers are instrument-dependent. Negative error numbers are reserved by the SCPI standard.

Return values:
<ErrorNumber>

<ErrorText>

Usage: Query only

SYSTem:ERRor:CODE:ALL?

Queries all unread entries in the error/event queue and removes them from the queue. Only the error numbers are returned and not the entire error text.

Return values:
<ErrorCode>

Example: `SYSTem:ERRor:CODE:ALL?`
Queries all entries in the error queue.
`Response: 0`
No errors have occurred since the error queue was last read out.

Usage: Query only

SYSTem:ERRor:CODE[:NEXT]?

Queries the oldest entry in the error queue and then deletes it. Only the error number is returned and not the entire error text.

Return values:
<Error>

Example: `SYSTem:ERRor:CODE`
Queries the oldest entry in the error queue.
`Response: 0`
No errors have occurred since the error queue was last read out.

Usage: Query only

SYSTem:ERRor:COUNt?

Queries the number of entries in the error queue.

Return values:
<ErrorCount>

Example: `SYSTem:ERRor:COUNt`
Queries the number of entries in the error queue.
`Response: 1`
One error has occurred since the error queue was last read out.

Usage: Query only

SYSTem:ERRor[:NEXT]?

Queries the error/event queue for the oldest item and removes it from the queue. The response consists of an error number and a short description of the error.

Positive error numbers are instrument-dependent. Negative error numbers are reserved by the SCPI standard.

Return values:
<ErrorCode>

<ErrorDescription>

Example: `SYSTem:ERRor?`
Queries the oldest entry in the error queue.
`Response: 0, 'no error'`
No errors have occurred since the error queue was last read out.

Usage: Query only

SYSTem:SERRor:LIST:NEXT?

Queries the list of all static errors that have occurred but have already been resolved for the oldest entry and removes it from the queue. The response consists of an error number and a short description of the error.

Example: `SYST:SERR:LIST?`
Query
```
0,"reported at uptime:2942;
notice; auto-averaging exceeded maximum
time; Notification"
```
Response

Usage: Query only

SYSTem:HCOPy [<filename>]

Triggers a screenshot (hardcopy) of the current display. If a filename is given, this is used as a target file. Otherwise an internal name is generated which can be read by the query function.

The hardcopy is saved to the root directory of the first detected USB stick. If no USB stick is connected, the hardcopy is saved to the volatile directory of the ftp directory.

Parameters:
<filename>

Manual operation: See "Screenshot" on page 15

SYSTem:INFO:TERMchar <termination>

Selects the termination character(s) for returned information.

Parameters:

<termination> CR | LF | CRLF | STRS

*RST: STRS

SYSTem:VERSion?

Queries the SCPI version that the command set of the sensor complies with.

Example: `SYST:VERS?`
Query
`1999.0`
Response: SCPI version from 1999.

Usage: Query only

SYSTem:FWUPdate <fwudata>

This command is used to load new operating firmware into the device.
Rohde & Schwarz provides new firmware in form of `*.rsu` files. An `*.rsu` file often can be downloaded from the Rohde & Schwarz web sites or can be supplied by the customer support or the product marketing. The `*.rsu` file is usually packed in a `*zip` archive that must be extracted before.

If you want to integrate a firmware update function in their own application, use the `SYSTem:FWUPdate` command. The parameter of this command is a "Definite Length Arbitrary Block Data" containing the direct copy of the binary `*.rsu` file.

A "Definite Length Datablock" has a well-defined format. It consists of:

- A '#' sign.
- A single digit indicating the length of the number which represents the size of the binary file.
- The binary data.
- An appended delimiter (LF, 0x0a).

Example:

Lets assume that this file has a size of 10242884 bytes.

To send the file to the sensor for updating the firmware, your application has to assemble a memory block containing:

- The command.
- The "Definite Length Block" header.
- The contents of the `*.rsu` file.
- A trailing delimiter (0x0a = Linefeed.

First, have a look at the size of the binary data; it is 10242884 in this case. This number has 8 digits. Now you have all the information to assemble everything:

- The `SYST:FWUP` command
- A blank as a separator
- The '#' sign
- The '8' for the length of the file size
- The '10242884' specifying the size of the file
- .... (the contents of the `*.rsu` file).....
- 0x0a as a delimiter

In this example, you would write exactly 10242905 bytes to the sensor (for example via a 'viWrite()' function).

The result sums up from the values of the above list to:

9 + 1 + 1 + 1 + 8 + 10242884 + 1= 10242905

In a (pseudo) string notation, it is:

```
SYST:FWUP #810242884.........(file content)........ <LF> ,
```

Where `<LF>` is a single 0x0a character and `........(file content)........` is the direct byte-by-byte contents of the `*.rsu` file.

Setting parameters:

<fwudata> <block_data>

Usage: Setting only

SYSTem:FWUPdate:STATus?

Reads the result of the firmware update.

While a firmware update is in progress, the LED of the sensor flashes in bright white color. When the firmware update is completed, you can read the result.

The result of the query is a readable string.

Example: `SYST:FWUP:STAT?`
Query
`"Success"`
Response

Usage: Query only

SYSTem:HELP:HEADers? [<Item>]

Returns a list of all SCPI commands supported by the sensor.

Query parameters:

<Item> <block_data>

Usage: Query only

SYSTem:HELP:SYNTax? [<Item>]

Returns the relevant parameter information for the specified SCPI.

Query parameters:
<Item>

Example: `SYSTem:HELP:SYNTax? 'sens:aver:coun'`

Usage: Query only

SYSTem:HELP:SYNTax:ALL?

Queries the implemented SCPI commands and their parameters. Returns the result as a block data.

Return values:
<Syntax> <dblock>

Usage: Query only

SYSTem:KLOCk <klock>

Disables or enables the front panel keyboard of the instrument including the [LOCAL] key.

Parameters:
<klock> OFF | ON

SYSTem:LOCK:NAME?

Returns the name of the interface over which the query was made.

Return values:
<name>

Usage: Query only

SYSTem:LOCK:NAME:DETailed?

Returns the detailed name of the interface over which the query was made.

Return values:
<name>

Usage: Query only

SYSTem:LOCK:OWNer?

Returns the current owner(s) of the locking. In case of shared locking, each interface is listed only once. If there is additionally an exclusive lock, only the owner of this exclusive lock is returned.

Return values:
<owner>

Usage: Query only

SYSTem:LOCK:OWNer:DETailed?

Returns the current owner(s) of the locking, including all locking details. In case of shared locking, each interface is listed only once. If there is additionally an exclusive lock, only the owner of the exclusive lock is returned.

Return values:
<owner>

Usage: Query only

SYSTem:LOCK:RELease

Releases a locking if the caling client is the owner of the locking. If no locking is active or the calling client ist not the owner of the locking, nothing happpens.

In case of an active shared locking, the device is locked until all members of the shared locking group have released the locking.

Usage: Event

SYSTem:LOCK:RELease:ALL

Releases all locking of the calling client.

Usage: Event

SYSTem:LOCK:REQuest:SHARed? <lock_string>[, <timeout>]

This query tries to initiate a shared locking. A lock string must be specified. If successful, the actual lock string of this locking group is returned, otherwise 0.

Query parameters:
<lock_string>

<timeout>

Return values:
<result>

Usage: Query only

SYSTem:LOCK:REQuest[:EXCLusive]? [<timeout>]

This query attempts to initiate an exclusive locking. If successful, 1 is returned, otherwise 0.

Optionally, a timeout in milliseconds can be specified, specifying the maximum time to wait for the device to become free if a locking is already active.

The owner of an exclusive locking can call `SYST:LOCK:REQ?` even if an exclusive lock already exists. However, `SYST:LOCK:REL` must be called just as often until the device is released again.

Query parameters:
<timeout>

Return values:
<result>

Usage: Query only

SYSTem:LOCK:SHARed:STRing?

Returns the lock string assigned to the locking group when shared locking is active. If no shared locking was previously initiated, an error is written to the error queue.

Return values:
<result>

Usage: Query only

SYSTem:LOCK:TIMeout <timeout>

Sets the maximum time in milliseconds to wait when processing a command if the device is locked and the sender of the command is not the owner of the lock before the command is discarded and an error is written to the error queue.

Setting parameters:
<timeout>

Return values:
<result>

SYSTem:SERRor[:ALL]?

Queries the (next) error from the list of static errors.

Usage: Query only

SYSTem:SERRor:REMove <num>

Removes an entry from the list of static errors. The entry is identified by a unique sequence number <num>.

Setting parameters:
<num> *RST: 0

Usage: Setting only

SYSTem:SERRor:LIST:ALL?

Queries the list of all static errors that have occurred so far. The list is persistent. Entries can be removed by `SYSTem:SERRor:REMove <n>`.

Usage: Query only

SYSTem:SHUTdown

Shuts down the instrument.

Usage: Event

SYSTem:SPEed <mode>

The data processing speed of the R&S NRX can be increased when `FAST` is selected. The display is switched off and the measured values are no longer displayed since the continuous update of the screen content requires computation time.

Parameters:

<mode> NORMal | FAST

*RST: NORMal

SYSTem:TIME <hour>, <min>, <sec>

Sets the time for the instrument-internal calendar.

Parameters:

<hour> hh

<min> mm

<sec> ss

Manual operation: See "Time" on page 114

SYSTem:TIME:LOCal <hour>, <minute>, <second>

Sets the local time.

Parameters:

<hour> hh

<minute> mm

<second> ss

SYSTem:TIME:UTC <hour>, <minute>, <second>

Sets the time in the coordinated universal time (UTC).

Parameters:

<hour> hh

<minute>	mm
<second>	ss

SYSTem:TIME:DSTime:MODE <dst>

Configures whether the operating system automatically adjusts its clock for daylight saving time (DST) or not.

The rules defining when exactly the clock must be adjusted by which offset depend on the configured time zone, see `SYSTem:TIME:DSTime:RULE` on page 336.

If the automatism is disabled, the local time is calculated as:

Local time = *UTC* + *time zone offset* (no DST offset)

Parameters:

<dst>

1
Automatism enabled.

0
Automatism disabled.

Example: `SYSTem:TIME:DSTime:MODE 1`
The clock is automatically adjusted.

SYSTem:TIME:DSTime:RULE <rule>

Sets the timezone. You can query the list of the available timezones with `SYSTem:TIME:DSTime:RULE:CATalog?` on page 336.

Parameters:

<rule>

Manual operation: See "Time Zone" on page 114

SYSTem:TIME:DSTime:RULE:CATalog?

Querys the list of available time zones.

Return values:

<cat>

Usage: Query only

Manual operation: See "Time Zone" on page 114

SYSTem:TIME:HRTimer:ABSolute <duration>

Start a timer relative to an absolutely set start time.

Setting parameters:

<duration>

Usage: Setting only
Asynchronous command

SYSTem:TIME:HRTimer:ABSolute:SET

Define the start time for an absolute timer.

Return values:
<year>

<month>

<day>

<hour>

<min>

<sec>

<msec>

SYSTem:TIME:HRTimer:RELative <duration>

Start a timer expiring after a given duration from the command's execution time.

Setting parameters:
<duration>

Usage: Setting only
Asynchronous command

SYSTem:TZONe <hour>, <minute>

Specifies the offset of the local time to the UTC time, due to the time zone. There can be an additional offset due to daylight saving time (DST).

Changing the time zone (offset) does not affect an eventual DST offset and the time zone configured via `SYSTem:TIME:DSTime:RULE` on page 336.

The local time is calculated as: *local time = UTC + time zone offset + DST offset*.

Parameters:

<hour>	Range:	-12 to 15
<minute>	Range:	-59 to 59

Manual operation: See "Time Zone Region" on page 114

13.13 Using the Status Register

13.13.1 General Status Register Commands

STATus:PRESet

Resets the edge detectors and `ENABle` parts of all registers to a defined value.

Usage: Event

STATus:QUEue[:NEXT]?

Queries the most recent error queue entry and deletes it.

Positive error numbers indicate sensor specific errors, negative error numbers are error messages defined by SCPI.

If the error queue is empty, the error number 0, "No error", is returned.

Return values:
<ErrorCode>

<ErrorDescription>

Usage: Query only

13.13.2 Reading Out the CONDition Part

STATus:DEVice:CONDition?
STATus:OPERation:BIT<bitno>:CONDition?
STATus:OPERation:CALibrating:CONDition?
STATus:OPERation:CONDition?
STATus:OPERation:LLFail<RegisterIndex>:CONDition?
STATus:OPERation:MEASuring:CONDition?
STATus:OPERation:MEASuring:EXTension<RegisterIndex>:CONDition?
STATus:OPERation:SENSe:CONDition?
STATus:OPERation:TRIGger:CONDition?
STATus:OPERation:TRIGger:EXTension<RegisterIndex>:CONDition?
STATus:OPERation:ULFail<RegisterIndex>:CONDition?

STATus:QUEStionable:BIT<bitno>:CONDition?
STATus:QUEStionable:CALibration:CONDition?
STATus:QUEStionable:CONDition?
STATus:QUEStionable:MEASure<RegisterIndex>:CONDition?
STATus:QUEStionable:POWer:CONDition?
STATus:QUEStionable:WINDow<RegisterIndex>:CONDition?

Suffix:

<RegisterIndex> 1..8

Usage: Query only

13.13.3 Reading Out the EVENt Part

STATus:DEVice[:EVENt]?
STATus:OPERation[:EVENt]?
STATus:OPERation:BIT<bitno>[:EVENt]?
STATus:OPERation:CALibrating[:SUMMary][:EVENt]?
STATus:OPERation:LLFail<RegisterIndex>[:SUMMary][:EVENt]?
STATus:OPERation:MEASuring[:SUMMary][:EVENt]?
STATus:OPERation:MEASuring:EXTension<RegisterIndex>[:SUMMary][:EVENt]?
STATus:OPERation:SENSe[:SUMMary][:EVENt]?
STATus:OPERation:TRIGger[:SUMMary][:EVENt]?
STATus:OPERation:TRIGger:EXTension<RegisterIndex>[:SUMMary][:EVENt]?
STATus:OPERation:ULFail<RegisterIndex>[:SUMMary][:EVENt]?
STATus:QUEStionable[:EVENt]?
STATus:QUEStionable:BIT<bitno>[:EVENt]?
STATus:QUEStionable:CALibration[:SUMMary][:EVENt]?
STATus:QUEStionable:MEASure<RegisterIndex>[:SUMMary][:EVENt]?
STATus:QUEStionable:POWer[:SUMMary][:EVENt]?
STATus:QUEStionable:WINDow<RegisterIndex>[:SUMMary][:EVENt]?

Suffix:

<RegisterIndex> 1..8

Usage: Query only

13.13.4 Controlling the ENABle Part

STATus:DEVice:ENABle <value>
STATus:OPERation:BIT<bitno>:ENABle <RegisterBit>
STATus:OPERation:CALibrating:ENABle <value>
STATus:OPERation:ENABle <RegisterValue>
STATus:OPERation:LLFail<RegisterIndex>:ENABle <value>
STATus:OPERation:MEASuring:ENABle <value>
STATus:OPERation:MEASuring:EXTension<RegisterIndex>:ENABle <value>
STATus:OPERation:SENSe:ENABle <value>
STATus:OPERation:TRIGger:ENABle <value>
STATus:OPERation:TRIGger:EXTension<RegisterIndex>:ENABle <value>
STATus:OPERation:ULFail<RegisterIndex>:ENABle <value>

STATus:QUEStionable:BIT<bitno>:ENABle <RegisterBit>
STATus:QUEStionable:CALibration:ENABle <value>
STATus:QUEStionable:ENABle <RegisterValue>
STATus:QUEStionable:MEASure<RegisterIndex>:ENABle <value>
STATus:QUEStionable:POWer:ENABle <value>
STATus:QUEStionable:WINDow<RegisterIndex>:ENABle <value>

Suffix:
<RegisterIndex> 1..8

Parameters:
<value> *RST: 0

13.13.5 Controlling the Negative Transition Part

STATus:DEVice:NTRansition <value>
STATus:OPERation:BIT<bitno>:NTRansition <RegisterBit>
STATus:OPERation:CALibrating:NTRansition <value>
STATus:OPERation:LLFail<RegisterIndex>:NTRansition <value>
STATus:OPERation:MEASuring:NTRansition <value>
STATus:OPERation:MEASuring:EXTension<RegisterIndex>:NTRansition <value>
STATus:OPERation:NTRansition <RegisterValue>
STATus:OPERation:SENSe:NTRansition <value>
STATus:OPERation:TRIGger:NTRansition <value>
STATus:OPERation:TRIGger:EXTension<RegisterIndex>:NTRansition <value>
STATus:OPERation:ULFail<RegisterIndex>:NTRansition <value>
STATus:QUEStionable:BIT<bitno>:NTRansition <RegisterBit>
STATus:QUEStionable:CALibration:NTRansition <value>
STATus:QUEStionable:NTRansition <RegisterValue>
STATus:QUEStionable:MEASure<RegisterIndex>:NTRansition <value>
STATus:QUEStionable:POWer:NTRansition <value>
STATus:QUEStionable:WINDow<RegisterIndex>:NTRansition <value>

Suffix:
<RegisterIndex> 1..8

Parameters:
<value> *RST: 0

13.13.6 Controlling the Positive Transition Part

STATus:DEVice:PTRansition <value>
STATus:OPERation:BIT<bitno>:PTRansition <RegisterBit>
STATus:OPERation:CALibrating:PTRansition <value>
STATus:OPERation:LLFail<RegisterIndex>:PTRansition <value>
STATus:OPERation:MEASuring:PTRansition <value>
STATus:OPERation:PTRansition <RegisterValue>
STATus:OPERation:MEASuring:EXTension<RegisterIndex>:PTRansition <value>
STATus:OPERation:SENSe:PTRansition <value>
STATus:OPERation:TRIGger:PTRansition <value>

STATus:OPERation:TRIGger:EXTension<RegisterIndex>:PTRansition <value>
STATus:OPERation:ULFail<RegisterIndex>:PTRansition <value>
STATus:QUEStionable:BIT<bitno>:PTRansition <RegisterBit>
STATus:QUEStionable:CALibration:PTRansition <value>
STATus:QUEStionable:MEASure<RegisterIndex>:PTRansition <value>
STATus:QUEStionable:POWer:PTRansition <value>
STATus:QUEStionable:PTRansition <RegisterValue>
STATus:QUEStionable:WINDow<RegisterIndex>:PTRansition <value>

Suffix:

<RegisterIndex>	1..8

Parameters:

<value>	*RST:	65535

14 Remote Control Basics

14.1 Remote Control Interfaces and Protocols

For remote control, communication between the R&S NRX and the controlling host is established based on the following interfaces and protocols.

Table 14-1: Supported interfaces and protocols

Interface	Protocol	VISA*) address string	Library	Further information
USB	USBTMC	USB::<vendor ID>::<product ID>:: <serial number>[::INSTR]	VISA	Chapter 14.1.1, "USB Interface", on page 342
Ethernet	VXI-11	TCPIP::host address[::LAN device name][::INSTR]	VISA	Chapter 14.1.2.2, "VXI-11 Protocol", on page 345
	HiSLIP High-speed LAN instrument protocol (IVI-6.1)	TCPIP::host address::hislip0[::INSTR]	VISA	Chapter 14.1.2.3, "HiSLIP Protocol", on page 345
	Socket communication (SCPI raw)	TCPIP::host address[::LAN device name]::<port>::SOCKET		Chapter 14.1.2.4, "Socket Communication", on page 346
	*) VISA is a standardized software interface library providing input and output functions to communicate with instruments. A VISA installation on the controller is a prerequisite for remote control over LAN (when using VXI-11 or HiSLIP protocol) and USBTMC interfaces. See also Chapter 14.1.2.1, "VISA Resource Strings", on page 344.			

14.1.1 USB Interface

Computer requirements

- VISA library
  A USB connection requires the VISA library to be installed. VISA detects and configures the R&S NRX automatically when the USB connection is established.
- USBTMC driver
  Apart from the USBTMC driver, which comes with the installation of the R&S NRP Toolkit, you do not have to install a separate driver.

Setup

► Connect the host interface of the R&S NRX and the USB interface of the computer.

USBTMC protocol

USBTMC is a protocol that is built on top of USB for communication with USB devices from the test & measurement category. It defines a dedicated class code that identifies a device's functionality. R&S NRX also uses this class code to identify itself as a member of the test & measurement class. Using a VISA library, such devices support service request, trigger and other operations that are commonly found in GPIB devices.

USB resource string

The VISA resource string for USBTMC device communication represents an addressing scheme that is used to establish a communication session with the sensor. It is based on the sensor address and some instrument- and vendor-specific information. The syntax of the used USB resource string is:

USB::<vendor ID>::<product ID>::<serial number>[::INSTR]

- *<vendor ID>* is the vendor ID for Rohde & Schwarz.
- *<product ID>* is the product ID for the R&S NRX.
- *<serial number>* is the individual serial number of the , printed on the casing.

Example:

`USB::0x0AAD::0x015B::100001`

0x0AAD is the vendor ID for Rohde & Schwarz.

0x015B is the product ID for the R&S NRX.

100001 is the serial number of the particular R&S NRX.

14.1.2 Ethernet Interface

The Ethernet interface of the R&S NRX allows you to integrate it in a local area network (LAN).

Requirements

- TCP/IP network protocol
  The local area network must support the TCP/IP network protocol.
  The TCP/IP network protocol and the associated network services are preconfigured on the R&S NRX.
- VISA library
  Installed on the computer.
- Software for device control
  Installed on the computer.

Setup

► Using the Ethernet interface, connect the computer and the R&S NRX to a local area network.

14.1.2.1 VISA Resource Strings

The VISA resource string for network device communication is required to establish a communication session between the controller and the power sensor in a LAN. The resource string is a unique identifier, composed of the specific IP address of the sensor and some network and VISA-specific keywords.

TCPIP::<IP address or hostname>[::<LAN device name>][::INSTR]

- *TCPIP* designates the network protocol used
- *<IP address or hostname>* is the IP address or hostname of the device
- *[::<LAN device name>]* defines the protocol and the instance number of a subinstrument:
- *[::INSTR]* indicates the power sensors resource class (optional)

The IP address or hostname is used by the programs to identify and control the sensor. While the hostname is determined by settings in the sensor, the IP address is assigned by a DHCP server when the sensor requests one. Alternatively the IP address is determined with a procedure called Zeroconf.

You can also assign a *LAN device name* which defines the protocol characteristics of the connection. See the description of the VISA resource string below for the corresponding interface protocols. The string of the *LAN device name* is emphasized in italics.

VXI-11

TCPIP::<IP address or hostname>*[::inst0]*[::INSTR]

- *inst0* is the LAN device name, indicating that the VXI-11 protocol is used (optional)

inst0 currently selects the VXI-11 protocol by default and can be omitted.

For further details, see Chapter 14.1.2.2, "VXI-11 Protocol", on page 345.

HiSLIP

TCPIP::<IP address or hostname>*::hislip0*[::INSTR]

- *hislip0* is the HiSLIP device name, designates that the interface protocol HiSLIP is used (mandatory)

hislip0 is composed of [::HiSLIP device name[,HiSLIP port]] and must be assigned.

For further details, see Chapter 14.1.2.3, "HiSLIP Protocol", on page 345.

Socket communication

TCPIP::<IP address or hostname>*::port::SOCKET*

- *port* determines the used port number
- *SOCKET* indicates the raw network socket resource class

Socket communication requires the specification of the port (commonly referred to as port number) and of "SOCKET" to complete the VISA resource string with the associated protocol used.

The default port for socket communication is port 5025.

For further details, see Chapter 14.1.2.4, "Socket Communication", on page 346.

Example:

A power sensor has the IP address *10.111.11.20*; the valid resource string using VXI-11 protocol is:

TCPIP::10.111.11.20::INSTR

The DNS hostname is *nrx-100001*; the valid resource string is:

TCPIP::nrx-100001::hislip0 (HiSLIP)

TCPIP::nrx-100001::inst0 (VXI-11)

A raw socket connection can be established using:

TCPIP::10.111.11.20::5025::SOCKET

TCPIP::nrx-100001::5025::SOCKET

14.1.2.2 VXI-11 Protocol

The VXI-11 standard is based on the ONC RPC (Open Network Computing Remote Procedure Call) protocol which in turn relies on TCP/IP as the network/transport layer. The TCP/IP network protocol and the associated network services are preconfigured. TCP/IP ensures connection-oriented communication, where the order of the exchanged messages is adhered to and interrupted links are identified. With this protocol, messages cannot be lost.

14.1.2.3 HiSLIP Protocol

The HiSLIP (high-speed LAN instrument protocol) is the successor protocol for VXI-11 for TCP-based instruments specified by the IVI foundation. The protocol uses two TCP sockets for a single connection - the first for fast data transfer, the second one for non-sequential control commands (e.g. `Device Clear` or `SRQ`).

HiSLIP has the following characteristics:

- High performance as with raw socket network connections
- Compatible IEEE 488.2 support for Message Exchange Protocol, Device Clear, Serial Poll, Remote/Local, Trigger, and Service Request.
- Uses a single IANA registered port (4880), which simplifies the configuration of firewalls.
- Supports simultaneous access of multiple users by providing versatile locking mechanisms.
- Usable for IPv6 or IPv4 networks.

The HiSLIP data is sent to the device using the "fire and forget" method with immediate return. Opposed to VXI-11, where each operation is blocked until a VXI-11 device handshake returns. Thus, a successful return of a VISA operation such as `viWrite()` does not guarantee that the sensor has finished (or even started) executing the requested command. It just indicates that the command has been delivered to the TCP/IP buffers.

For more information see also the application note at:

http://www.rohde-schwarz.com/appnote/1MA208.

14.1.2.4 Socket Communication

An alternative way for remote control of the software is to establish a simple TCP/IP connection to the device using the standard network drivers of your operating system. The so-called "socket" on Linux, "winsock" on Windows. The socket communication, also referred to as "raw Ethernet communication", does not necessarily require a VISA installation on the remote controller side.

Socket connections are established on a specially defined port. The socket address is a combination of the IP address or hostname of the sensor and the number of the port configured for remote control. The power sensors use port number 5025 for this purpose.

14.2 SCPI Command Structure

SCPI commands - messages - are used for remote control. Commands that are not taken from the SCPI standard follow the SCPI syntax rules. The power sensor supports the SCPI version 1999. The SCPI standard is based on standard IEEE 488.2 and aims at the standardization of device-specific commands, error handling and the status registers.

SCPI commands consist of a so-called header and, usually, one or more parameters. The header and the parameters are separated by a "white space" (ASCII code 0 to 9, 11 to 32 decimal, e.g. blank). The headers can consist of several mnemonics (keywords). Queries are formed by appending a question mark directly to the header.

The commands can be either device-specific or device-independent (common commands). Common and device-specific commands differ in their syntax.

14.2.1 Syntax for Common Commands

Common (=device-independent) commands consist of a header preceded by an asterisk (*) and possibly one or more parameters.

Examples:

*RST	RESET	Resets the instrument.
*ESE	EVENT STATUS ENABLE	Sets the bits of the event status enable registers.
*ESR?	EVENT STATUS QUERY	Queries the contents of the event status register.
*IDN?	IDENTIFICATION QUERY	Queries the instrument identification string.

14.2.2 Syntax for Device-Specific Commands

Long and short form

The mnemonics feature a long form and a short form. The short form is marked by upper case letters here, to distinguish it from the long form, which constitutes the complete word. Either the short form or the long form can be entered; other abbreviations are not permitted.

Example:

`INITiate:CONTinuous` is equivalent to `INIT:CONT` or `init:cont`.

Case-insensitivity

Upper case and lower case notation only serves to distinguish the two forms in the manual, the instrument itself is case-insensitive.

Numeric suffixes

If a command can be applied to multiple instances of an object, e.g. specific channels or sources, the required instances can be specified by a suffix added to the command. Numeric suffixes are indicated by angular brackets (<1...4>, <n>, <i>) and are replaced by a single value in the command. Entries without a suffix are interpreted as having the suffix 1.

Different numbering in remote control

For remote control, the suffix can differ from the number of the corresponding selection used in manual operation. SCPI prescribes that suffix counting starts with 1. Suffix 1 is the default state and used when no specific suffix is specified.

Some standards define a fixed numbering, starting with 0. If the numbering differs in manual operation and remote control, it is indicated for the corresponding command.

Optional mnemonics

Some command systems permit certain mnemonics to be inserted into the header or omitted. These mnemonics are marked by square brackets in the description. The instrument must recognize the long command to comply with the SCPI standard. Some commands are considerably shortened by these optional mnemonics.

Example:

Definition: `INITiate[:IMMediate]`

Command: `INIT:IMM` is equivalent to `INIT`

Parameters

Parameters must be separated from the header by a "white space". If several parameters are specified in a command, they are separated by a comma (,).

For a description of the parameter types, refer to Chapter 14.2.3, "SCPI Parameters", on page 348.

Special characters

|	**Parameters** A vertical stroke in parameter definitions indicates alternative possibilities in the sense of "or". The effect of the command differs, depending on which parameter is used.
[ ]	Mnemonics in square brackets are optional and can be inserted into the header or omitted. **Example**: `INITiate[:IMMediate]` `INIT:IMM` is equivalent to `INIT`
{ }	Parameters in curly brackets are optional and can be inserted once or several times, or omitted.

14.2.3 SCPI Parameters

Many commands are supplemented by a parameter or a list of parameters. The parameters must be separated from the header by a "white space" (ASCII code 0 to 9, 11 to 32 decimal, e.g. blank). Allowed parameters are:

- Numeric values
- Special numeric values
- Boolean parameters
- Text
- Character strings
- Block data

The parameters required for each command and the allowed range of values are specified in the command description.

Numeric values

Numeric values can be entered in any form, i.e. with sign, decimal point and exponent. Values exceeding the resolution of the instrument are rounded up or down. The mantissa can comprise up to 255 characters, the exponent must lie inside the value range -32000 to 32000. The exponent is introduced by an "E" or "e". Entry of the exponent alone is not allowed. In the case of physical quantities, the unit can be entered. Allowed unit prefixes are G (giga), MA (mega), MOHM and MHZ are also allowed), K (kilo), M (milli), U (micro) and N (nano). If the unit is missing, the basic unit is used.

Units

hBasic units and unit prefixes are allowed and recognized.

Special numeric values

The texts listed below are interpreted as special numeric values. In the case of a query, the numeric value is provided.

- **MIN/MAX**

`MINimum` and `MAXimum` denote the minimum and maximum value.

- **DEF**
  `DEFault` denotes a preset value which has been stored in the non variable memory. This value conforms to the default setting, as it is called by the *RST command.
- **UP/DOWN**
  `UP`, `DOWN` increases or reduces the numeric value by one step. The step width can be specified via an allocated step command for each parameter which can be set via UP, DOWN.
- **INF/NINF**
  `INFinity`, `Negative INFinity (NINF)` represent the numeric values 9.9E37 or -9.9E37, respectively. `INF` and `NINF` are only sent as instrument responses.
- **NAN**
  Not A Number (NAN) represents the value 9.91E37. NAN is only sent as a instrument response. This value is not defined. Possible causes are the division by zero, the subtraction of infinite from infinite and the representation of missing values.

Boolean Parameters

Boolean parameters represent two states. The "ON" state (logically true) is represented by "ON" or a numeric value 1. The "OFF" state (logically untrue) is represented by "OFF" or the numeric value 0. The numeric values are provided as the response for a query.

Example:

Setting command: `SENSe:AVERage:COUNt:AUTO ON`

Query: `SENSe:AVERage:COUNt:AUTO?`

Response: `1`

Text parameters

Text parameters observe the syntactic rules for mnemonics, i.e. they can be entered using a short or long form. Like any parameter, they have to be separated from the header by a white space. In the case of a query, the short form of the text is provided.

Example:

Setting command: `TRIGger:SLOPe POSitive`

Query: `TRIG:SLOP?`

Response: `POS`

Character strings

Strings must always be entered in quotation marks (' or ").

Example:

Setting command: `SENSe:FUNCtion "POWer:AVG"`

Query: `SENS:FUNC?`

Response: `"POWer:AVG"`

Block data

Block data is a format which is suitable for the transmission of large amounts of data. A command using a block data parameter has the following structure:

Example:

`SYSTem:HELP:SYNTax:ALL?`

`Response: #45168xxxxxxxx`

The ASCII character # introduces the data block. The next number indicates how many of the following digits describe the length of the data block. In the example the 4 following digits indicate the length to be 5168 bytes. The data bytes follow. During the transmission of these data bytes all end or other control signs are ignored until all bytes are transmitted.

#0 specifies a data block of indefinite length. The use of the indefinite format requires a `NL^END` message to terminate the data block. This format is useful when the length of the transmission is not known or if speed or other considerations prevent segmentation of the data into blocks of definite length.

14.2.4 Overview of Syntax Elements

The following table provides an overview of the syntax elements:

:	The colon separates the mnemonics of a command. In a command line the separating semicolon marks the uppermost command level.
;	The semicolon separates two commands of a command line. It does not alter the path.
,	The comma separates several parameters of a command.
?	The question mark forms a query.
*****	The asterisk marks a common command.
' **"**	Quotation marks introduce a string and terminate it (both single and double quotation marks are possible).
#	The hash symbol introduces binary, octal, hexadecimal and block data. ● Binary: #B10110 ● Octal: #O7612 ● Hexa: #HF3A7 ● Block: #21312
	A "white space" (ASCII-Code 0 to 9, 11 to 32 decimal, e.g. blank) separates the header from the parameters.

14.2.5 Structure of a command line

A command line can consist of one or several commands. It is terminated by one of the following:

- a <New Line>
- a <New Line> with EOI
- an EOI together with the last data byte

Several commands in a command line must be separated by a semicolon ";". If the next command belongs to a different command system, the semicolon is followed by a colon.

If the successive commands belong to the same system, having one or several levels in common, the command line can be abbreviated. To this end, the second command after the semicolon starts with the level that lies below the common levels. The colon following the semicolon must be omitted in this case.

Example:

`TRIG:LEV 0.1mW;TRIG:DEL 3E-3`

This command line contains two commands. Both commands are part of the `TRIG` command system, i.e. they have one level in common.

When abbreviating the command line, the second command begins with the level below `TRIG`. The colon after the semicolon is omitted. The abbreviated form of the command line reads as follows:

`TRIG:LEV 0.1E-3;DEL 3E-3`

A new command line always begins with the complete path.

Example:

`TRIG:LEV 0.1E-3`

`TRIG:DEL 3E-3`

14.2.6 Responses to Queries

A query is defined for each setting command unless explicitly specified otherwise. It is formed by adding a question mark to the associated setting command. According to SCPI, the responses to queries are partly subject to stricter rules than in standard IEEE 488.2.

- The requested parameter is transmitted without a header.
  Example: `TRIG:SOUR?`, Response: `INT`
- Maximum values, minimum values and all other quantities that are requested via a special text parameter are returned as numeric values.
- Numeric values are output without a unit. Physical quantities are referred to the basic units or to the units set using the `Unit` command. The response `3.5E9` for example stands for 3.5 GHz.
- Truth values (Boolean values) are returned as `0` (for `OFF`) and `1` (for `ON`).

Example:
Setting command: `SENS:AVER:COUN:AUTO ON`
Query: `SENS:AVER:COUN:AUTO?`
Response: `1`

- Text (character data) is returned in a short form.
  Example:
  Setting command: `TRIGger:SOURce INTernal`
  Query: `TRIG:SOUR?`
  Response: `INT`

Glossary: List of Abbreviations

A

AVG: Average

C

CCDF: Complementary Cumulative Distribution Function

CDMA: Code Division Multiple Access

D

DAB: Digital Audio Broadcast

DHCP: Dynamic Host Control Protocol

DNS: Domain Name Service

DVB-T: Digital Video Broadcasting - Terrestrial

E

EMC: Electromagnetic Compatibility

EMI: Electromagnetic Interference

G

GPIB: General Purpose Interface Bus
General Purpose Instrumentation Bus

I

IDN: Instrument Identification String

IP: Internet Protocol

L

LAN: Local Area Network

O

OPT: Option Identification String

OSA: Open Source Acknowledgement

P

PEP: Peak Envelope Power

R

RFB: Remote Framebuffer Protocol

S

SCPI: Standard Commands for Programmable Instruments

SSH: Secure Shell

SWR: Standing Wave Ratio

U

USB: Universal Serial Bus

V

VISA: Virtual Instrument Software Architecture

VNC: Virtual Network Computing

W

WCDMA: Wideband Code Division Multiple Access

List of Commands

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