R&S®NRX
Power Meter
Getting Started

1424707002

ROHDE&SCHWARZ

Getting Started

Version 05

This document describes the following R&S®NRX models:

- R&S®NRX (1424.7005.02)

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1424.7070.02 | Version 05 | 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.

Contents

1 Safety Information..... 5

2 Documentation Overview.....6

2.1 Getting Started Manual.....6

2.2 User Manuals and Help..... 6

2.3 Tutorials..... 6

2.4 Basic Safety Instructions..... 6

2.5 Data Sheets and Brochures..... 7

2.6 Release Notes and Open Source Acknowledgment (OSA).....7

2.7 Application Notes, Application Cards, White Papers, etc.....7

3 Key Features..... 8

4 Preparing for Use.....9

4.1 Unpacking and Checking..... 9

4.1.1 Accessory List..... 9

4.2 Operating Conditions..... 10

4.3 Important Aspects for Test Setup.....10

4.4 Placing on a Bench Top.....11

4.5 Mounting in a Rack..... 12

4.6 Connecting to the AC Power Supply..... 13

4.7 Switching On or Off..... 13

4.8 Connecting Power Sensors..... 14

4.8.1 Sensor Connectors A to D..... 14

4.8.2 Optional Sensor Interface for R&S NRT (R&S NRX-B9)..... 15

4.8.3 LAN Interface..... 16

4.8.4 USB 2.0 Host Interfaces..... 16

4.9 Connecting USB and External Devices..... 16

5 Instrument Tour..... 17

5.1 Front Panel Tour.....17

5.1.1 Sensor Connector A and B..... 17

5.1.2 Module Bay..... 18

5.1.3 Touchscreen.....19

5.1.4 Keys..... 19

5.1.5 USB Host Interface..... 21

5.1.6 On/Standby Key.....22

5.2 Rear Panel Tour.....23

5.2.1 Trig In / Out 2 and Out 1 / Trig Out Connectors..... 23

5.2.2 Ethernet Interface..... 24

5.2.3 USB Device Interface.....24

5.2.4 USB Host Interface..... 24

5.2.5 AC Supply and Power Switch..... 24

5.2.6 IEC 625/IEEE 488 Interface.....24

5.2.7 Sensor Connectors C and D..... 25

Index..... 26

1 Safety Information

The product documentation helps you to use the R&S NRX safely and efficiently. Follow the instructions provided here and in the printed "Basic Safety Instructions". Keep the product documentation nearby and offer it to other users.

Intended use

The R&S NRX is designated for the development, production and verification of electronic components and devices in industrial, administrative, and laboratory environments. Use the R&S NRX only for its designated purpose. Observe the operating conditions and performance limits stated in the data sheet.

Where do I find safety information?

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

- The printed "Basic Safety Instructions" provide safety information in many languages and are delivered with the R&S NRX.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

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

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.

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 .

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.

2.4 Basic Safety Instructions

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

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

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

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

3 Key Features

The R&S NRX supports:

- Easy RF power measurements
- Multi-channel measurements
- RF pulse analysis
- System integration

The R&S NRX is a versatile, user-friendly base unit.

- Straightforward numerical and graphical display of measured values, plus intuitive operation with touchscreen-based graphical user interface
- Supports up to four R&S NRP and R&S NRQ6 power sensors.
- Supports all sensor-dependent measurement functions
- Hardware interfaces for remote control and triggering
- Code emulation of the R&S NRP2
- Optional high-precision CW and pulse mode reference source module
- Optional power reflection measurements with R&S NRT directional power sensors

See also the R&S NRX fact sheet at www.rohde-schwarz.com.

4 Preparing for Use

- Unpacking and Checking 9
- Operating Conditions 10
- Important Aspects for Test Setup 10
- Placing on a Bench Top 11
- Mounting in a Rack 12
- Connecting to the AC Power Supply 13
- Switching On or Off 13
- Connecting Power Sensors 14
- Connecting USB and External Devices 16

4.1 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.

4.1.1 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

4.2 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.

4.3 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.

4.4 Placing on a Bench Top

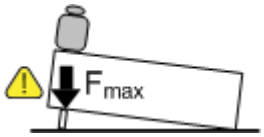
Place the R&S NRX on a stable and level surface. The R&S NRX can be used in horizontal position, standing on its feet, or with the support feet on the bottom extended. Do not place anything on top of the R&S NRX, if the R&S NRX is not in a level position.

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.



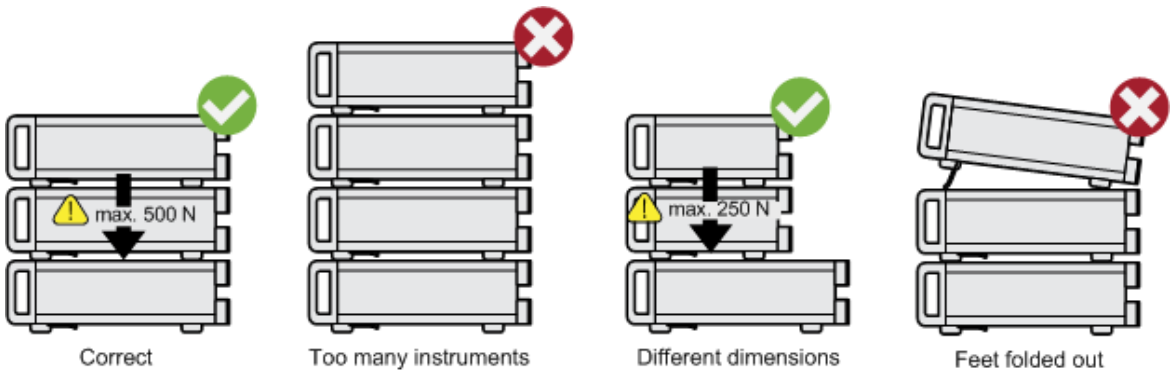
⚠ WARNING

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.



4.5 Mounting in a Rack

1. Order one of the rack adapter kits designed for the R&S NRX. For the order number, see data sheet.
2. Follow the installation instructions provided with the adapter kit.
3. **NOTICE!** Insufficient airflow can cause overheating and thus damage the R&S NRX.

Develop and implement an efficient ventilation concept.

4.6 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.

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.

1. Plug the AC power cable into the AC power connector on the rear panel of the R&S NRX. Only use the power cable delivered with the R&S NRX.
2. Plug the AC power cable into a power outlet with ground contact. The R&S NRX complies with safety class EN61010-1.

   The required ratings are listed next to the AC connector and in the data sheet.

Further information:

- Chapter 5.2.5, "AC Supply and Power Switch", on page 24

4.7 Switching On or Off

The possible instrument states are described in Chapter 5.1.6, "On/Standby Key", on page 22.

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.
If the previous session ended 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.

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 5.1.6, "On/Standby Key", on page 22

4.8 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, you have different choices for connecting it.

4.8.1 Sensor Connectors A to D

See Chapter 5.1.1, "Sensor Connector A and B", on page 17 and Chapter 5.2.7, "Sensor Connectors C and D", on page 25.

Suitable for:

- USB and LAN power sensors
- R&S NRQ6
- R&S NRP-Zxx power sensors

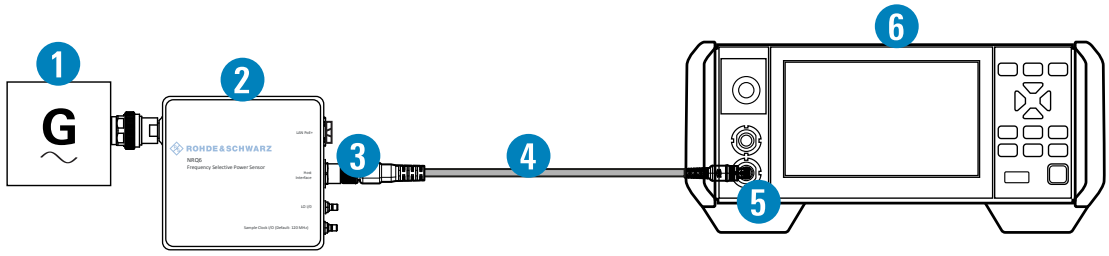


Figure 4-1: Setup with an R&S power sensor (example)

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.

4.8.2 Optional Sensor Interface for R&S NRT (R&S NRX-B9)

See Chapter 5.1.2, "Module Bay", on page 18.

Suitable for R&S NRT directional power sensors.

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

4.8.3 LAN Interface

See Chapter 5.2.2, "Ethernet Interface", on page 24.

Suitable for LAN power sensors.

4.8.4 USB 2.0 Host Interfaces

See Chapter 5.1.5, "USB Host Interface", on page 21 and Chapter 5.2.4, "USB Host Interface", on page 24.

Suitable for USB power sensors.

4.9 Connecting USB and External Devices

Apart from connecting USB power sensors, you can use the USB interfaces to connect USB devices. You can increase the number of connected devices 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, useful USB devices are listed exemplarily:

- 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.

5 Instrument Tour

- Front Panel Tour.....17
- Rear Panel Tour.....23

5.1 Front Panel Tour

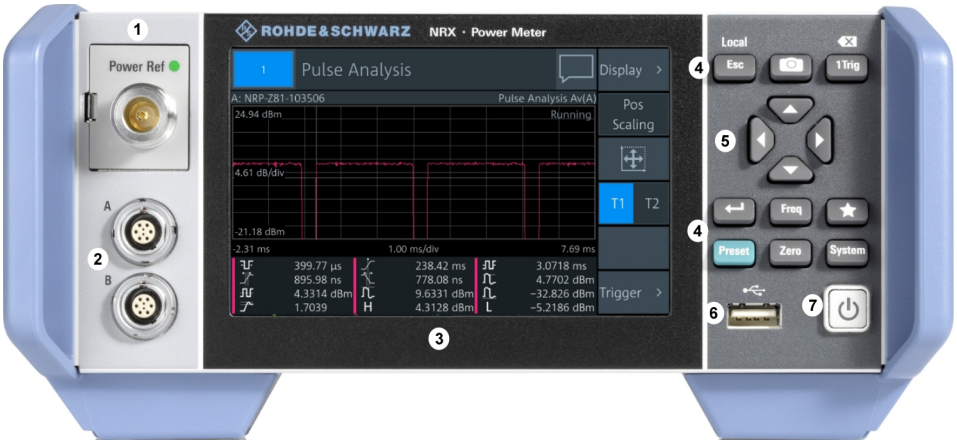


Figure 5-1: Front View of R&S NRX

1 = Module bay for optional connectors, see Chapter 5.1.2, "Module Bay", on page 18.
2 = Sensor connectors A and B, see Chapter 5.1.1, "Sensor Connector A and B", on page 17.
3 = Touchscreen, see Chapter 5.1.3, "Touchscreen", on page 19.
4 = Keys, see Chapter 5.1.4, "Keys", on page 19.
5 = Cursor keys, see "Cursor keys" on page 21.
6 = USB host interface, see Chapter 5.1.5, "USB Host Interface", on page 21.
7 = On/standby key, see Chapter 5.1.6, "On/Standby Key", on page 22.

5.1.1 Sensor Connector A and B

See (2) in Figure 5-1.

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 4.8, "Connecting Power Sensors", on page 14

5.1.2 Module Bay

See (1) in Figure 5-1.

Two options fit in this bay. If you have both options, you can exchange them, see "To exchange the option" on page 18.

If no option is installed, the module bay is closed by a cover.

Sensor check source (R&S NRX-B1)

Used as a power reference for testing the connected power sensors and the cabling. The LED of the sensor check source (R&S NRX-B1) shows the state, see Table 5-1.

You can remove the option and send it to Rohde & Schwarz for calibration. Contact the Rohde & Schwarz customer service.

Table 5-1: Possible states

Illumination	State	Signal output setting
Off	No signal is generated.	"Off"
Steady green	Continuous wave is output.	"CW"
Blinking green	Pulse signal is output.	"Pulse"
Blinking red	Settings conflict exists. For example if "Pulse" is set and the power level is set to 20 dBm.	"CW" or "Pulse"

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.

To exchange the option

1. Press the latch to the right, using your thumb nail or a small pen.

2. Pull the option from its casing.
3. Insert the other option.
4. Press until you hear a click when the latch locks.

Further information:

- Chapter 4.8, "Connecting Power Sensors", on page 14

5.1.3 Touchscreen

See (3) in Figure 5-1.

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.

5.1.4 Keys

See (4) in Figure 5-1.

[Esc] / Local

Esc

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 active measurements.

Screenshot

Creates a screenshot of the current display.

[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.
- Resets the auxiliary values that provide additional information about the measured values.
- 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.

Favorites

Reserved for future use.

[Preset]

Opens the "Save / Recall / Preset" dialog.

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

If you press the [Preset] key during booting, the R&S NRX starts with the factory default state.

[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.

Cursor keys

See (5) in Figure 5-1.

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.

5.1.5 USB Host Interface

See (6) in Figure 5-1.

USB 2.0 (universal serial bus) interface of the type A (host USB). Used to connect USB power sensors and external devices like a keyboard, mouse, or memory stick.

Further information:

- Chapter 4.8.4, "USB 2.0 Host Interfaces", on page 16
- Chapter 4.9, "Connecting USB and External Devices", on page 16

5.1.6 On/Standby Key

See (7) in Figure 5-1.

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 4.7, "Switching On or Off", on page 13.

5.2 Rear Panel Tour

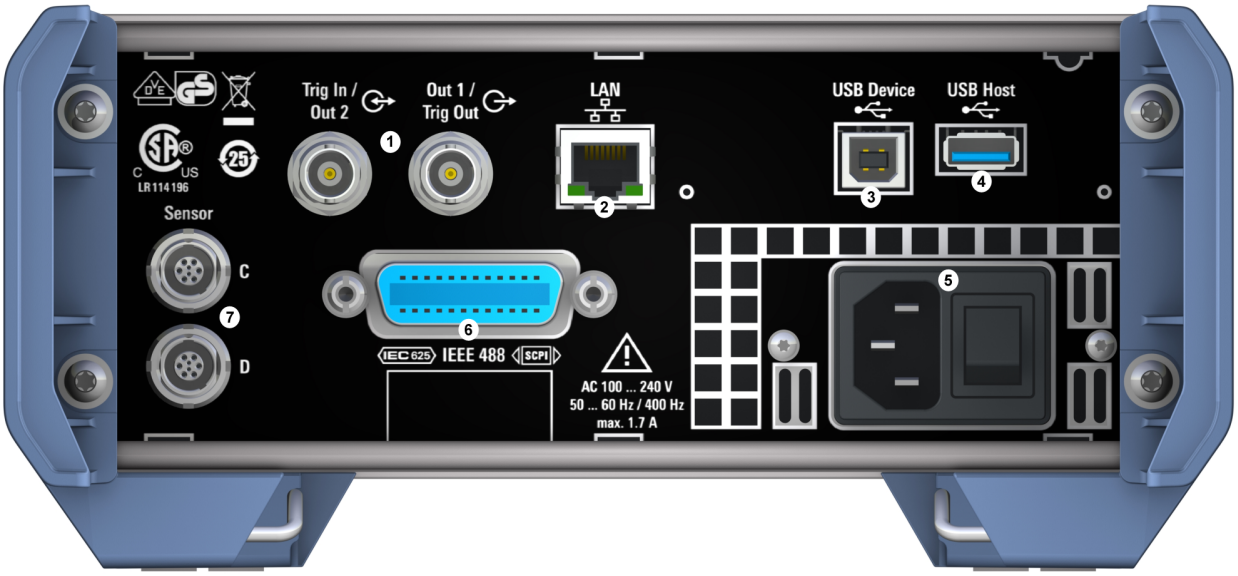


Figure 5-2: RearView of R&S NRX

1 = Trig In / Out 2 and Out 1 / Trig Out connectors, see Chapter 5.2.1, "Trig In / Out 2 and Out 1 / Trig Out Connectors", on page 23.
2 = Ethernet interface, see Chapter 5.2.2, "Ethernet Interface", on page 24.
3 = USB device interface, see Chapter 5.2.3, "USB Device Interface", on page 24.
4 = USB host interface, see Chapter 5.2.4, "USB Host Interface", on page 24.
5 = AC supply and power switch, see Chapter 5.2.5, "AC Supply and Power Switch", on page 24.
6 = IEC 625/IEEE 488 interface, optional, see Chapter 5.2.6, "IEC 625/IEEE 488 Interface", on page 24.
7 = Sensor connectors C and D (optional), used to connect R&S power sensors, see Chapter 5.2.7, "Sensor Connectors C and D", on page 25.

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

See (1) in Figure 5-2.

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, both connectors are disabled.

5.2.2 Ethernet Interface

See (2) in Figure 5-2.

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

5.2.3 USB Device Interface

See (3) in Figure 5-2.

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.

5.2.4 USB Host Interface

See (4) in Figure 5-2.

See Chapter 5.1.5, "USB Host Interface", on page 21.

5.2.5 AC Supply and Power Switch

See (5) in Figure 5-2.

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 4.6, "Connecting to the AC Power Supply", on page 13.

5.2.6 IEC 625/IEEE 488 Interface

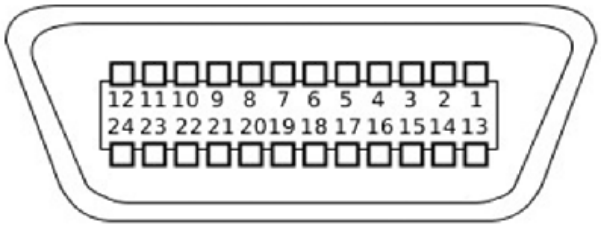
See (6) in Figure 5-2.

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)



5.2.7 Sensor Connectors C and D

See (7) Figure 5-2.

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

For more details, see Chapter 5.1.1, "Sensor Connector A and B", on page 17.

Index

Symbols

1 Trig key 20

A

AC power supply 24
  Connecting to 13
Accessory list 9
Application cards 7
Application notes 7

B

Bench top operation 11
Brochures 7

C

Checking 9
Connecting
  External devices 16
  Power supply 13
  Sensor 14
Connector
  AC power supply 24
  Out 1 / Trig Out 23
  Sensor 17, 25
  Trig In / Out 2 23
Cursor keys 21

D

Data sheets 7
Delete key 20
Documentation overview 6

E

Electromagnetic interference (EMI) 10
Electrostatic discharge (ESD) 10
Enter key 20
Esc key 19
Ethernet interface 24
External devices 16

F

Favorites key 20
Freq key 20
Front panel keys 19

G

Getting started 6

H

Hardware option 18
Help 6

I

IEC 625/IEEE 488 interface 24
Interface
  Ethernet 24
  IEC 625/IEEE 488 24
  Module bay 18
  USB device 24
  USB host 24

K

Key 19
  1 Trig 20
  Delete 20
  Enter 20
  Esc 19
  Favorites 20
  Freq 20
  Local 19
  On/standby 22
  Preset 21
  Screenshot 20
  System 21
  Zero 21

L

Local key 19

M

Module bay 18

O

On/standby key 22
Open source acknowledgment (OSA) 7
Operating conditions 10
Out 1 / Trig Out connector 23

P

Placing 11

Power supply
Connecting to 13
Preparing for use 9
Preset key 21

R

Release notes 7

S

Safety information 10
Safety instructions 6
Screenshot key 20
Sensor
Connecting 14
Connector 17, 25
Switching on 13
System key 21

T

Touchscreen 19
Trig In / Out 2 connector 23
Tutorials 6

U

Unpacking 9
USB
Device interface 24
Host interface 21, 24
User manual 6

W

White papers 7

Z

Zero key 21