

# NRP2 Power Meter Getting Started

 海洋儀器

致力于电子测试、维护领域!



1144.1351.02 - 03

# Basic Safety Instructions

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

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







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

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








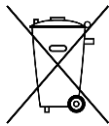



Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before and when using the product. It is also absolutely essential to observe the additional safety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

## Safety labels on products

The following safety labels are used on products to warn against risks and dangers.

Symbol	Meaning	Symbol	Meaning
	Notice, general danger location Observe product documentation		ON/OFF Power
	Caution when handling heavy equipment		Standby indication
	Danger of electric shock		Direct current (DC)

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Symbol	Meaning	Symbol	Meaning
	Caution ! Hot surface		Alternating current (AC)
	Protective conductor terminal To identify any terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth		Direct/alternating current (DC/AC)
	Earth (Ground)		Class II Equipment to identify equipment meeting the safety requirements specified for Class II equipment (device protected by double or reinforced insulation)
	Frame or chassis Ground terminal		EU labeling for batteries and accumulators For additional information, see section "Waste disposal/Environmental protection", item 1.
	Be careful when handling electrostatic sensitive devices		EU labeling for separate collection of electrical and electronic devices For additional information, see section "Waste disposal/Environmental protection", item 2.
	Warning! Laser radiation For additional information, see section "Operation", item 7.		

### Signal words and their meaning

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



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



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



Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



Indicates information considered important, but not hazard-related, e.g. messages relating to property damage.

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

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

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### Operating states and operating positions

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

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

### Electrical safety

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

1. Prior to switching on the product, always ensure that the nominal voltage setting on the product matches the nominal voltage of the mains-supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with a protective conductor contact and protective conductor.
3. Intentionally breaking the protective conductor either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
4. If there is no power switch for disconnecting the product from the mains, or if the power switch is not suitable for this purpose, use the plug of the connecting cable to disconnect the product from the mains. In such cases, always ensure that the power plug is easily reachable and accessible at all times. For example, if the power plug is the disconnecting device, the length of the connecting cable must not exceed 3 m. Functional or electronic switches are not suitable for providing disconnection from the AC supply network. If products without power switches are integrated into racks or systems, the disconnecting device must be provided at the system level.
5. Never use the product if the power cable is damaged. Check the power cables on a regular basis to ensure that they are in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by, for example, tripping over the cable or suffering an electric shock.

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6. The product may be operated only from TN/TT supply networks fuse-protected with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket provided for this purpose. Otherwise, sparks that result in fire and/or injuries may occur.
8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
9. For measurements in circuits with voltages  $V_{rms} > 30$  V, suitable measures (e.g. appropriate measuring equipment, fuse protection, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC 60950-1 / EN 60950-1 or IEC 61010-1 / EN 61010-1 standards that apply in each case.
11. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
12. If a product is to be permanently installed, the connection between the protective conductor terminal on site and the product's protective conductor must be made first before any other connection is made. The product may be installed and connected only by a licensed electrician.
13. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fuse-protected in such a way that anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.
14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.
15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.
16. Unless specified otherwise, products are not liquid-proof (see also section "Operating states and operating positions", item 1). Therefore, the equipment must be protected against penetration by liquids. If the necessary precautions are not taken, the user may suffer electric shock or the product itself may be damaged, which can also lead to personal injury.
17. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product has been moved from a cold to a warm environment. Penetration by water increases the risk of electric shock.
18. Prior to cleaning the product, disconnect it completely from the power supply (e.g. AC supply network or battery). Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluents for cellulose lacquers.

### Operation

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



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2. Before you move or transport the product, read and observe the section titled "Transport".
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.
4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal/Environmental protection", item 1.
5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.
6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.
7. Laser products are given warning labels that are standardized according to their laser class. Lasers can cause biological harm due to the properties of their radiation and due to their extremely concentrated electromagnetic power. If a laser product (e.g. a CD/DVD drive) is integrated into a Rohde & Schwarz product, absolutely no other settings or functions may be used as described in the product documentation. The objective is to prevent personal injury (e.g. due to laser beams).
8. EMC classes (in line with EN 55011/CISPR 11, and analogously with EN 55022/CISPR 22, EN 55032/CISPR 32)
  - Class A equipment:  
Equipment suitable for use in all environments except residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings  
Note: Class A equipment is intended for use in an industrial environment. This equipment may cause radio disturbances in residential environments, due to possible conducted as well as radiated disturbances. In this case, the operator may be required to take appropriate measures to eliminate these disturbances.
  - Class B equipment:  
Equipment suitable for use in residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings

### Repair and service

1. The product may be opened only by authorized, specially trained personnel. Before any work is performed on the product or before the product is opened, it must be disconnected from the AC supply network. Otherwise, personnel will be exposed to the risk of an electric shock.

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2. Adjustments, replacement of parts, maintenance and repair may be performed only by electrical experts authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, protective conductor test, insulation resistance measurement, leakage current measurement, functional test). This helps ensure the continued safety of the product.

### Batteries and rechargeable batteries/cells

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

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

### Transport

1. The product may be very heavy. Therefore, the product must be handled with care. In some cases, the user may require a suitable means of lifting or moving the product (e.g. with a lift-truck) to avoid back or other physical injuries.
2. Handles on the products are designed exclusively to enable personnel to transport the product. It is therefore not permissible to use handles to fasten the product to or on transport equipment such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport or lifting. Observe the safety regulations of the manufacturer of the means of transport or lifting. Noncompliance can result in personal injury or material damage.
3. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely and properly. The manufacturer assumes no responsibility for accidents or collisions. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident.

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# 1 Putting into Operation

This section describes the basic steps to be taken when setting up the R&S NRP2 for the first time.

It contains the following topics:

- unpacking
- AC supply connection
- switching the meter on and off
- function testing and installing the meter
- preset or default settings
- front and rear views

## 1.1 Notes on putting into operation

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**NOTICE****Risk of instrument damage**

Note that the general safety instructions also contain information on operating conditions that will prevent damage to the instrument. The instrument's data sheet may contain additional operating conditions.

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**NOTICE****Risk of instrument damage**

Before putting the R&S NRP2 into operation, make sure that:

- the sensor inputs are not overloaded
- the meter's outputs are not overloaded or wrongly connected
- the ventilation holes are not obstructed

The meter may be damaged if these precautions are not observed.

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## 1.2 EMC



### EMI impact on measurement results

To prevent EMI, the meter must always be installed to meet the relevant EMC standards. Never operate the instrument with its enclosure removed. Only use shielded signal and control cables that meet the relevant EMC standards.

## 1.3 Unpacking the meter

When you have removed the meter from its packing, check that nothing is missing using the delivery note and the accessory lists.

If there is any damage, contact the carrier. Keep all the packing to support any claims for compensation.



Retain the original packing material. If the instrument needs to be transported or shipped at a later date, you can use the material to prevent control elements and connectors from being damaged.

## 1.4 Setting up the meter

The R&S NRP2 is designed for use under laboratory conditions, either on a bench top or in a rack.

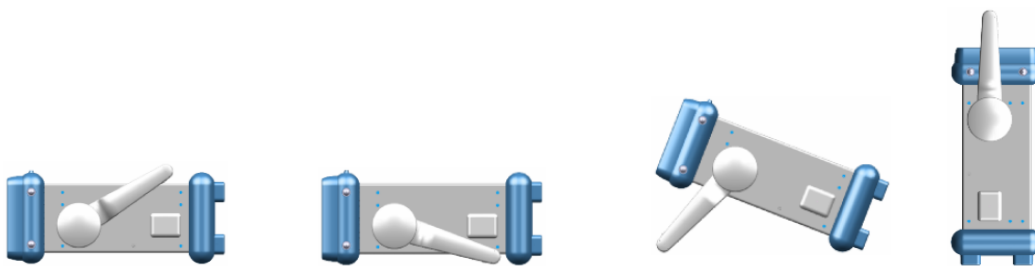
### 1.4.1 Carrying handle

If the R&S NRP2 is not installed in a rack, it should be set up so that the viewing angle for the display is optimal. The carrying handle can be locked in a variety of positions to act as a stand.



To adjust the handle, pull the two side-pieces of the handle outwards so that the handle can be rotated.

The handle locks at angles which are multiples of  $60^\circ$ .



### 1.4.2 Bench top operation

If the R&S NRP2 is operated on a bench top, the surface should be flat. The instrument can be used in horizontal position, standing on its feet, or with the support feet on the bottom extended.

### 1.4.3 Mounting the instrument in a rack

The R&S NRP2 can be installed in a rack using a variety of rack adapters (order numbers see data sheet). The installation instructions are part of an adapter kit.

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#### **NOTICE**

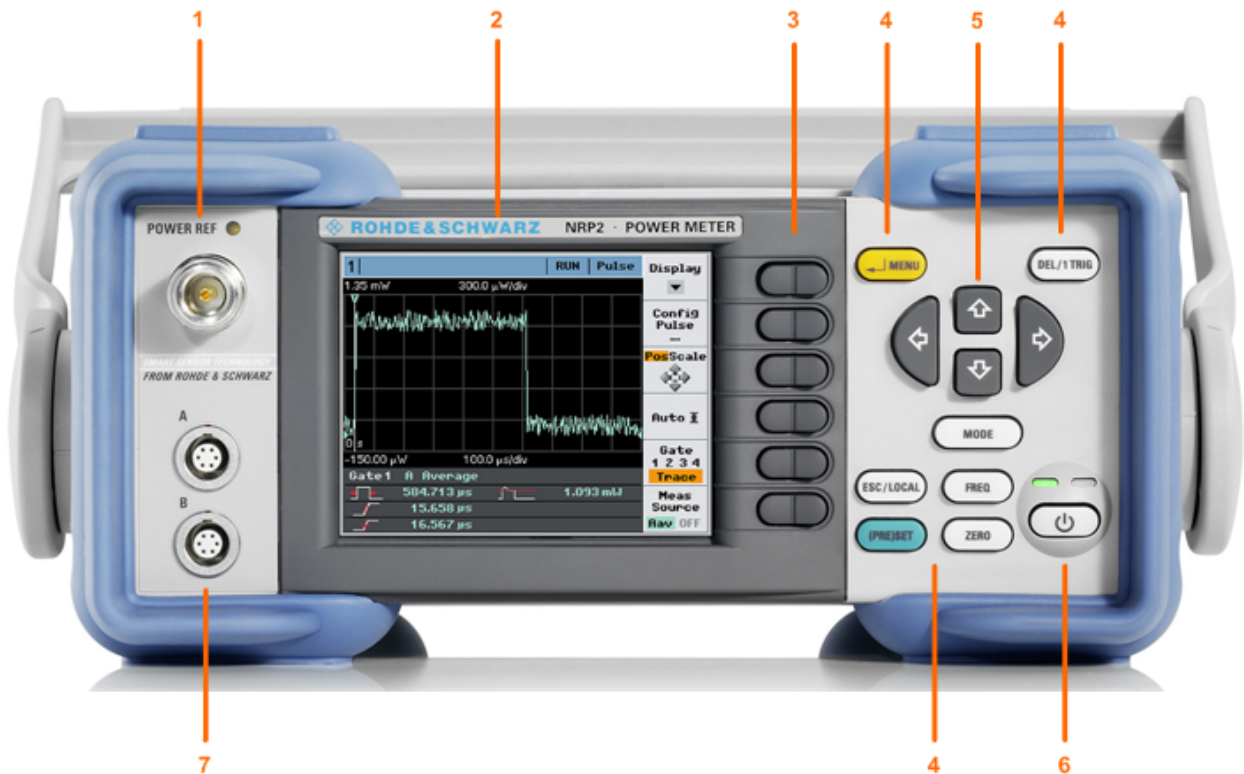
##### **Risk of instrument damage**

For rack installation, make sure that the airflow perforations are unimpeded. This helps to prevent the instruments from being overheated.

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## 1.5 Front panel tour

The front panel of the R&S NRP2 consists of the VGA display with the softkey area, the connectors on the left side and the hardkeys and utility keys on the right side. The subsequent sections provide brief explanations on the controls and connectors, the hardkey area and the front panel.



**Fig. 1-1: Front panel view**

- 1 = POWER REF connector
- 2 = Display
- 3 = Softkeys
- 4 = Hardkeys
- 5 = Cursor keys
- 6 = On/Standby key and standby LEDs
- 7 = Sensor connectors

### 1.5.1 Display

The R&S NRP2 displays results in windows. Depending on the measurement mode, values are displayed digitally, in a combined digital and analog mode, or graphically.



The display mode can be selected individually for each measurement, i.e. you can perform both graphical and numerical representations simultaneously.

## Graphical display

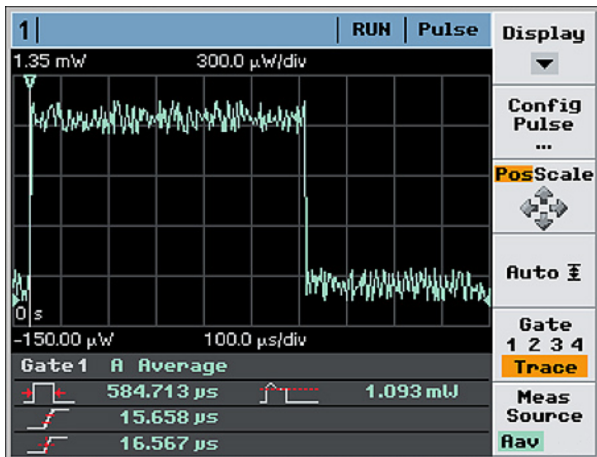


Fig. 1-2: Trace in Pulse display in 'Trace&Statistic' mode

The meter shows the results in a measurement curve, i.e. as a function of time. This presentation is obtained in "Trace & Statistics" mode, see "Instrument functions" > "Displaying Traces" in the operating manual.

The window is tiled in several sections:

- the **status bar** on top of the screen indicates information concerning the measurement and instrument state.
- the **display area** shows the measurement curve, including markers, result and time axes information and further auxiliary values.
- the **control panel** on the right offers functions for direct setting of the screen, or the access of further subdialogs. Pressing the associated key (right next to the display) executes the function or opens the dialog box.
- the **info panel** underneath the graph shows auxiliary information.

## Numerical display

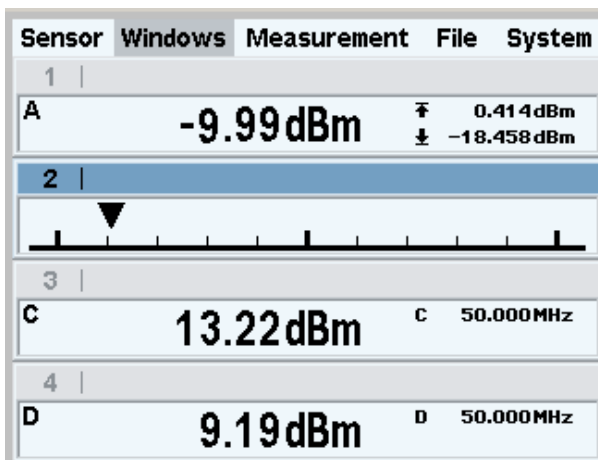


Fig. 1-3: Digital and analog display

Numerical measuring windows indicate the readings digitally, or provide the values in form of an analog meter. A maximum of four windows can be displayed on the screen, while their size is determined by the number of windows. The R&S NRP2 indicates either all windows simultaneously, or individually expanded.

For detailed information concerning the screen layout see [chapter 3.2, "Screen layout"](#), on page 51.

## 1.5.2 Keys

The keys on the front panel of the meter are used to manually operate the instrument. Grouped by soft- and hardkeys, each group represents specific functions.

### Softkeys



### Hardkeys, Cursor keys and On/Standby key





### 1.5.2.1 Softkeys



The six softkeys are rocker switches - in other words, they can be “rocked” backwards and forwards by pressing on the right or left side of the key. The softkey function is context-sensitive and is indicated by screen labeling.

For more information on the softkeys see also [chapter 2.2, "Brief introduction to the operation"](#), on page 24, [chapter 3.5, "Dialog boxes and their controls"](#), on page 57 and [chapter 3.4, "Menu handling"](#), on page 56.

### 1.5.2.2 Hardkeys

Hardkeys cause the R&S NRP2 to return to a definite instrument state, provide access to the main settings and activate functions. Hardkeys are always available for use.

For further information on using the hardkeys see also [chapter 2.2, "Brief introduction to the operation"](#), on page 24, and especially on the setup keys (PRE)SET, FREQ and ZERO, see chapter "Instrument Functions" > "Main Settings" in the operating manual.

#### ↵ MENU



- as the "↵" key (i.e. Enter key), it is used to confirm entries in text fields and dialog boxes and to confirm selections in the drop-down lists.
- as the MENU key, it is used to fold out and fold back the menus next to the softkeys.

The function of the key is determined according to context – in other words, the ENTER or MENU function is always selected automatically for the operator by the instrument.

#### DEL / 1 TRIG



- the DEL key is used to delete numbers or text in a field so that a completely new entry can be made.

- as the 1 TRIG key, it enables and triggers single-shot measurements in the trace mode.

The function of the key is selected automatically according to context.

## ESC / LOCAL



- this key is used as an ESC key to escape from the entry mode in text boxes and drop-down lists. It is also used to close dialog boxes and menus without losing any entries that have been made, see [chapter 3.2, "Screen layout"](#), on page 51.
- as the LOCAL key, it is used to switch the R&S NRP2 from remote control mode (all controls disabled) to manual mode.

The key is automatically assigned its function according to context - in other words, there is no manual assignment by the operator.

## MODE



MODE opens the "Mode" dialog box to select and configure the measurement mode.

See also chapter "Instrument Functions" > "Data acquisition and parameters" > "Setting the measurement mode" in the operating manual.

## (PRE)SET



The (PRE)SET hardkey sets the R&S NRP2 to its default setting. Default settings are sensor specific.

The function can also be started with the "Preset" softkey in the file menu, described in the operating manual chapter "Instrument functions" > "Management of settings" > "Default setting".

## FREQ



FREQ sets the carrier frequency of the applied signal to obtain the specific measurement uncertainty.

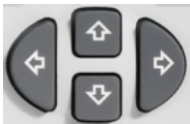
Find more information on the frequency dialog box in the operating manual, chapter "Instrument Functions" > "Main Settings" > "Frequency setting".

## ZERO



This function starts the autozero function, see also "Instrument Functions" > "Main Settings" > "Zeroing" in the operating manual.

### 1.5.2.3 Cursor keys



The cursor-key functions are context-sensitive. They are used to:

- select a menu
- select the active window
- move the cursor in text boxes
- change the value of an entry in a text box
- select an element from a drop-down list

Except of moving the cursor, the above mentioned functions can also be activated using softkeys.

### 1.5.3 On/Standby key and standby LEDs



The standby LEDs and the ON/STANDBY key are located in the bottom right corner of the front panel. The ON/STANDBY key toggles the R&S NRP2 between standby and ready state, indicated by the standby LEDs.

The standby LEDs indicate the current instrument state:

- **Yellow LED (AC supply)**  
The yellow LED indicates that the R&S NRP2 is power supplied and in standby mode.

- **Green LED (ON)**

The green LED indicates when the meter is on, i.e. ready for operation.

The possible operating states are:



The meter is off and disconnected from the AC supply.



The meter is on standby. The AC supply is connected and the power supply is operating correctly.



The meter is on and is being powered from the AC supply.

### 1.5.4 Connectors

To the left of the display, the R&S NRP2 provides a power reference signal connector and two sensor connectors.



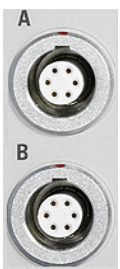
If option R&S NRP-B5 is installed, the R&S NRP2 offers two sensor ports at the rear. Thus, you can perform measurements with a maximum of 4 connected sensors simultaneously.

#### POWER REF



The POWER REF connector (option R&S NRP-B1/-B7, sensor check source) provides a high-precision sine signal with a power of 1 mW and a frequency of 50 MHz for checking the sensors. Option R&S NRP-B7 additionally comes with a pulse mode of the test signal with a modulation frequency of 10 kHz.

The generator is turned on and off in the System Settings dialog box, described in the operating manual, chapter "Instrument functions" > "System Settings" > "Sensor check source".



#### Sensor connectors

The front panel accommodates a maximum of two sensor connectors (for sensors A and B). Sensor connector B requires option R&S NRP-B2, second sensor input (B).



The power sensors are connected by inserting the male connector.

**Note:** You can not disconnect the sensor simply by pulling at the cable or the rear part of the connector. To disconnect pull the connector at its sleeve, which is marked with a red dot.

## 1.6 Rear Panel Tour

This section gives an overview of the control elements and the connectors on the rear panel of the R&S NRP2. Each element and connector is briefly described and a reference is given to the chapters containing detailed information.



**Fig. 1-4: Rear panel view**

- 1 = TRIG IN / OUT2 and OUT1 / TRIG OUT connectors
- 2 = ETHERNET interface
- 3 = USB interface
- 4 = IEC 625/IEEE 488 interface
- 5 = AC supply and power switch
- 6 = Sensor connectors (option R&S NRP-B5 or R&S NRP-B6)

## TRIG IN / OUT2 and OUT1 / TRIG OUT



The BNC connector OUT1 / TRIG OUT outputs an analog signal with a voltage between 0 V and 3.3 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 threshold monitoring.

If configured as trigger output, the trigger signal of a power sensor can be supplied. In this case, the power sensor must be set as trigger master.

The BNC connector TRIG IN / OUT2 can be used either as an external trigger input or as a second analog output.

The inputs/outputs are configured in the "System" menu, see the operating manual chapter "Instrument Functions" > "System Settings" > "Setting analog outputs".

## ETHERNET



The Ethernet connector is an RJ45 socket for remote controlling the R&S NRP2 via a network.

## USB



USB (**U**niversal **S**erial **B**us) interface of type B. This connector is used for remote control of the instrument (see chapter 'Connecting a controller to the base unit') and to update the firmware of the instrument by means of PC downloads (for more information, see the service manual, chapter 4).



### IEC 625/IEEE 488



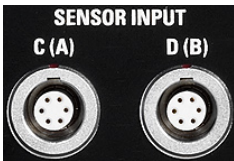
The IEC/IEEE bus connector to IEEE488 is used to remote control the R&S NRP2.

### AC supply and power switch



For detailed information on the AC supply, see [chapter 1.7, "Connecting the instrument to the AC supply"](#), on page 17 .

### Sensor connectors



Optional sensor connectors C and D (option R&S NRP-B5) can be installed at the rear panel. Alternatively, sensor connectors A and B can be retrofitted from front to rear panel (option R&S NRP-B6).

## 1.7 Connecting the instrument to the AC supply

The [AC supply and power switch](#) are at the rear of the unit.

When the R&S NRP2 is connected to the AC supply, it automatically sets itself to the correct range for the applied voltage (range: see type label). There is no need to set the voltage manually.

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, which is indicated by the color of the Status LED on the front panel.



*Fig. 1-5: AC supply connector at the rear of the meter*

- ▶ Connect the instrument to the AC power source using the AC power cable delivered with the instrument.

**Note:** The instrument is in compliance with safety class EN61010-1. Connect the instrument only to a socket with earthing contact.



### AC supply voltage

The R&S NRP2 can be operated from AC lines with a voltage range of 100 V to 240 V and a frequency range of 50 Hz to 60 Hz. Note that a restricted voltage range (100 V to 120 V) applies to 400 Hz networks.

## 1.8 Starting the R&S NRP2

### 1.8.1 Switching on

1. To turn the power on, press the main power switch at the rear to position I (On).



*Fig. 1-6: Power switch*

After power-up, the instrument is in standby or ready state, depending on the state of the ON/STANDBY key at the front panel of the instrument when the instrument was switched off for the last time.

2. Press the ON/STANDBY key to switch the instrument from the standby to ready state.



**Fig. 1-7: ON / Standby key**

green and yellow = ready for operation

yellow = standby, AC supply is connected and power supply is operating correctly

off = off and disconnected from the AC supply

## 1.8.2 Startup

- ▶ Press the ON/STANDBY key to switch to ready state. The R&S NRP2 initiates its startup procedure, i.e. it boots the operating system, automatically performs a selftest and starts the instrument firmware. If the previous session was terminated regularly, the instrument uses the last setup with the relevant instrument settings.



Use the (PRE)SET key to return the instrument to its definite reset/preset state, if the current setup is no longer relevant.

To customize the start settings use the "File" dialog box, see "Instrument Functions" > "Management of Settings" in the operating manual.

### 1.8.2.1 Start screen

Immediately after turning on the start screen appears, and the R&S NRP2 provides short-term access to the boot menu and the firmware update menu.

The bootmenu provides service and system functions, e.g. resetting the internal memory, see chapter 'Error Messages'.

For further information on the firmware update see firmware release notes on the R&S website available for download: <http://www.rohde-schwarz.com/product/NRP2.html>.

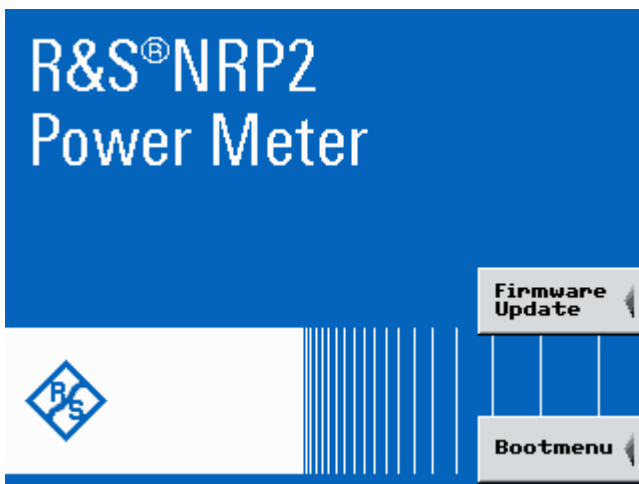


Fig. 1-8: Start screen with access to Firmware Update and Bootmenu

### 1.8.2.2 Function check

After switch-on, the R&S NRP2 performs a function test. The contents of all non-volatile memories, the RAM and the addressability of the interfaces are checked. Messages indicate the options the instrument is equipped with.

The R&S NRP2 checks the following functions:

- Function test on the RAM
- Function test on the keyboard controller
- Addressability check on the keypad
- Addressability check on the test generator.  
This test is performed if the instrument is equipped with option R&S NRP-B1/B7, sensor check source.
- Addressability check of the sensor channels  
Depending on the number of installed sensors, the displayed icon varies:



Fig. 1-9: Connected sensors (symbols)

- One of the sensor boxes shown on the left bottom of the icon represents a sensor connected at channel A, i.e. the instrument is single channel.
- Two sensor boxes indicate that channels A and B are connected, fitted at the front panel (requires option NRP-B2, the second measurement input).

## Starting the R&amp;S NRP2

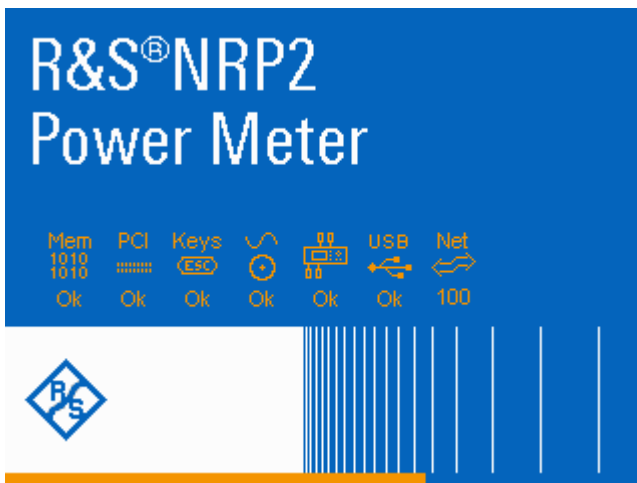
- Accordingly, one or two sensor boxes shown on top indicate that channels A and B are fitted at the rear panel with option NRP-B6, sensor connectors A (B).
- Four sensor boxes indicate that the meter supports channels A to D, option NRP-B5, 3rd and 4th measurement input.
- Addressability check on the USB interface
- Addressability check of the Ethernet interface

The instrument performs a test on the Ethernet interface, and displays the transmission rate, e.g. **100**. When finished, the instrument displays the result under the network icon, i.e. "OK" indicates that the interface can be addressed.

If the R&S NRP2 is not connected to a network hub or if a connection cannot be established during booting, the message **NC** (Not Connected) is displayed instead of "OK". It is however possible to establish a network connection later on at any time.

### Results display of the function test

The R&S NRP2 shows the progress of the tests in a colored (orange) progress bar. The tests are completed when the bar has reached the end of the screen and all symbols are shown. The instrument indicates the result of each test underneath the respective symbol.



**Fig. 1-10: R&S NRP2 welcome screen with function test results and progress bar**

Mem	= function test on the RAM
PCI	= function test on the keyboard controller
Keys	= addressability check on the keypad
~ ⊙	= addressability check on the test generator

(instrument icon) = addressability check on the interfaces for the sensor channels

USB = addressability check on the USB interface

Net = addressability check of the ethernet interface

Successful tests are confirmed with **Ok** ("OK", orange colored), and recognized malfunctions with **Failed** ("Failed", red colored).

Some tests respond with further information, messages or actions:

- If any interface error occurred, the boot process stops after completion of all tests. It may be continued by pressing the ESC hardkey.

Press ESC to continue

- During the test of the network connection, additional information is provided, as described above.
- If an error is detected when the non-volatile memory containing instrument settings is checked, an error message is displayed when booting is completed.

Nonvolatile RAM is empty  
or failure of EEPROM  
occured.

Close: [← MENU]

The non-volatile memory is then re-initialized completely and the R&S NRP2 goes into the preset state. All instrument settings that have been saved are lost as a result of this procedure.

### 1.8.3 Shutting down the meter

Whenever the meter is switched off, its settings are saved. The next time it is switched on, these settings are automatically restored.

- ▶ Press the ON/STANDBY key to save the current setup, shut down the operating system and set the instrument to standby state.



#### Switching off the AC power

You can leave the AC power on permanently to preserve your last instrument settings. Switching off is required only if the instrument must be completely disconnected from all power supplies.



## 2 Getting Started

This chapter introduces the main functions and settings of the R&S NRP2, by means of some basic power measurement examples.

Included topics:

- [Brief introduction to the operation, on page 24](#) provides a quick introduction on how to operate the instrument.
- [Preset and zeroing, on page 27](#) explains how to set the R&S NRP2 and the R&S Power Sensors to defined initial states.
- [Measuring average power \(Cont Av mode\), on page 29](#) introduces standard power measurement with the R&S NRP2.
- [Window handling, on page 37](#) and [Setting measurement functions, on page 42](#) explains the basic techniques for configuring result windows.
- [Graphically representing power versus time, on page 44](#) represents graphically the time characteristics in "Trace & Statistics" mode.
- [Measuring average burst power \(Burst Av mode\), on page 48](#). enables you to perform a measurement of burst power without external triggering.



Some of the sections later on in this chapter assume familiarity with the basic operating techniques which are introduced in the first sections. It is, therefore, advisable to go through these sections first before considering other topics.

An in-depth description of the operation of the instrument is described in [chapter 3, "Manual Operation"](#), on page 51.

### 2.1 Requirements

- Read the notes on putting the meter into operation in [chapter 1.1, "Notes on putting into operation"](#), on page 5.
- A single-channel R&S NRP2 is sufficient for most of the examples used in the sequel. However, if you want to work through all the steps in [chapter 2.6, "Setting measurement functions"](#), on page 42 you will need a dual-channel instrument.

- Any sensor of the R&S NRP-Zx series is suitable.
- A signal source is required for the following measurements. It is best to use a signal generator whose level can be adjusted. If a generator of this type is not available, the R&S NRP2's integral power reference (option R&S NRP-B1/-B7) can be used instead.



### Recommended first steps

Before you set up a new measurement, we recommend that you preset the R&S NRP2. Thus, the instrument is in a defined initial state. This prevents any previous settings from causing incorrect results. In addition, a zero calibration of the sensors is required. Follow the steps in [chapter 2.3, "Preset and zeroing"](#), on page 27.

## 2.2 Brief introduction to the operation

The R&S NRP2 can be operated intuitively via the hardkeys and the interactive display with the associated softkeys. All menus and dialog boxes are in the form of windows that can be operated in the same way. The hardkeys and softkeys allow direct and therefore convenient access to entries and settings.

The clear-cut display shows the power measurement results of up to 4 power measurements simultaneously. Results can be displayed digitally or graphically, either by an analog meter or, depending on the measurement mode, in a trace diagram.

This section briefly describes the concept of manual operation of the power meter in order to perform the test examples with the instrument, described later on in this chapter.



For a detailed description on the controls, the screen layout and how to operate the R&S NRP2, refer to [chapter 3, "Manual Operation"](#), on page 51.

### Using the hardkeys



- hardkeys are always available for use.
- according to its label, a hardkey directly activates a function.
- if two functions are provided in one hardkey, e.g. "↵ Menu", the context determines the currently active function. The respective function is selected automatically by the instrument.  
See [chapter 1.5.2.2, "Hardkeys"](#), on page 11 for information concerning assignment and the respective functional description of the hardkeys.

A highlighted menu item corresponding to one of the hardkeys, indicates that the function can be started either by the softkey or the associated hardkey, as shown in the example with "Preset".



## Using the softkeys



To quickly allocate the softkey to a menu item, all the menus open directly next to the softkey bar, i.e. on the right side of the display.



The six softkeys perform the functions that are indicated in the active menu or dialog box. Located at the right edge of the display, the functions in a line are assigned to the corresponding softkey.

As a special feature, sometimes two or more functions are assigned to one softkey. In this case the softkey operated as a rocker switch, see the following examples:

Two functions are associated with one softkey. In the example, the two functions are position ("Pos.") and scale ("Scale"), "Scale" is selected

- ▶ To select function "Pos." press the left-hand side of the rocker switch.



Now setting the position with the cursor keys is possible

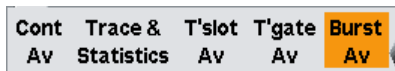
Several functions are associated with one softkey. In the example, the different sensor modes are offered, "T'slot Av" is selected.



1. To select another function to the left, e.g. "Trace & Statistics", press the left side of the softkey ↓,

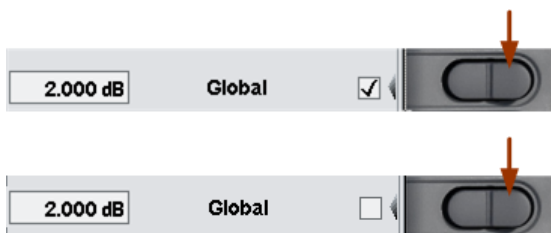


2. or to select another function to the right, e.g. "Burst Av", press the right side of the softkey ↓(in this case twice).



## Check boxes

- ▶ To toggle between the two states of "Global" press the right side of the softkey.



Note: The left side of the softkey activates the entry of the "Global" value, see below 'Entry fields'.

## Entry fields

1. Activate the entry field using the associated softkey.

The activated entry field is marked by a yellow frame. The position in the value to be changed is inverted.



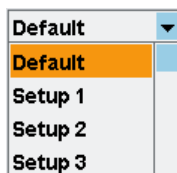
A digit (or a letter) panel appears on the right side of the display.



2. Select the position to be changed using the cursor keys  $\leftarrow$   $\rightarrow$ .
3. To change the entry at the marked position, either
  - a) select the digit in the panel using the associated softkey.
  - or
  - b) increase / decrease the value using the cursor keys  $\uparrow$   $\downarrow$
4. Confirm the selection with the  $\leftarrow$ MENU hardkey or reject with ESC hardkey.

## Lists

1. Select the function by selecting an item in a list using the associated softkey.  
The list folds out.



2. Select the item using the softkey associated with list or the  $\uparrow$   $\downarrow$  cursor keys.
3. Confirm the selection with the  $\leftarrow$ MENU hardkey or reject with ESC hardkey.

## 2.3 Preset and zeroing

### Preset

If the instrument is switched on, it is not the preset state that is active, but rather the instrument state that was set when the instrument was switched off. To prevent any previous settings from causing incorrect results, it is recommended that you set the R&S NRP2 and the R&S Power Sensors to defined initial states.

To preset the R&S NRP2

1. Press the (PRE)SET hardkey.



The "File" menu appears.



*Fig. 2-1: File menu*

2. Press the (PRE)SET hardkey again or press the "Preset" softkey.

All parameters and switching states are preset, also those of inactive operating modes. When the preset is completed, the "File" menu disappears and the meter is in the preset state. The preset settings provide a reproducible initial basis for all other settings.

For a detailed description of the R&S NRP2's initial state including a list of default parameters, see chapter "Instrument Functions" > "Main Settings" > "Preset hardkey" in the operating manual.

## Zeroing

Zeroing should be performed whenever necessary. As a rule of thumb, this is the case for measurements of power values less than a 1000 fold of the zero offset and after the sensor has reached its operating temperature.



Turn off all test signals before zeroing. An active test signal during zeroing causes an error.

## To zero the meter

1. Connect the sensor to a signal source
2. Switch off the power

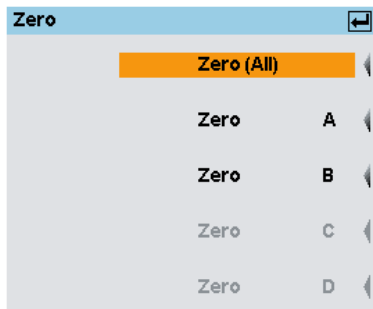


## Measuring average power (Cont Av mode)

- Press the ZERO hardkey.



The "Zero" dialog box is displayed.

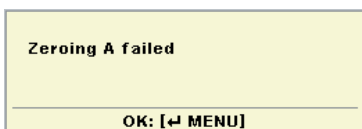
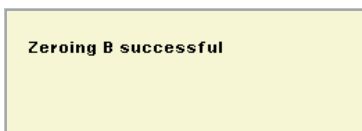


**Fig. 2-2: Zeroing dialog box**

- Press the ZERO hardkey again to perform zeroing of all connected sensor channels ("Zero (All)") or press the appropriate softkey to select a specific sensor for zeroing.

Zeroing of all connected sensors is performed.

The correction measurement takes several seconds. When completed, the R&S NRP2 displays a message indicating success or failure of zeroing.



If zeroing fails, the most frequent cause for this error is a signal that is applied to the sensor and prevents zeroing.

## 2.4 Measuring average power (Cont Av mode)

In the following example for measuring the average power the following steps are performed:

- Setting up the measurement
- Setting the frequency

- Setting the unit for the measurement result
- Setting a fixed offset correction
- Performing a relative power measurement
- Checking the settings with full height window
- Selecting the display mode
- Selecting the indication of auxiliary values

## Setting up the measurement

### To set up the measurement

1. Put the R&S NRP2 into operation as described in [chapter 1, "Putting into Operation"](#), on page 5 and connect a sensor to connector A.
2. Preset the R&S NRP2 and execute Zero A.  
After preset, one result window indicates the result (in dBm) obtained with sensor A.

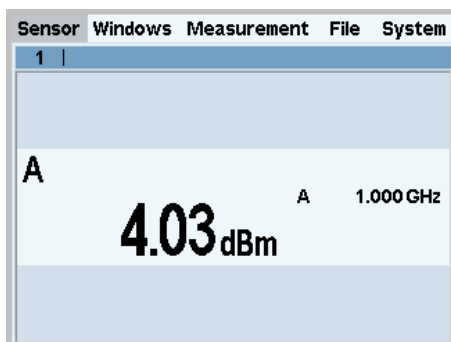


Fig. 2-3: Result window (dBm)

### Setting the frequency

The R&S NRP2 must be set to the carrier frequency of the applied signal if the specified measurement accuracy is to be reached.

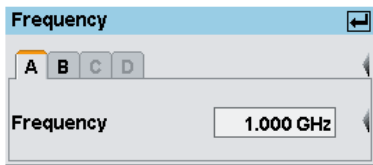
### To set the frequency

1. Connect an unmodulated signal with a level between  $-10$  dBm and  $+10$  dBm to the sensor.
2. Press the **FREQ** hardkey.



## Measuring average power (Cont Av mode)

The dialog box for entering the frequency appears.



**Fig. 2-4: Frequency dialog box**

3. Press the associated softkey to activate the entry of the frequency value. A digit panel is displayed to insert the frequency. The panel also includes unit letters.



4. Clear the field with the DEL/1TRIG hardkey.
5. Enter the signal frequency by pressing the associated softkeys.
6. Select the unit by using the "UNIT" softkey.



**Tip:** Alternatively you can use the cursor keys to set a value. To get familiar with the editor, try the following steps. In this example the overwrite mode (default mode) is active:

- Use the LEFT/RIGHT  $\leftarrow \rightarrow$  cursor keys to move the block cursor and overwrite the digits with new values.
- Use the UP/DOWN  $\uparrow \downarrow$  cursor keys to increase/decrease the digit value at the cursor position.
- Move the insertion mark to the right onto the units. Use the UP/DOWN cursor keys to change the unit.

7. Press the  $\leftarrow$ MENU hardkey twice to confirm your entry and exit the "Frequency" dialog box.

### Setting the unit for the measurement result

The measurement result is indicated in the result window. The unit of the measurement result can be changed.

## Measuring average power (Cont Av mode)

To set the unit of the measurement result

1. Use the topmost softkey to select the "Measurement" menu.

Sensor Windows **Measurement** File System

The menu opens. Post-processing of the measurement can be set in the "Measurement" menu.



Fig. 2-5: Measurement menu

2. Select the unit "W" using the associated softkey.

The result is displayed in W.

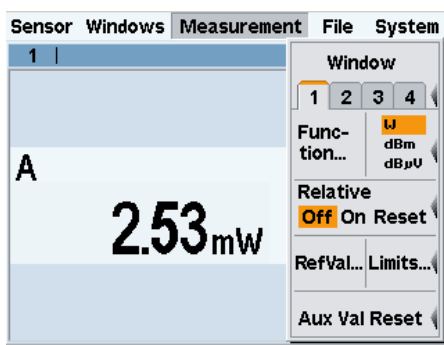


Fig. 2-6: Result window (W)

### Setting a fixed offset correction

The R&S NRP2 provides an offset correction to the displayed measurement result.

#### To set a fixed offset correction

1. Select the "Sensor" menu.

Sensor Windows Measurement File System

The "Sensor" menu opens.

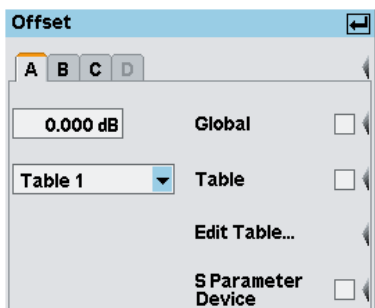


**Fig. 2-7: Sensor menu**

All sensor-related settings are made in the "Sensor" menu. It determines type and details of data acquisition.

2. Press the left side of the "Offset..." softkey.

The "Offset" dialog box opens. Offsets in dB for compensating external signal losses or gains, for example by attenuator or amplifiers, can be set in this dialog box.



**Fig. 2-8: Offset dialog box**

3. Activate the entry for the global offset.  
Positive values are for correcting losses and negative values for gains.
4. If you have an attenuator at hand, enter its value and connect the attenuator between the sensor and the signal source, otherwise just enter 10 dB.
5. Confirm the entry with ↵MENU.
6. Activate the global offset correction by pressing the right side of the associated softkey.

## Measuring average power (Cont Av mode)

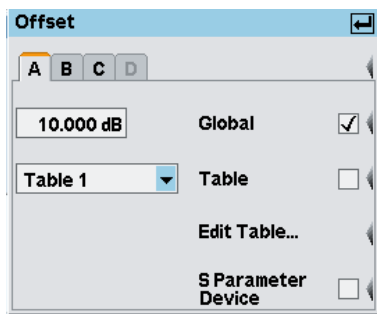


Fig. 2-9: Offset dialog box / Global activated

**Tip:** Factors which are not, or only minimally, depending on frequency can be corrected in this way.

7. Press the  $\leftarrow$ MENU hardkey twice to exit the dialog box and the menu.

If you have connected an attenuator and entered its attenuation, the R&S NRP2 will display about the same value as before.

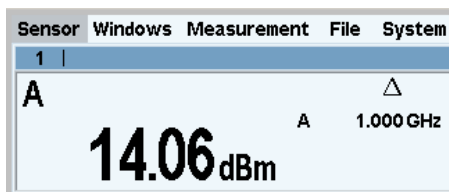


Fig. 2-10: Result window / Offset

In the note line of the result window, the  $\Delta$  symbol indicates that global offset correction is active.

## Performing relative power measurements

The R&S NRP2 calculates and displays also the relative difference between a measured value and a reference value. The reference value can be a measured value that has been saved or an arbitrary value that is entered.

1. Select the "Measurement" menu.



2. Open the "Measurement" menu with  $\leftarrow$ MENU.

## Measuring average power (Cont Av mode)



Fig. 2-11: Measurement menu

- To activate the relative mode, press the right side of the softkey next to "Relative".



As the default setup was loaded in step 1, the value relative to 0 dBm is displayed.

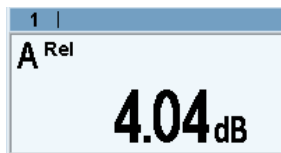


Fig. 2-12: Result window / Relative

- Press the right side of the softkey next to "Relative" again.



"Reset" will set the current power result as new reference value. After the reset, relative measurement is automatically active again.



If the power has not changed in the meantime, the indicated value is close to 0 dB.



Fig. 2-13: Result window / Reset relative

- If an attenuator is still connected, remove it now and connect the sensor directly to the signal source.



## Measuring average power (Cont Av mode)

The displayed value should now equal the offset that has been entered.

### Checking the settings with full height window

1. Select and open the "Windows" menu.

Sensor **Windows** Measurement File System

The "Windows" menu contains all the functions required for opening, closing and configuring windows.



Fig. 2-14: Window menu / Digital

2. Check if window 1 has been selected.
3. Press the "Expand" softkey.

Window 1 now expands to full size below the menu bar and displays all relevant settings:

- measurement modes of contributing channels (A (ContAV))
- Trigger mode (auto)
- averaging number and mode (32 Auto)
- Offset (10 dB)
- S parameter device (none)
- duty cycle correction (none)

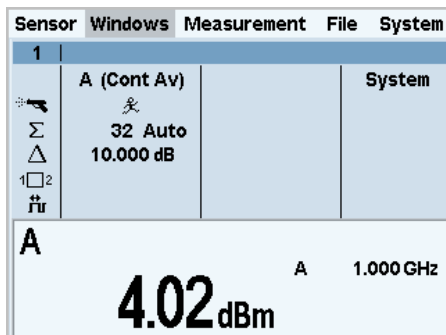


Fig. 2-15: Result window / key measurement parameters

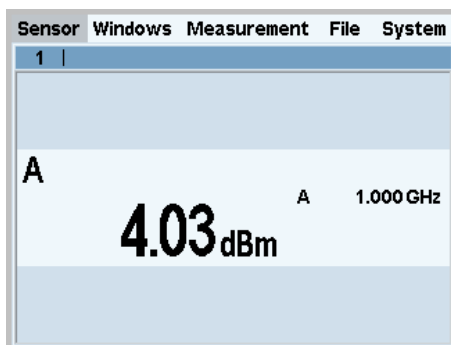
- To return the window to its normal size, open the "Windows" menu with the ↵MENU hardkey and press the "Arrange" softkey.

## 2.5 Window handling

Up to four windows can be indicated simultaneously on the R&S NRP2's display. Each window can be configured for a separate measurement. The following examples show how to handle windows.

### Opening, expanding and closing windows.

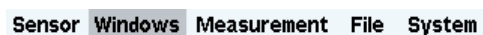
- Press the (PRE)SET hardkey twice.



*Fig. 2-16: Result window*

A display window indicating the result (in dBm) from sensor A appears.

- Select the "Windows" menu with the topmost softkey or the cursor keys.



The "Window" softkey selects the window. The settings in the "Windows" menu and in the "Measurement" menu are valid for the selected window.



*Fig. 2-17: Windows menu*

The cursor keys can, in most cases, be used to select windows instead of the softkeys. This also applies to opened dialog boxes.

3. Select window 1.

The third softkey is now labeled "Close | Expand".

4. Press the right side of the softkey to expand the window.

The window expands to occupy the full display height and indicates all parameters relevant to the measurement.

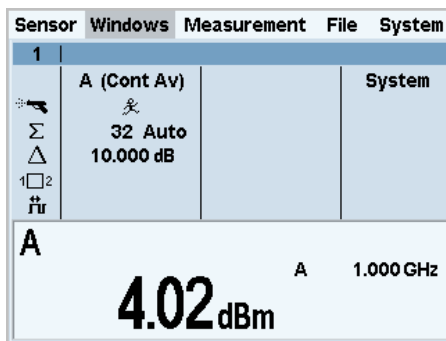
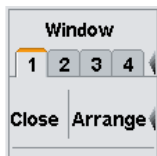


Fig. 2-18: Result window / Dig

5. Open the menu again.

"Arrange" now replaces "Expand". This function arranges all opened windows.



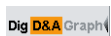
6. Press the "Arrange" softkey.

Window 1 returns to its previous size.

The following steps show the difference between the "Open" and "Init" functions. You first have to change two settings of window 1.

### Opening, creating and closing windows.

1. Activate the analog display of results "D&A".

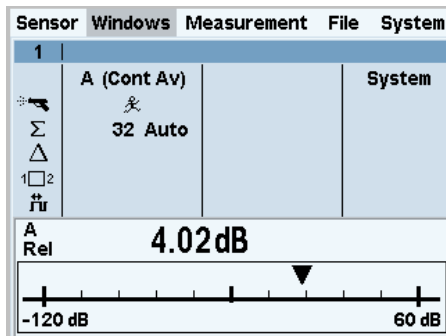


2. Switch to the "Measurement" menu and select "Relative On".



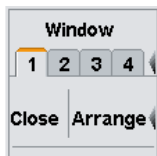
- Return to the "Windows" menu.

Window 1 now displays the "A Rel" function on an analog scale.



*Fig. 2-19: Result window / D&A / full height*

- Now, close window 1 with the "Close" softkey.



The "Window" menu shows that window "1" is still selected. The labeling next to the third softkey is now "Open | Init".

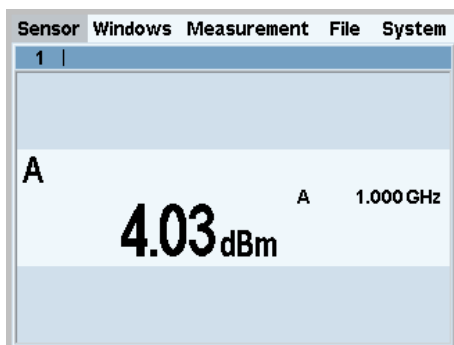


- Press the "Open" softkey.

The appearance of the window has not changed, and all window-specific settings have been maintained.

- Close window "1" again with "Close".
- Open it this time with "Init"

The window again displays the measurement function A in digital format. In contrast to "Open", where the settings remain unchanged, "Init" sets all the parameters to their default values. "Init" only resets the window settings made in the "Windows" and "Measurement" menus, but it does not affect the sensor settings!



*Fig. 2-20: Result window / initialized / full height*

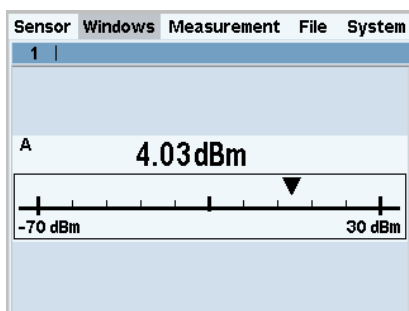
## Display options

1. The "Dig" and "D&A" softkeys are used to select the display mode. The standard display mode is "Dig"ital measurement result.



*Fig. 2-21: Windows menu / digital display mode*

2. Select the "D&A" display mode. Window "1" now shows an analog scale and a digital reading.



*Fig. 2-22: Result window / analog meter / full height*

The menu now includes the new item "Analog Meter..." for setting the scale limits.

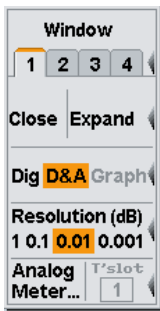


Fig. 2-23: Windows menu / digital and analog display mode

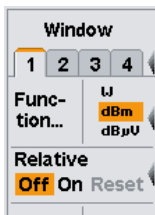
3. Switch back to "Dig" display mode.

### Auxiliary values (Maximum, Minimum, Max, Min, ...).

1. Select the "Measurement" menu.



2. Select "Function..." in this menu.



The measurement function, unit of the measurement result, sensors used and the auxiliary values can be selected in the "Function & Unit" dialog box.

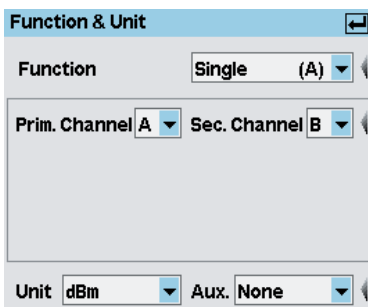
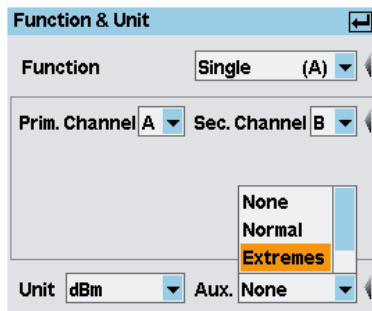


Fig. 2-24: Function & Unit dialog box

3. Open the "Auxiliaries" drop-down list.



**Fig. 2-25: Function Unit dialog box / auxiliaries**

4. Select "Extremes".
5. Close the dialog box.
6. Select the "Measurement" menu and restart the search for the extreme values with "Aux Val Reset".

The updated maximum, minimum and max-min are now displayed to the right of the measured value.



**Fig. 2-26: Result window / auxiliaries / half height**

Maximum and minimum should be close to the measurement result, the max-min value therefore slightly more than 0 dB.

If you reduce the signal power, the maximum should remain the same, whereas the minimum value tracks the measurement result. The max-min values rise correspondingly. However, if the signal power is increased, the maximum value tracks the measurement result as soon as the stored maximum is exceeded.

## 2.6 Setting measurement functions

An R&S NRP2 with two sensors connected is required for this section. If only one sensor is available, you can only select the measurement function "Single".



## Performing ratio measurements

1. Connect the two sensors to connectors A and B on the R&S NRP2 and apply an unmodulated signal with a level between  $-10$  dBm and  $+10$  dBm to each of the sensors.
2. Press the (PRE)SET key twice.  
A window for each sensor is opened with (PRE)SET. The windows indicate the results (in dBm) from sensors A and B.

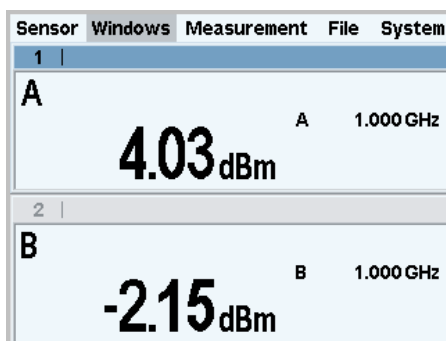
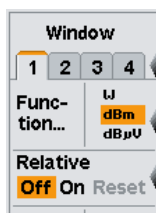


Fig. 2-27: Result windows / sensor A and B

3. Select the "Measurement" menu and then select "Function..." for window 1 of this menu.



4. Open the "Function & Unit" dialog box.

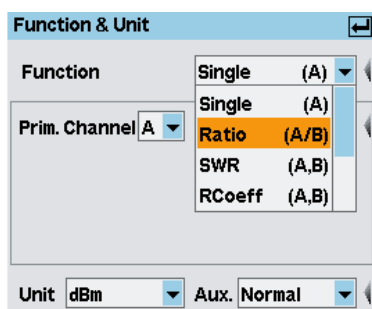


Fig. 2-28: Function & Unit dialog box / ratio

Graphically representing power versus time

In this dialog box, you can select the function used to calculate the result in the selected window. For example, "Ratio (A/B)" yields the quotient from the measured power values in channels A and B.

5. Select "Ratio (A/B)" from the drop-down list for the measurement function and close the drop-down list with  $\leftarrow$  MENU.
6. Now, press the "Unit" softkey.

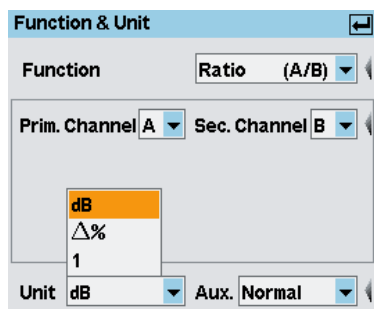


Fig. 2-29: Function & Unit dialog box / unit

The ratio of two powers is dimensionless – this is why only "dB", "Δ%" and "1" are available in the unit list. The symbol "Δ%" represents the difference between the power values in W, given in % (0 % means the powers in both channels are equal). The symbol "1" represents the quotient of the power values in W, i.e. not the log of a ratio.

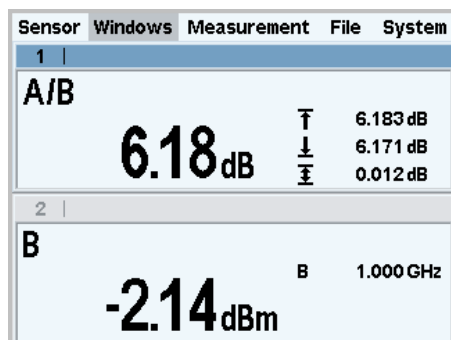


Fig. 2-30: Result windows / sensor A and B

## 2.7 Graphically representing power versus time

In the "Trace & Statistics" mode, power versus time can be represented graphically as with an oscilloscope. If you wish to carry out measurements on signals with modulated power envelope (in the Burst or Timeslot mode), initially display-

Graphically representing power versus time

ing the signal in the Trace mode is always recommended. Stable triggering by the R&S NRP2 can more easily be accomplished in this mode.

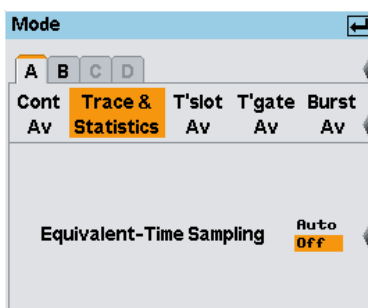
### Setting the "Trace & Statistics" mode.

1. Connect a power sensor of the R&S NRP-Z1x, R&S NRP-Z2x or R&S NRP-Z8x family to connector A of the R&S NRP2.
2. Apply an amplitude-modulated or pulsed signal having a modulation frequency or pulse frequency of approx. 1 kHz. The maximum level should be between  $-10$  dBm and  $+10$  dBm.  
A pulse with  $250\mu\text{s}$  width, a period of 1ms, and 4dBm is used in the following example.
3. Press the (PRE)SET hardkey twice.  
A measurement window appears.
4. Change to the "Sensor" menu and select "Mode".



*Fig. 2-31: Sensor menu*

5. Switch to the "Trace & Statistics" mode.

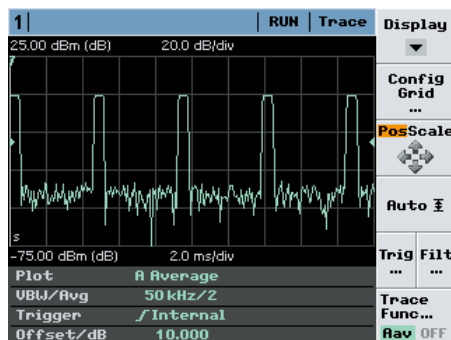


*Fig. 2-32: Trace & Statistics measurement mode*

6. Close the "Mode" dialog box.
7. Close the "Sensor" menu.


Graphically representing power versus time

The window is now in the "Trace & Statistics" display mode and shows the "Trace" page.



**Fig. 2-33: Trace representation of a pulsed signal**

The info panel at the bottom of the window shows all parameters relevant for the display.

**Note:** If you do not see a trace, the trigger threshold probably does not match the signal. In this case, a highlighted  appears in the info panel of the trace window. Continue with the next step to set the trigger threshold.



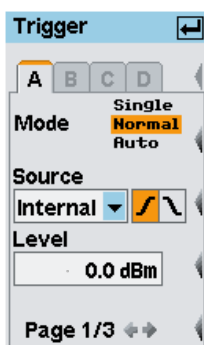
Further measurement modes can be selected via the "Display" softkey.

Based upon the trace display, gates, timeslots, and markers can be added for further analysis. Automatic pulse measurements can be carried out and a statistic analysis of the power envelope can be performed.

## Settings for reliable triggering

1. Press the "Trigger" softkey in the trace display.

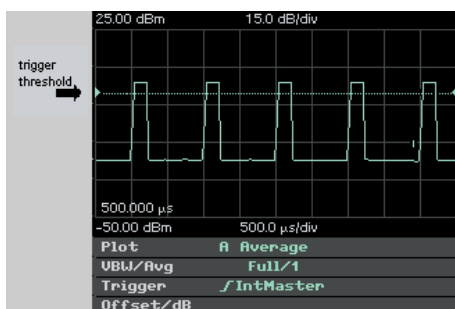
The "Trigger" dialog box opens.




**Fig. 2-34: Trigger dialog box, page 1**


A dotted line indicates the trigger threshold in the diagram.

Graphically representing power versus time

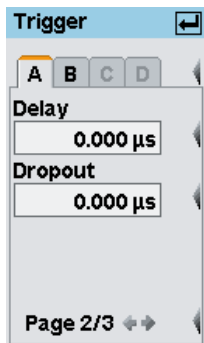


**Fig. 2-35: Trace display / trigger threshold**

2. Select the "Normal" trigger mode.
3. Select internal triggering ("Source" = "Internal")
4. Set the positive  trigger slope.
5. Set the trigger threshold in the "Level" entry field.

**Tip:** A  in the info panel shows, that the sensor doesn't trigger. In this case use the DEL/1TRIG hardkey in order to manually trigger the sensor once, and set the trigger settings accordingly.

6. Open the second page of the "Trigger" dialog box.



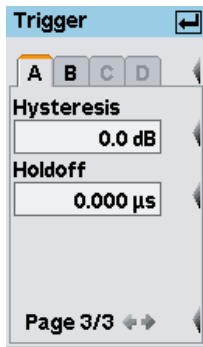
**Fig. 2-36: Trigger dialog box / page 2**

7. Set the trigger delay time. If you set a positive value, the trigger event will become effective only after the selected period of time. The displayed trace will be shifted to the left.  
In the "Trace & Statistics" display, the physical and the delayed trigger time has been made visible in the form of small triangles, thus allowing an interactive adaptation of the "Delay" parameter to the signal, see [chapter 3.6.2, "Special symbols"](#), on page 62.
8. Enter a "Dropout" value.

## Measuring average burst power (Burst Av mode)

The dropout time prevents the trigger system from being activated by signal excursions prior to the trigger event targeted.

9. Scroll to the third page of the "Trigger" dialog box.



*Fig. 2-37: Trigger dialog box / page 3*

10. Set a "Hysteresis" value.

Setting the trigger hysteresis to a value other than 0 dB will prevent triggering from occurring again until the measurement level has fallen below the trigger threshold by at least this value.

11. Define a "Holdoff" time.

This parameter allows you to set the period of time during which further trigger events (measured from the last successful triggering) should be ignored.



For a detailed description of these parameters, refer to chapter "Instrument Functions" > "Data acquisition and parameters" > "Trigger Settings" of the operating manual.

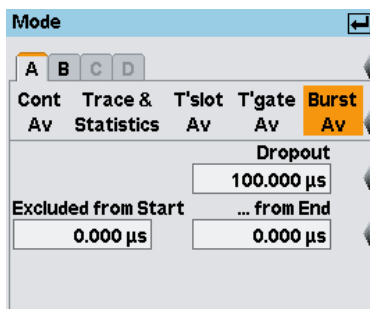
## 2.8 Measuring average burst power (Burst Av mode)

An R&S NRP-Z1x, R&S NRP-Z2x(x), or R&S NRP-Z8x sensor is required for this measurement.

To perform a burst-average power-measurement, you need a pulsed RF signal. If you use an R&S NRP-Z1x or R&S NRP-Z2x(x) sensor, the pulse repetition frequency of the signal should not exceed 10 kHz.

### Setting the burst mode.

1. Connect the power sensor to connector A on the R&S NRP2 and apply a pulsed signal with a level between  $-10$  dBm and  $+10$  dBm.
2. Press the (PRE)SET hardkey twice.  
A measurement window is now available.
3. Change to the "Sensor" menu and select "Mode".  
The "Mode" dialog box opens.
4. Select "Trace & Statistics".
5. In the trace mode check that the sensor detects a signal and reliably triggers.  
For information concerning reliable triggering see [chapter 2.7, "Graphically representing power versus time"](#), on page 44.
6. Change back to the "Sensor" menu and select "Burst Av" in the "Mode" dialog box.



**Fig. 2-38: Mode dialog box / Burst Av**

The burst mode parameters are displayed at the bottom of the dialog box. To exclude the pulse build-up and decay phases from the measurement, you can set the "Excluded from Start" and "...from End" parameters accordingly.



## Measuring average burst power (Burst Av mode)

The parameter "Dropout" helps to reliably detect the end of modulated-signal bursts (e.g. NADC). With unmodulated pulses as in this case, it should be set to 0.

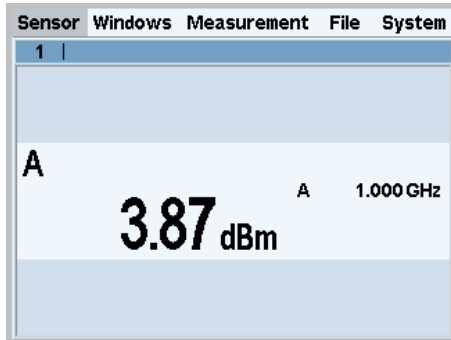


Fig. 2-39: Burst av result window



For a detailed description of burst av power measurement, see the operating manual, chapter "Instrument Functions" > "Data acquisition and parameters" > "Setting the measurement mode" > "Measuring the average power of burst signals".

The power of burst can be measured also by means of timegates. In contrast to the burst mode which automatically detects the burst end, the length and position of the gate over time must be exactly defined.

## 3 Manual Operation

This chapter describes the controls, displays, etc, the screen layout and how to operate the R&S NRP2.

### 3.1 Keys

Keys on the front panel of the meter are used to manually operate the instrument. There are several groups of keys, each group having a different function.



#### For more information on keys...

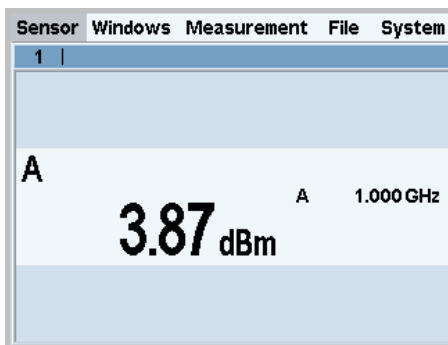
According to their functionality, keys are described in several sections of the R&S NRP2 documentation. See:

- [Front panel - keys \(hard-, soft- and cursor\), page 10](#) for information on the keys located at the front panel.
- [Brief introduction to the operation - key handling, page 24](#), providing a brief introduction on how to operate.
- chapter "Instrument Functions" > "Main Settings" in the operating manual for information on the setup keys **FREQ**, **(PRE)SET** and **ZERO**.
- [Softkey - manual operation > Menu handling, page 56](#)
- [Dialog boxes and their control elements, page 57](#)

### 3.2 Screen layout

The R&S NRP2 screen displays the menu bar with the menu names and at least one or more measurement result window. The folded-out menu and the setting dialog boxes may overlay the result windows.

## Result window



*Fig. 3-1: Screen layout / result window*

The R&S NRP2 displays results in windows. A maximum of four windows can be displayed simultaneously on the screen. They are numbered 1 to 4. Windows have a title bar which contains the number (fixed) and, optionally, the window name (user-definable).

Windows do not have any control elements.

## Menu bar



*Fig. 3-2: Screen layout / menu bar*

A menu bar is always displayed at the top of the screen. It contains the menu names. The active menu is highlighted.

## Selecting the active menu



*Fig. 3-3: Screen layout / selecting the active menu*

Select the active menu:

- ▶ Press the right or left side of the topmost softkey one or more times. Alternatively you can also use the cursor keys  $\leftarrow$   $\rightarrow$ .

## Folding menus out or in

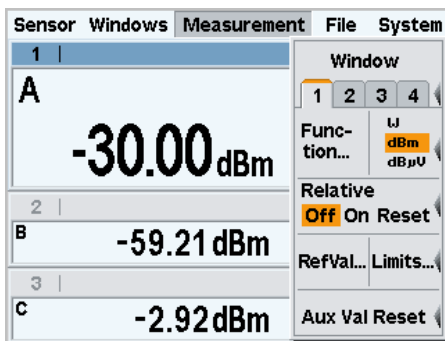


Fig. 3-4: Screen layout / measurement menu folded out

Fold out/in the active menu:

1. Press the  $\leftarrow$  MENU hardkey to fold the menu out.
2. Press the  $\leftarrow$  MENU hardkey again to fold the menu in.

The menu also folds out automatically if another menu is selected.



To quickly allocate the associated softkey to a menu item, all the menus open directly next to the softkey bar, i.e. on the right side of the display; this is against usual PC convention with menus drop-down directly below the menu name.

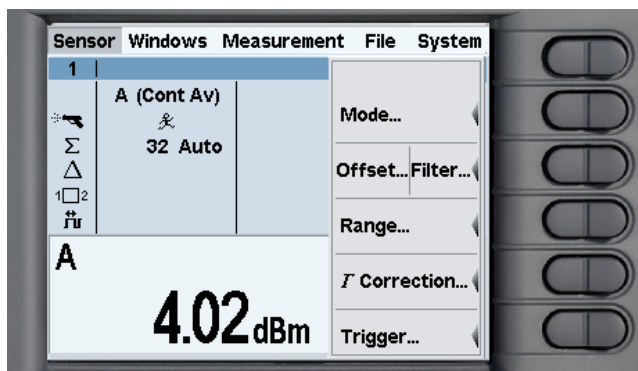


Fig. 3-5: Screen layout / menus next to the rocker switches

See [chapter 3.4, "Menu handling"](#), on page 56 for more information on operating the menu functions.

### Dialog boxes

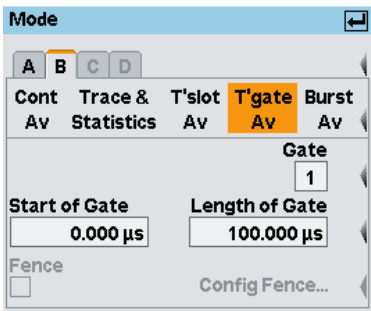


Fig. 3-6: Screen layout / dialog boxes

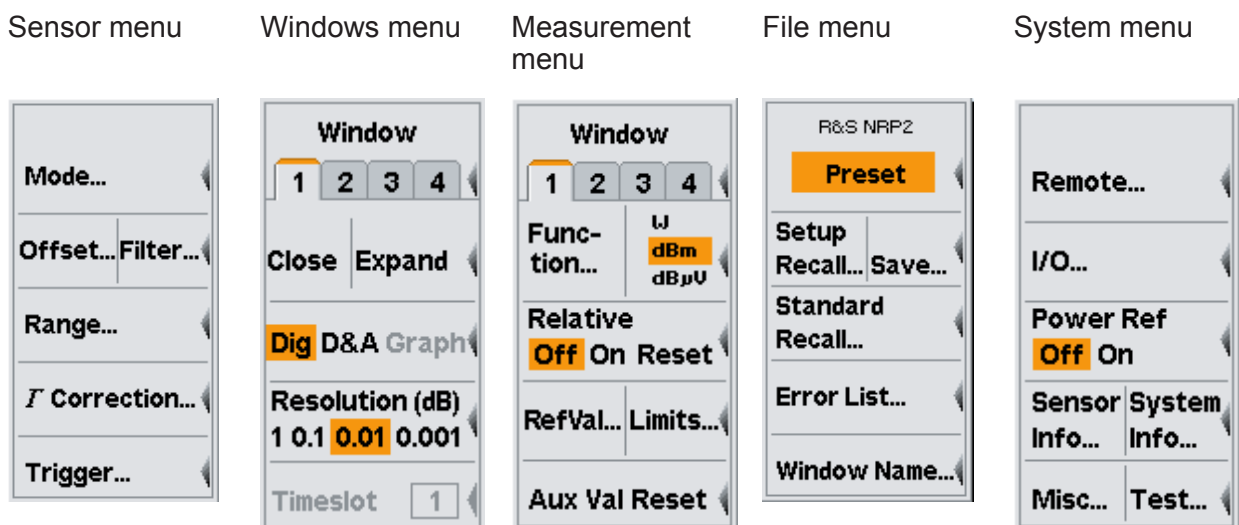
Dialog boxes can be opened from the menus. The dialog boxes display a group of related parameters that can be set.

See [chapter 3.5, "Dialog boxes and their controls"](#), on page 57 for more information on operating the dialog box functions.

## 3.3 Menu layout

This section describes the menu provided by the R&S NRP2. The meter displays the menu names in the menu bar at the top of the screen. The menus are selected by the top-most rocker switch. The following figure shows the main menus of the R&S NRP2, which are then briefly summarized.

The menu functions are described in the operating manual, chapter "Instrument functions".



### Sensor menu

All sensor settings can be made using the "Sensor" menu. The type and details of data acquisition can be specified with this menu.

Refer also to "Instrument Functions" > "Data acquisition and parameters" in the operating manual for a detailed description of the "Sensor " menu.

### Windows menu

The "Windows" menu is used to configure windows and the result display in the windows.

Refer also to "Instrument Functions" > "Displaying measurement results" in the operating manual for a detailed description of the "Windows" menu.

### Measurement menu

The details of postprocessing are summarized in the "Measurement" menu.

Refer also to "Instrument Functions" > "Configuring measurements" in the operating manual for a detailed description of the "Measurement" menu.

### File menu

The "File" menu is used to handle the setup memories, window names and display information about errors.

Refer also to "Instrument Functions" > "Management of settings" in the operating manual for a detailed description of the "File" menu.

### System menu

The "System" menu is used to handle general functions that are not specifically used to perform measurements, i.e. to configure the remote interfaces and I/O sockets, to provide information about the meter and the connected sensors, and to trigger test measurements.

Refer also to "Instrument Functions" > "System settings" in the operating manual for a detailed description.

## 3.4 Menu handling

The menus can contain up to eight menu items which are used to perform an action, open a dialog box or set a parameter.

### Perform an action

Close

If the menu contains only one or two descriptive terms, an action is performed directly.

### Use a hardkey to perform an action

Preset

If the name of the action to be performed is shown in a wide orange field, you can start the action by pressing the hardkey of the same name, e.g. (PRE)SET in this case.

### Open a dialog box

Mode...

If a menu item is followed by three dots "...", it can be used to open a dialog box to set a variety of parameters.

### Set parameters

Relative  
Off On Reset

Parameter setting options are provided in the menu. The currently selected option is highlighted in orange. Select the option by pressing the left or right side of the associated rocker switch.

### Use of softkeys with dual assignments

Close Expand

Some softkeys are assigned two menu items. One is selected by pressing the left-hand side of the rocker switch, the other, the right-hand side.

The two menu items are separated by a vertical line.



## 3.5 Dialog boxes and their controls

Dialog boxes contain check boxes, option fields, editing fields and drop-down lists as control elements. They are activated using the appropriate rocker switch to their right. If two control elements are positioned side by side, the element on the left is operated with the left-hand side of the rocker switch and the element on the right with the right-hand side of the rocker switch.

### 3.5.1 Title bar



Dialog boxes have a title bar which displays the name of the dialog box and the ↵ symbol which is a reminder that the dialog box can be closed with the ↵MENU hardkey.

Settings made in dialog boxes are immediately set on the R&S NRP2 - in other words you do not need to close the dialog box to activate the settings in the box.

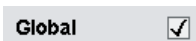
### 3.5.2 Dialog boxes with tabs



Channel-specific settings are made in a special page in a super-ordinate dialog box. In the top row of the dialog box, there are tabs which you can use to switch between pages.

Channels which do not have a sensor connected and channels that have not been installed are shown in gray and cannot be selected.

### 3.5.3 Check boxes



Check boxes are used to activate and deactivate functions. You can toggle between the two states by pressing the appropriate softkey.

### 3.5.4 Option fields

Cont Av	Trace & Statistics	T'slot Av	T'gate Av	Burst Av
------------	-----------------------	--------------	--------------	-------------

Option fields contain groups of mutually exclusive operating modes.

When you press the left-hand side of the rocker switch, the next option on the left is selected. When you press the right-hand side of the rocker switch, the next option on the right is selected.

In the "System I/O" dialog box, option fields are assigned to only one side of a rocker switch. It is therefore only possible to scroll through in one direction.

### 3.5.5 Editing fields

Editing fields are used to enter or modify numbers and text.

Nominal Width
1.000 ms
not active

The editor is activated by pressing the appropriate rocker switch.

Nominal Width
1.000 ms
Entry active

Editing can be performed in overwrite mode, indicated by the marked character being in inverse video. Modifications can be made either with the  $\uparrow$   $\downarrow$  cursor keys or numeric/digit softkeys which are provided in a digit or letter panel when the editor is activated.

The  $\leftarrow$   $\rightarrow$  cursor keys are used to select the digit to be edited.

### 3.5.6 Editing fields (cont.)

Nominal Width
1.000 ms

In the editing fields for quantities with units, the  $\leftarrow$   $\rightarrow$  cursor keys can be used to select the unit too; the  $\uparrow$   $\downarrow$  cursor keys are used to edit it. Usually, the digit panel also contains a unit softkey which you can use to change the unit whenever you want.

If you want to make a completely new entry, the whole field can be cleared with the DEL/1TRIG hardkey. In the insert mode, you can enter digits and/or letters.



Any changes you make to a field can be confirmed with the ↵MENU hardkey. When this hardkey is pressed, the new value is subjected to a validity check. If the check discovers an error, a warning message is output.

You can quit the editor by pressing the ESC hardkey; this leaves the old values unchanged. Any warning messages are cleared.



To set the maximum or minimum value permitted for a parameter, first move the insertion mark to the left edge of the entry field by using the ⇐ key. Then press the ↑ key to set the maximum permissible value or the ↓ key to set the minimum permissible value.

### 3.5.7 Editing fields of the Filter, Range and Trigger dialog boxes



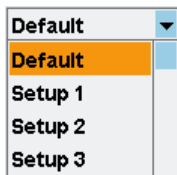
The Filter, Range and Trigger dialog boxes are designed such that the result windows are still visible.

If you edit a value in a Filter, Range and Trigger dialog box using the cursor keys ↑ ↓, the new value is accepted immediately. This feature allows you to quickly assess the effect of value change and, thus, to perform interactive adjustment of settings.



If you enter a new value with the digit/letter panel (see below), the new value has to be confirmed before it is accepted. The symbol ↵ appears above the editing field to indicate that the new value is not accepted until you confirm it with the ↵MENU hardkey.

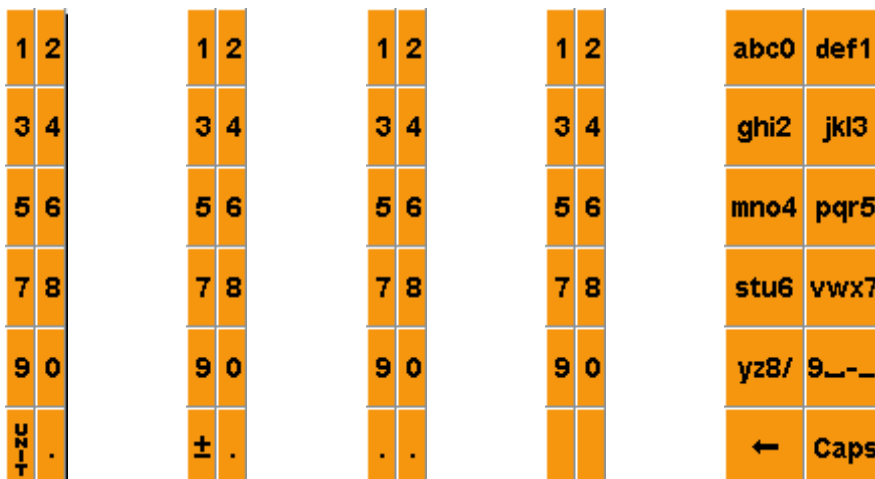
### 3.5.8 Drop-down lists



Drop-down lists are used to select an item from a list of predetermined values. When the drop-down list is activated, the list “folds out” upwards or downwards.

The up/down cursor keys, or one of the rocker switches next to the list, are used to select items from folded out pop-up menus. Confirm the selection with the ↵MENU hardkey or reject with the ESC hardkey.

### 3.5.9 Digit and letter panels



Panels which are displayed when an editing field is activated (see above) are used to enter digits, letters and units.

Entering letters with the letter panel is like entering letters on a phone keypad. "Caps" is used to select upper case for the next letter.



To edit the Trigger Delay, you must select the unit by means of the cursor keys (see above).

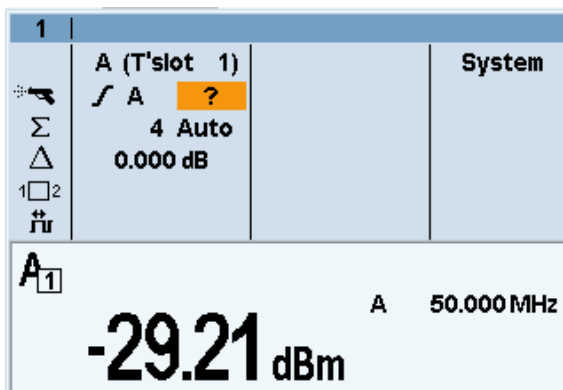
## 3.6 Display windows

### 3.6.1 Window sizes and types

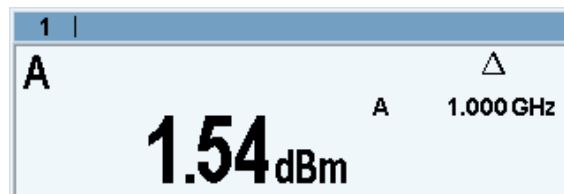
Results are displayed in the main section of the screen in windows. Windows come in three sizes: half height, quarter height and full height. In windows, measurement results are displayed digitally, in a combined digital and analog mode, and graphically.

See "Instrument Functions" > "Displaying measurement results" for instructions on selecting these modes.

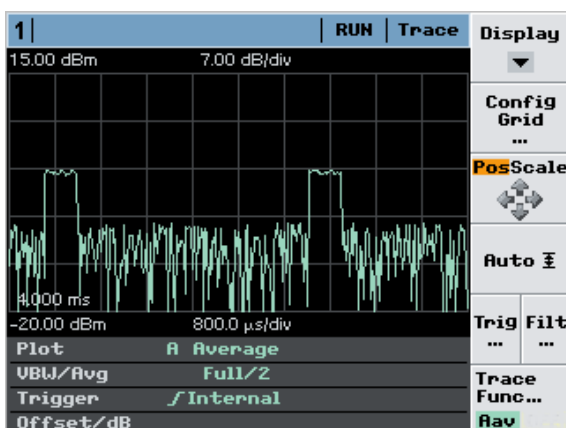
"Dig" window, full height



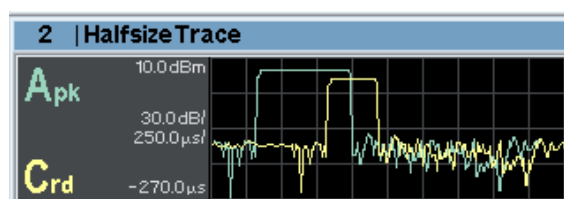
"Dig" window, half height



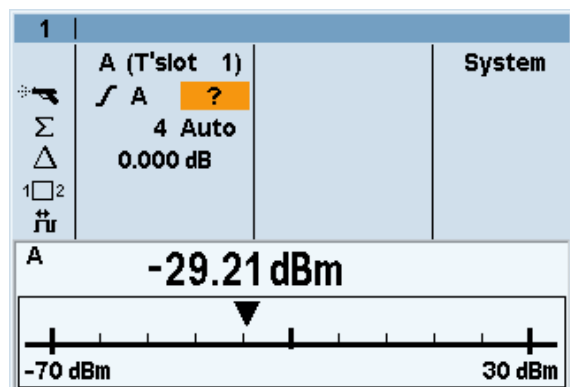
"Graph" trace window, full height



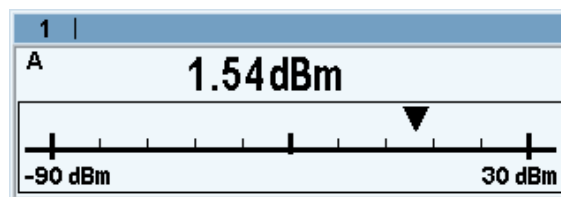
"Graph" trace window, half height



"D&amp;A" window, full height



"D&amp;A" window, half height



"Dig" window, quarter height



"D&amp;A" window, quarter height



You can expand all opened windows to full height by activating the "Expand" function from the "Windows" menu. In this state, the full-height windows can be displayed consecutively using the window "1 2 3 4" menu item. The opened windows can be reduced to their previous sizes with the "Arrange" menu item. Otherwise, it is not possible to change the size of the windows – the window size is determined by the number of windows.

### 3.6.2 Special symbols

Table 3-1: Special symbols

Window		Auxiliary values	
<b>1</b>	Window number	<b>20.872 dB</b>	Auxiliary value; here, max-min
<b>burst_av</b>	Window name	<b>↕</b>	Max-Min
<b>↩</b>	Confirm with the ↵ MEN key	<b>↑</b>	Max
<b>Display values</b>		<b>↓</b>	Min
<b>R 1.000 GHz</b>	Frequency in the primary and	<b>Σ</b>	No. of measurement values
<b>B 1.000 GHz</b>	secondary channel		



































<p><b>Measurement function</b></p> <p><b>A/B</b> Measurement function</p> <p><b>A/B<sup>Rel</sup></b> Relative measurement active</p> <p><b>A<sub>□</sub></b> Timeslot or gate measurement</p>	<p><b>Auxiliary values</b></p> <p> Standard deviation</p> <p> Mean value</p>
<p><b>Correction functions</b></p> <p> Duty cycle correction ON</p> <p> Offset correction ON</p> <p> Twoport correction ON (S-parameter)</p>	<p><b>Trigger</b></p> <p> Trigger</p> <p> Free-running trigger</p> <p> Trigger event missing</p>
<p><b>Filter</b></p> <p> Averaging filter</p> <p><b>4 Auto</b> <b>4 Man</b> Filter size with auto-filter (normal mode) or for manual mode</p> <p><b>0.9000 dB S/N</b> Noise component with auto-filter in "Fixed Noise" mode</p> <p><b>S/N</b> Noise ratio exceeded</p>	<p> Single-shot mode, trigger expected</p> <p> Single-shot mode, measurement over</p> <p><b>Ext</b>  Trigger source external Trigger on rising slope</p> <p> Trigger on falling slope</p> <p><b>RUN</b> Measurement in progress</p> <p><b>STOP</b> Measurement stopped</p> <p> Physical trigger event</p>
<p><b>Other</b></p> <p><b>Limit Fail</b> Over limit</p>	<p> Trigger threshold</p> <p> Delayed trigger event (reference time)</p>

Table 3-2: Symbols for pulse parameters

Pulse Time Parameter		Pulse Power Parameter	
	Pulse Width		Pulse Top
	Duty Cycle		Trace Avg
	Rise Time		Trace Min
	Start Time		Pulse Base
	Pulse Period		Trace Peak
	Pulse Off Time		Pos. Overshoot
	Fall Time		Neg. Overshoot
	Stop Time		



**Table 3-3: Symbols for time slot measurement**

	Time slot start of measurement		Time slot end of measurement
	Time slot length of measurement		

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