

# R&S® ZNC/ZND

## Vector Network Analyzers

### Getting Started



1316240702

This manual describes the following vector network analyzer types:

- R&S®ZNC3 (2 ports, 9 kHz to 3 GHz, N connectors), order no. 1311.6004K12

#### Hardware Options

- R&S®ZNC-B10 "GPIB Interface", order no. 1316.1617.02
- R&S®ZN-B14 "Handler I/O", order no. 1316.2459.05
- R&S®ZNC-B19 "Additional Removable Harddisc", order nos. 1323.9503.02 (32-bit) and 1323.9503.08 (32-bit)
- R&S®ZNC3-B22 "Extended Power Range for R&S®ZNC3", order no. 1316.2459.02

#### Software Options

- R&S®ZNC-K2 "Time Domain (TDR)", order no. 1316.1630.02
- R&S®ZNC-K19 "1 mHz Frequency Resolution", order no. 1317.8596.02

- R&S®ZND (2 ports, 9 kHz to 4.5 GHz, unidirectional, N connectors), order no. 1328.5170.92

#### Hardware Options

- R&S®ZND-B7 "High Output Power", order no. 1338.1578.02
- R&S®ZND-B10 "GPIB Interface", order no. 1328.5358.02
- R&S®ZN-B14 "Handler I/O", order no. 1316.2459.05

#### Software Options

- R&S®ZND-K1 "Frequency range extension to 8.5 GHz for unidirectional instrument", order no. 1328.5306.02  
(not compatible with R&S®ZND-K5 and R&S®ZND-K8)
- R&S®ZND-K2 "Time Domain (TDR)", order no. 1328.5393.02
- R&S®ZND-K5 "Bidirectional measurements 9 kHz to 4.5 GHz", order no. 1328.5312.02  
(not compatible with R&S®ZND-K1 and R&S®ZND-K6)
- R&S®ZND-K6 "Bidirectional measurements 9 kHz to 8.5 GHz", order no. 1328.5329.02  
(requires R&S®ZND-K1; not compatible with R&S®ZND-K5 and R&S®ZND-K8)
- R&S®ZND-K8 "Frequency range extension to 8.5 GHz for bidirectional instrument", order no. 1328.5412.02  
(requires R&S®ZND-K5; not compatible with R&S®ZND-K1 and R&S®ZND-K6)
- R&S®ZND-K7 "Extended Power Range", order no. 1328.5335.02
- R&S®ZND-K19 "1 mHz Frequency Resolution", order no. 1326.8089.02

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Throughout this manual, R&S® is abbreviated as R&S.

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# 1 Safety Information

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

## **Intended use**

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

## **Where do I find safety information?**

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

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

## 2 Preface

This chapter provides safety-related information, an overview of the user documentation and the conventions used in the documentation.

### 2.1 Documentation Overview

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

- <https://www.rohde-schwarz.com/manual/ZNC>
- <https://www.rohde-schwarz.com/manual/ZND>

#### 2.1.1 Getting Started Manual

Introduces the R&S ZNC/ZND and describes how to set up and start working with the product. Includes basic operations, typical measurement examples, and general information, e.g. safety instructions, etc.

A printed version is delivered with the instrument. A PDF version is available for download on the Internet.

#### 2.1.2 User Manual and Help

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

The contents of the user manual is available as help in the R&S ZNC/ZND. The help offers quick, context-sensitive access to the complete information for the instrument and its firmware.

The user manual is also available for download or for immediate display on the Internet.

#### 2.1.3 Service Manual

Describes the performance test for checking the rated specifications, module replacement and repair, firmware update, troubleshooting and fault elimination, and contains mechanical drawings and spare part lists.

The service manual is available for registered users on the global Rohde & Schwarz information system (GLORIS):

- [R&S ZNC Service Manual](#)



- [R&S ZND Service Manual](#)

## 2.1.4 Instrument Security Procedures

Deals with security issues when working with the R&S ZNC/ZND in secure areas. It is available for download on the Internet.

## 2.1.5 Basic Safety Instructions

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

## 2.1.6 Data Sheets and Brochures

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

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

See

- <https://www.rohde-schwarz.com/brochure-datasheet/ZNC>
- <https://www.rohde-schwarz.com/brochure-datasheet/ZND>

## 2.1.7 Release Notes and Open Source Acknowledgment (OSA)

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

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

See

- <https://www.rohde-schwarz.com/firmware/ZNC>
- <https://www.rohde-schwarz.com/firmware/ZND>

## 2.1.8 Application Notes, Application Cards, White Papers, etc.

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

See

- <https://www.rohde-schwarz.com/application/ZNC>
- <https://www.rohde-schwarz.com/application/ZND>

## 2.2 Conventions Used in the Documentation

### 2.2.1 Typographical Conventions

The following text markers are used throughout this documentation:

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

### 2.2.2 Conventions for Procedure Descriptions

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

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

### 2.2.3 Notes on Screenshots

When describing the functions of the product, we use sample screenshots. These screenshots are meant to illustrate as many as possible of the provided functions and possible interdependencies between parameters. The shown values may not represent realistic usage scenarios.

The screenshots usually show a fully equipped product, that is: with all options installed. Thus, some functions shown in the screenshots may not be available in your particular product configuration.

## 3 Instrument Tour

This chapter gives an overview of the control elements and connectors of the R&S ZNC/ZND and gives all information that is necessary to put the instrument into operation and connect external devices.

### 3.1 Front Panel

The front panel of the network analyzer consists of the touchscreen with the diagrams and softtool panels (left side), the hardkey area (right side) and the test port area below. Brief explanations on the controls and connectors, the hardkey area and the rear panel can be found on the next pages.

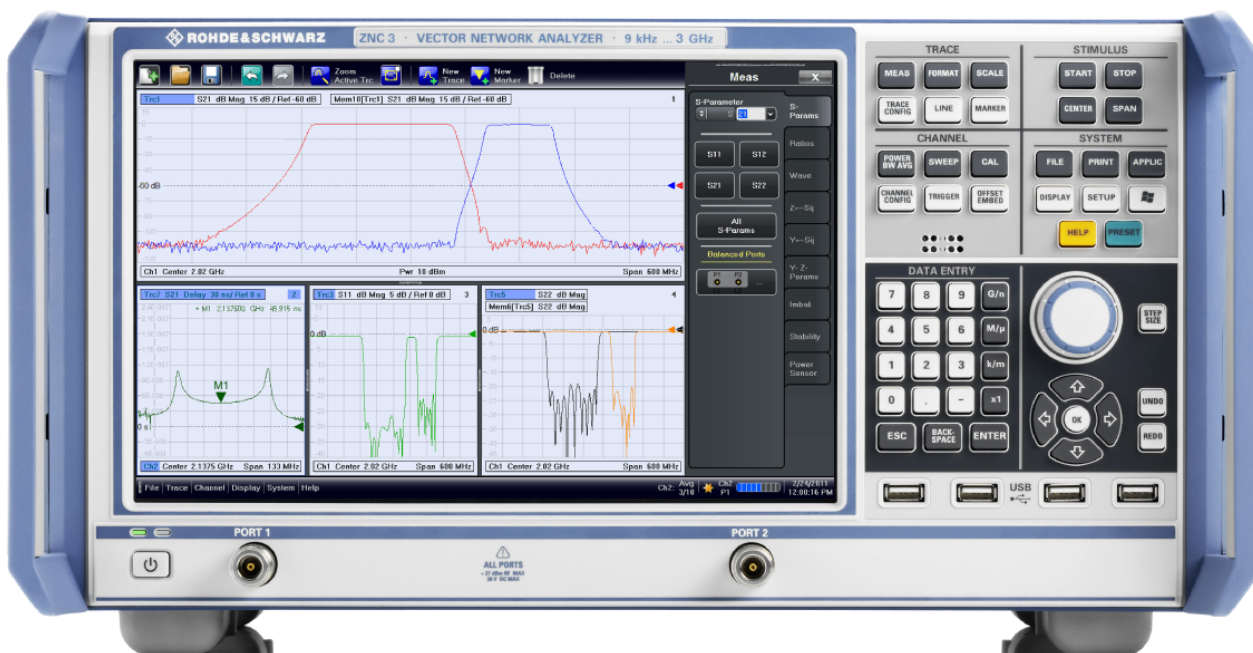


Figure 3-1: Front View of R&S ZNC3

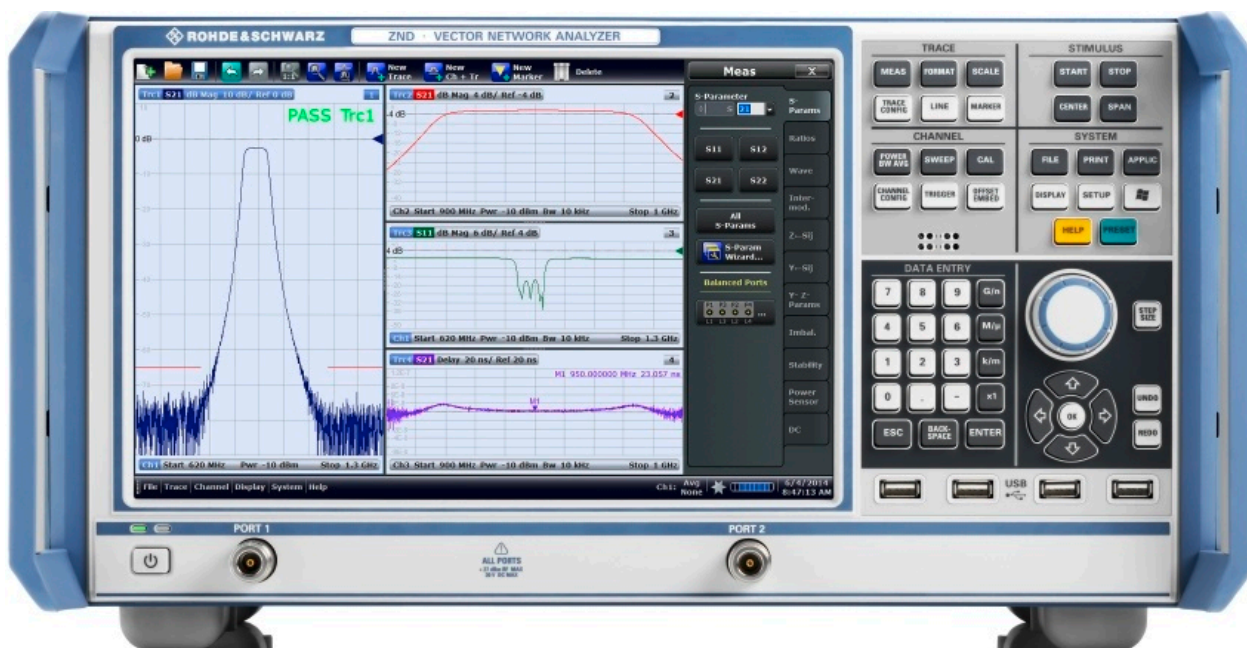


Figure 3-2: Front View of R&S ZND

## NOTICE

### Instrument damage caused by cleaning agents

Cleaning agents contain substances such as solvents (thinners, acetone, etc.), acids, bases, or other substances. Solvents can damage the front panel labeling, plastic parts, or screens, for example.

Never use cleaning agents to clean the outside of the instrument. Use a soft, dry, lint-free dust cloth instead.

### 3.1.1 Touchscreen

The analyzer is equipped with a 12.1" XGA color touchscreen. The touchscreen presents all measurement results, mostly in the form of diagrams. Besides, all instrument functions can be accessed and operated by tapping the control elements on the touchscreen. For an introduction to touchscreen operation, refer to [Chapter 6.1, "Manual Operation"](#), on page 38.

The following sections contain further useful information about manual control of the instrument.

- Refer to the other sections in chapter [Chapter 6, "Operating the Instrument"](#), on page 38 to learn how to handle traces and diagrams, and how to use menus, keys and softtools.
- Refer to chapter "Concepts and Features" in the user manual or help system to obtain information about the results in the diagram.

- Refer to section "Display Menu" in the user manual or help system to learn how to customize the screen.
- Refer to the data sheet for the technical specifications of the display.



### Screen saver

The screen saver function of the operating system can be used to switch off the display if the analyzer receives no command for a selectable period of time. The display is switched on again if any front panel key is pressed.

To enable the screen saver, access the Windows® operating system (e.g. by pressing the Windows key in the SYSTEM keypad) and tap "Control Panel > Power Options > Change Plan Settings > Turn off the display".

(Windows 7: "Control Panel > Hardware and Sound > Power Options > Edit Plan Settings > Turn off the display").

## 3.1.2 Function Keys

Most of the keys in the TRACE, CHANNEL, STIMULUS, and SYSTEM keypads call up a related softtool of the analyzer GUI. Every softtool provides access to a group of related measurement settings.



The TRACE keys give access to all trace settings, to the limit check settings, and to the marker functions including marker search.

- The [MEAS] settings select the measured and displayed quantity.
- The [FORMAT] settings define how measured data (traces) are presented.
- The [SCALE] settings define how traces are scaled.
- The [TRACE CONFIG] settings store traces to the memory and perform mathematical operations on traces.
- The [LINES] settings define limits for the measurement results, visualize them in the diagrams and activate/deactivate the limit check.
- The [MARKER] settings position markers on a trace, configure their properties and select the format of the numerical readout. Markers can also be used to locate specific points on the trace, define the sweep range, and scale the diagram.



The CHANNEL keys give access to the hardware-related (channel) settings.

- The [POWER BW AVG] settings define the power of the internal signal source, the IF bandwidth, and the sweep average.
- The [SWEEP] settings define the scope of measurement, including the sweep type and the number of measured sweeps.
- [CAL] provides all functions that are necessary to perform a system error correction (calibration).
- [CHANNEL CONFIG] provides functions for channel management.
- The [TRIGGER] settings control the start of the measurement sequence.
- [OFFSET EMBED] provides a selection of length offset parameters to shift the measurement plane.



The STIMULUS keys ([START], [STOP], [CENTER], [SPAN]) define the sweep range, depending on the sweep type.



The SYSTEM keys provide general system settings.

- [FILE] provides standard Windows® functions used to create, save, recall or print recall sets, to copy the active screen and to shut down the application.
- The [PRINT] settings control an external printer that is used to print a hardcopy of the current recall set.
- [APPLIC] gives access to external software tools and optional extensions of the analyzer firmware.
- [DISPLAY] gives access to all display settings and to the functions which activate, modify and arrange different diagrams.
- [SETUP] provides general system settings which are not restricted to a particular recall set.
- The Windows® key opens the startup menu of the Windows® operating system from where you can perform system configurations and call up additional software utilities.
- [HELP] opens the context-sensitive help system of the analyzer.
- [PRESET] performs a preset of the instrument settings.

### 3.1.3 Data Entry Keys



The keys in the DATA ENTRY keypad are used to enter numbers, units, and characters. The data entry keys are only enabled while the cursor is placed on a data input field in a dialog or in the Help navigation pane.

- The keys 0 to 9 enter the corresponding numbers.
- The function of the "." and "-" keys depends on the data type of the active input field:
  - In numeric input fields, the keys enter the decimal point and a negative sign for the entered numeric value. Multiple entries have no effect.
  - In character input fields, the keys enter a dot and a hyphen, respectively. Both entries can be repeated as often as desired.
- The function of the four unit keys depends on the data type of the active input field; see [Chapter 6.5, "Entering Data"](#), on page 54.
  - In numeric input fields, the G/n, M/μ, k/m or x1 keys multiply the entered value with factors of  $10^{(-)9}$ ,  $10^{(-)6}$ ,  $10^{(-)3}$  or 1 and add the appropriate physical unit. x1 is equivalent to ENTER and confirms the previous entry.
  - In character input fields, the G/n, M/μ, k/m keys enter the letters G, M, K, respectively. x1 is equivalent to ENTER and confirms the previous entry.
- ESC is used to:
  - Cancel entries / close dialogs without activating the entries made (equivalent to the "Close" button).
  - Close the Help system.



- ENTER is used to:
  - Activate the selected active control element, e.g. a button in a dialog or a link in the "Contents" page of the Help system.
  - Confirm selections and entries made and close dialogs (equivalent to the "OK" button).
  - Compress or expand menus or the Help table of contents
- BACKSPACE deletes the last character before the cursor position or the selected character sequence or numeric value.

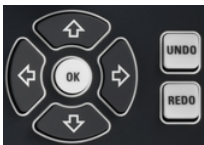
### 3.1.4 Rotary Knob



The rotary knob increases and decreases numerical values, scrolls within lists, activates controls and confirms entries. Turning or pressing the rotary knob is equivalent to the action of the "Cursor Up" and "Cursor Down" navigation keys or of the ENTER key in the DATA ENTRY keypad, respectively.

STEP SIZE opens an input box to select the steps (in units of the current physical parameter) between two consecutive numerical values. The step size is also valid for value changes using the "Cursor Up" and "Cursor Down" keys. See also [Chapter 6.5.2, "Using the Numeric Editor"](#), on page 55.

### 3.1.5 Navigation Keys



The keys in the NAVIGATION keypad are used to navigate within the touchscreen and the help system, to access and control active elements.

The "Cursor Up" and "Cursor Down" keys are used to:

- Scroll up and down in lists, e.g. among menu items, in a list of keywords, in the Help table of contents, or in the Help index
- Navigate between table rows in diagrams. Press "OK" to toggle between navigation mode and data entries.
- Increase and decrease numerical input values

"Cursor Up" (Down) become inactive as soon as the beginning of the list is reached. "Cursor Up" (Down) is equivalent to a rotation of the rotary knob to the right (left).

The "Cursor Left" and "Cursor Right" keys are used to:

- Move the cursor to the left or right within input fields
- Navigate between table columns in diagrams. Press "OK" to toggle between navigation mode and data entries.
- Compress or expand menus or the Help table of contents
- Move the highlighted item in the menu bar of the active application

ENT OK is equivalent to the action of the ENTER key in the DATA ENTRY keypad.

UNDO reverses the last action, if possible. REDO reverses the action of the UNDO button.

### 3.1.6 Standby Key



The standby toggle switch is located in the bottom left corner of the front panel.

The key serves two main purposes:

- Toggle between standby and ready state; see [Chapter 4.8, "Standby and Ready State"](#), on page 24.
- Shut down the instrument; see [Chapter 4.7, "Starting the Analyzer and Shutting Down"](#), on page 23.

### 3.1.7 Front Panel Connectors

The test ports and four USB connectors are located on the front panel of the analyzer.

#### 3.1.7.1 Test Ports



Numbered type N female connectors.

The test ports serve as outputs for the RF stimulus signal and as inputs for the measured RF signals from the DUT (response signals).

- With a single test port, it is possible to generate a stimulus signal and measure the response signal in reflection. For a measurement example, refer to [Chapter 5.2, "Reflection S-Parameter Measurement"](#), on page 36.
- With 2 test ports, full two-port measurements are possible; see [Chapter 5.1, "Transmission S-Parameter Measurement"](#), on page 29.

However, to use port 2 of a R&S ZND as driving port, you need one of the "bidirectional measurements" options:

- R&S ZND-K5, for a R&S ZND without "extended frequency range" option  
R&S ZND-K1
- R&S ZND-K6, for a R&S ZND with "extended frequency range" option  
R&S ZND-K1

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#### **NOTICE**

##### **Maximum input levels**

The maximum input levels at all test ports according to the front panel labeling or the data sheet must not be exceeded.

In addition, the maximum input voltages of the other input connectors at the rear panel must not be exceeded.

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Use a torque wrench when screwing RF cables on the test port connectors.

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### 3.1.7.2 USB Connectors

Four USB 2.0 connectors of type A (master USB).



The USB ports can be used to connect:

- External PC accessories such as mouse or other pointing devices, a keyboard, printer or external storage device (USB stick, CD-ROM drive etc.).
- External measurement equipment such as a calibration unit or power meter.

## 3.2 Rear Panel

This section gives an overview of the rear panel controls and connectors of the network analyzer.

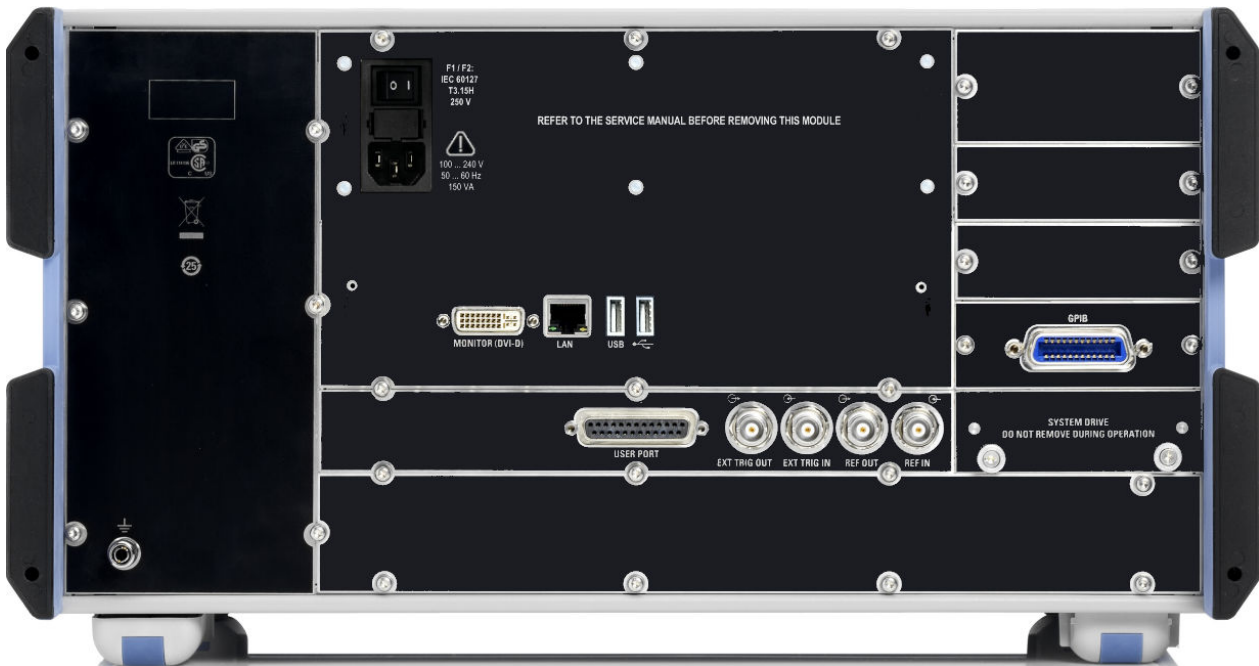


Figure 3-3: Rear Panel R&S ZNC



Figure 3-4: Rear Panel R&S ZND

The following connectors are available on all instruments:

- LAN is an RJ-45 connector. Use this connector to integrate the instrument to a Local Area Network, primarily for remote control purposes; see [Chapter 7.3.1, "Assigning an IP Address"](#), on page 65.
- Connectors MONITOR (DVI-D) on the R&S ZNC and DVI on the R&S ZND can be used to connect an external monitor; see [Chapter 4.9.1, "Connecting a Monitor"](#), on page 25.
- USER PORT is a 25-pin D-Sub connector used as an input and output for low-voltage (3.3 V) TTL control signals.
- EXT TRIG IN and EXT TRIG OUT are two BNC connectors for 5 V TTL external trigger signals.
- REF OUT is a BNC output for the internal reference frequency of the R&S ZNC/ZND. Use this connector to synchronize other instruments to the analyzer.
- REF IN is a BNC input for an external reference frequency. Use this connector to synchronize the R&S ZNC/ZND to another device.
- SYSTEM DRIVE contains the removable system drive of the R&S ZNC/ZND, containing all software (including the operating system and the VNA application) and data. Do not remove the system drive during operation. Options R&S ZNC-B19 and R&S ZND-B19 provide an additional removable system drive (including operating system and firmware).
- The ground connector in the lower left corner of the rear panel provides the ground of the analyzer's supply voltage. Use this connector for ESD protection; see ["Instrument damage caused by electrostatic discharge"](#) on page 21.

The following optional connectors can be installed in addition:

- Option R&S ZNC/ZND-B10 provides a GPIB bus connector according to standard IEEE 488 / IEC 625.
- Option R&S ZN-B14, Handler I/O (Universal Interface), provides a Centronics 36 input/output connector.

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**NOTICE****Input levels, EMC**

The maximum input levels and voltages of the input connectors at the front and rear panel must not be exceeded. Match signals with 50  $\Omega$  to comply with EMC directives.

See also [Chapter 4.5, "EMI Suppression"](#), on page 22.

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## 4 Putting the Analyzer into Operation

This section describes the basic steps to be taken when setting up the analyzer for the first time.

Simple measurement examples are provided in [Chapter 5, "Performing Measurements"](#), on page 29; for a description of the operating concept refer to [Chapter 6, "Operating the Instrument"](#), on page 38. For all background and reference information concerning manual and remote control of the instrument, refer to your analyzer's help system or user manual. A more detailed description of the hardware connectors and interfaces is also part of the help system or user manual.

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### **WARNING**

#### **Risk of injury due to disregarding safety information**

Observe the information on appropriate operating conditions provided in the data sheet to prevent personal injury or damage to the instrument. Read and observe the basic safety instructions provided with the instrument, in addition to the safety instructions in the following sections. In particular:

- Do not open the instrument casing.

---

### **NOTICE**

#### **Risk of instrument damage due to inappropriate operating conditions**

An unsuitable operating site or test setup can damage the instrument and connected devices. Before switching on the instrument, observe the information on appropriate operating conditions provided in the data sheet. In particular, ensure the following:

- All fan openings are unobstructed and the airflow perforations are unimpeded. A minimum distance of 10 cm to other objects is recommended.
- The instrument is dry and shows no sign of condensation.
- The instrument is positioned as described in the following sections.
- The ambient temperature does not exceed the range specified in the data sheet.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are connected correctly and are not overloaded.

---

### 4.1 Unpacking and Checking the Instrument

Check the equipment for completeness using the delivery note and the accessory lists for the various items. If you notice any damage, immediately contact the carrier who delivered the instrument.

**Packing material**

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

**WARNING****Risk of injury during transportation**

The carrying handles at the front and side of the casing are designed to lift or carry the instrument. Do not apply excessive force to the handles. If a handle is ripped off, the falling instrument can cause injury.

## 4.2 Positioning the Instrument

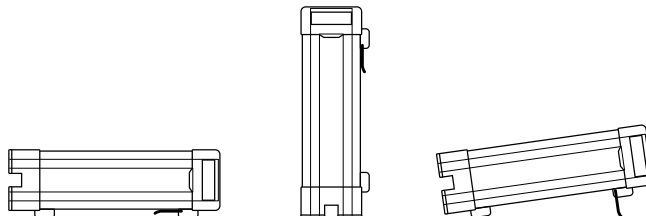
The network analyzer is designed for use under laboratory conditions, either on a bench top or in a rack. Notice the general ambient conditions at the operating site described under "[Risk of instrument damage due to inappropriate operating conditions](#)" on page 20.

**NOTICE****Instrument damage caused by electrostatic discharge**

Electrostatic discharge (ESD) can damage the electronic components of the instrument and the device under test (DUT). Electrostatic discharge is most likely to occur when you connect or disconnect a DUT or test fixture to the instrument's test ports. To prevent electrostatic discharge, use a wrist strap and cord and connect yourself to the ground, or use a conductive floor mat and heel strap combination.

## 4.3 Bench Top Operation

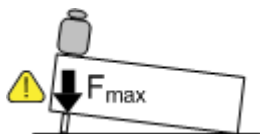
If the analyzer is operated on a bench top, the surface must be flat. The instrument can be used in horizontal or vertical position, standing on its feet, or with the support feet on the bottom expanded.



**WARNING****Risk of injury if feet are folded out**

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

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



## 4.4 Operation in a 19" Rack

The R&S ZNC/ZND can be mounted in 19" racks using the adapter R&S ZZA-KN5 (order number 1175.3040.00). Proceed according to the mounting instructions supplied with the rack adapter.

**NOTICE****Risk of instrument damage due to insufficient airflow in a rack**

If you mount several instruments in a rack, you need an efficient ventilation concept to ensure that the instruments do not overheat. Insufficient airflow for a longer period can disturb the operation and even cause damage.

## 4.5 EMI Suppression

Electromagnetic Interference (EMI) can affect the measurement results.

To suppress generated Electromagnetic Interference:

- Use suitable shielded cables of high quality (see table below)
- Always terminate open cable ends
- Note the EMC classification in the data sheet

Regarding cable length and quality, the following requirements have to be met:

**Table 4-1: Cable Requirements**

Cable Type (Connector)	Requirement
RF cables (PORT 1, ..., PORT N)	Double shielded
BNC cables (various)	Double shielded
DB-25 (USER PORT)	Double shielded
GPIB	Standard cable
Handler I/O	Standard cable
DVI-D (Monitor)	2 ferrite cores
LAN	At least CAT6, S/FTP
USB	Standard cables, length $\leq$ 3m

## 4.6 Connecting the Analyzer to the AC Supply

The network analyzer is automatically adapted to the AC supply voltage, which must be in the range of 100 V to 240 V at 50 Hz to 60 Hz. The mains connector is located in the upper part of the rear panel (see [Chapter 3.2, "Rear Panel"](#), on page 17).

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

The maximum power consumption and the typical power consumption of the individual analyzer models are listed in the data sheet.

The R&S ZNC is protected by two fuses located in the fuse drawer below the AC power switch; see [Chapter 8.3, "Replacing Fuses"](#), on page 70. There are no such fuses on the R&S ZND.

## 4.7 Starting the Analyzer and Shutting Down

The AC power switch is located in the upper part of the rear panel, together with the mains connector and the fuse drawer (R&S ZNC only); see [Chapter 3.2, "Rear Panel"](#), on page 17.

To start the analyzer, proceed as follows:

1. Switch the AC power switch to position I (On).

After power-on, the analyzer automatically goes to standby or ready state, depending on the state of the standby toggle key at the front panel when the instrument was switched off last time.

2. If necessary, press the standby toggle key on the front panel to switch the instrument to ready state (the green LED goes on).

The instrument automatically performs a system check, boots the Windows® operating system and then starts the vector network analyzer (VNA) application. If it was terminated regularly, the VNA application restores all recall sets and instrument settings of the previous analyzer session.

To shut down the analyzer, proceed as follows:

1. Press the standby key.

Pressing the standby key causes the instrument to save all loaded recall sets, to close the VNA application, to shut down Windows®, and to go to standby state. Of course, you can also perform these steps manually, like in any Windows session.

2. If desired, set the AC power switch to position **O** (Off).

### NOTICE

#### Risk of data loss

It is recommended to switch the analyzer to standby state before disconnecting it from the AC supply. If you set the power switch to 0 while the VNA application is still running, you lose the current settings. Moreover, loss of program data cannot be excluded if the application is terminated improperly.



The AC power switch can be permanently on. It is recommendable, however, to switch it off if the instrument is not used for some time. When you switch the instrument back on, be sure to comply with the extended warm-up phase specified in the data sheet.



To guarantee the specified functionality, after turning off the R&S ZNC/ZND, you have to wait for at least 10 seconds before turning it on again. This rule applies to both the AC power off and the standby state.

## 4.8 Standby and Ready State



The standby toggle key is located in the bottom left corner of the front panel.

In standby state, the right, amber LED is on. The standby power only supplies the power switch circuits. In this state, it is safe to switch the AC power off and disconnect the instrument from the power supply.

In ready state, the left, green LED is on and all modules are power-supplied. When switched to ready state, the analyzer initiates its startup procedure.

Observe the instructions for startup and shutdown in [Chapter 4.7, "Starting the Analyzer and Shutting Down"](#), on page 23.



## 4.9 Connecting External Accessories

The analyzer's standard PC interfaces (Monitor, USB, LAN) can be used to connect various accessories:

- An external monitor expands/displays the Windows® desktop, which is, by default, covered by the Vector Network Analyzer (VNA) application window in full-screen mode.
- External keyboard and mouse simplify local control, in particular manual (GUI) operation of the VNA application.
- A printer can be used to create hard copies of the measurement diagrams and traces from within the VNA application.
- A LAN connection can be established to access the analyzer's mass storage or control the analyzer from an external PC.



External monitor, keyboard and mouse are not required for local operation. A R&S ZNC/ZND can be fully controlled by tapping the touchscreen and front panel keys.

### 4.9.1 Connecting a Monitor



A standard monitor can be connected to the DVI-D connector on the rear panel of the R&S ZNC/ZND (labeled "MONITOR (DVI-D)" on the R&S ZNC and "DVI" on the R&S ZND). No extra configuration is required.

#### **NOTICE**

##### **Safety aspects**

The monitor must be connected while the instrument is switched off (or in standby mode). Otherwise correct operation cannot be guaranteed.

Select SYSTEM > [DISPLAY] > "View Bar" > "Hard Key Panel On" from the menu bar of the VNA application window to add the (virtual) "Hard Key Panel" to the application window.

### 4.9.2 Connecting a Keyboard

A keyboard can be connected to any of the USB connectors. After being auto-detected by the operating system, it can safely be disconnected and reconnected even during measurements.

##### **Keyboard configuration**

The default input language is English – US. Select "Settings" > "Time & language" > "Region & language" from the Windows® Start menu to manage languages and keyboards.

Windows 7: select "Control Panel" > "Clock, Language, and Region" > "Region and Language" > "Keyboards and Languages" from the Windows® Start menu to configure the keyboard properties.



To access Windows®, press the Windows key on the front panel or on the external keyboard.

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### 4.9.3 Connecting a Mouse

A USB mouse can be connected to any of the USB connectors. After being auto-detected by the operating system, it can safely be disconnected and reconnected even during measurements.

#### Mouse configuration

Select "Settings" > "Devices" > "Mouse & touchpad" from the Windows® "Start" menu to configure the mouse properties.

Windows 7: select "Control Panel" > "Hardware and Sound" > "Devices and Printers" > "Mouse" from the Windows® "Start" menu to configure the mouse properties.



To access Windows®, press the Windows key on the front panel or on the external keyboard.

---

### 4.9.4 Connecting a Printer

A printer can be connected to any of the USB connectors. After successful installation, it can safely be disconnected and reconnected even during measurements.

Before printing (SYSTEM – [PRINT]), the analyzer checks whether a printer is connected and turned on and whether the appropriate printer driver is installed.

#### Printer driver installation

If necessary, the printer driver installation is initiated using the operating system's "Add Printer Wizard". The wizard is self-explanatory. A printer driver must be installed only once.

A great variety of printer drivers is available on the analyzer. To obtain the complete list, select "Settings" > "Devices" > "Printers & scanners" from the Windows® "Start" menu.

Windows 7: select "Control Panel" > "Hardware and Sound" > "Devices and Printers" from the Windows® "Start" menu.



To access Windows®, press the Windows key on the front panel or on the external keyboard.

---

You can load updated and improved driver versions or new drivers from an installation disk, USB memory stick or another external storage medium. Alternatively, if the analyzer is integrated in a network, you can install driver data stored in a network directory. In either case, use the "Add Printer" wizard to complete the installation.

#### Printer configuration

Use the "Printer Setup" dialog of the firmware (SYSTEM – [PRINT] > "Print...") or the Windows® printer management to configure the printer properties and printing preferences.

### 4.9.5 Connecting a LAN Cable

A LAN cable can be connected to the LAN connector on the rear panel of the analyzer. To establish a LAN connection, proceed as follows:

1. Refer to [Chapter 7.3.1, "Assigning an IP Address"](#), on page 65.
2. Connect a CAT6 or CAT7 LAN cable to the LAN port.

The LAN port of the analyzer is an auto-crossover Ethernet port. You can connect it to a network, but you can also set up a direct connection to a computer or another instrument. For both connection types, you can use either crossover or straight through (patch) cables.

The IP address information is displayed in the SYSTEM – [SETUP] > "Remote Settings" softtool tab.

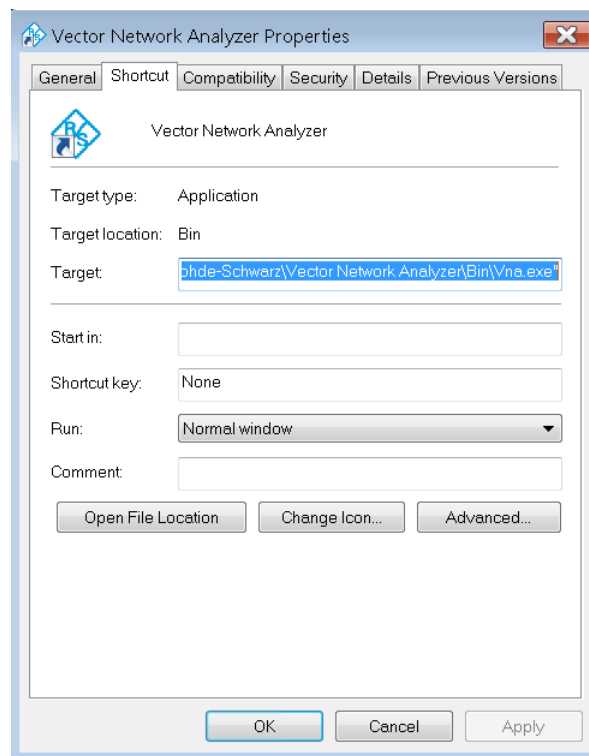
## 4.10 Minimizing the VNA Application

With a minimized VNA application, you can access your analyzer's Windows® desktop or run other applications.

To exit the default full-screen mode of the VNA application, deselect SYSTEM – [DISPLAY] > "View Bar" > "Title Bar Task Bar". Then use the standard Windows® titlebar functions to minimize/maximize/close the application window.

#### To start the VNA application with a minimized window

1. Right-click the Vector Network Analyzer shortcut icon on the desktop and open the "Properties" dialog.
2. In the "Shortcut" tab, select "Run: Minimized".



A software update restores the original shortcut properties.

## 5 Performing Measurements

This chapter takes you through a sample session with a R&S ZNC/ZND network analyzer and describes basic operation tasks.

### CAUTION

#### Safety considerations

Before starting any measurement on your network analyzer, please note the instructions given in [Chapter 4, "Putting the Analyzer into Operation"](#), on page 20.



Use the "S-Parameter Wizard" accessible via TRACE – [MEAS] > "S-Params" > "S-Param Wizard..." to measure S-parameters in a straightforward way. The wizard provides a series of dialogs where you can select the test setup, screen configuration and measurement parameters, configure the essential channel settings and perform a guided calibration.

#### Measurement stages in the wizard

The individual dialogs of the "S-Parameter Wizard" correspond to the typical stages of any measurement:

1. Select the test setup.
2. Define port impedances.
3. Select the measurement parameters and the diagrams.
4. Define the sweep range.
5. Adjust the receiver and source settings (measurement bandwidth, source power).
6. Perform a calibration.

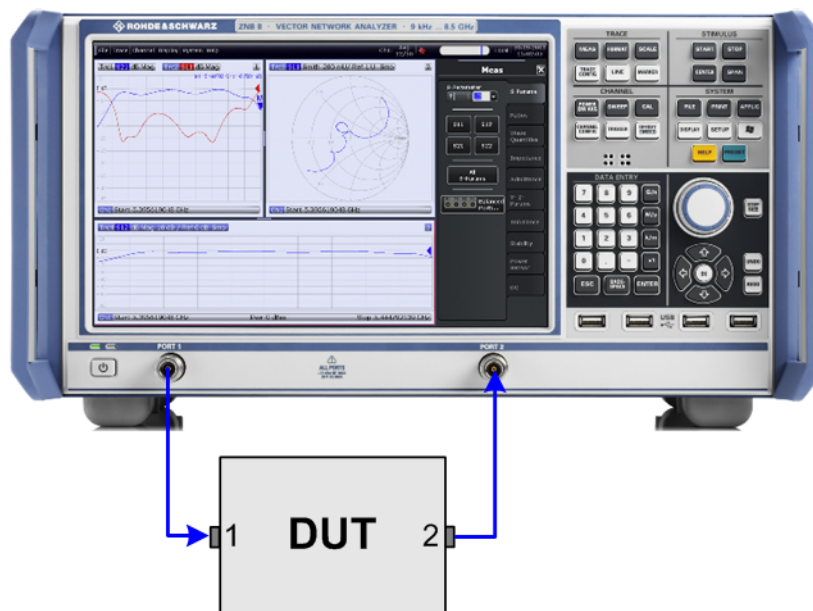
### 5.1 Transmission S-Parameter Measurement

In a transmission measurement, the analyzer transmits a stimulus signal to the input port of the device under test (DUT) and measures the transmitted wave at the DUT's output port. The trace settings allow you to select the measured quantities and display formats, depending on what you want to learn from the data. A minimum of two analyzer test ports are required for transmission measurements.

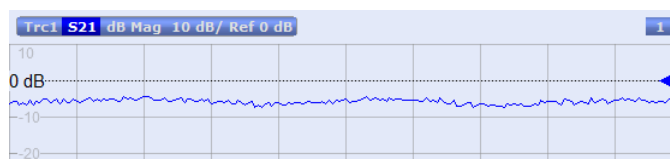
In the following example, the analyzer is set up for a two-port transmission measurement. A frequency sweep range is selected, the instrument is calibrated and the measurement result is analyzed using various display formats.

### 5.1.1 Connecting the Instrument for Transmission Measurements

To prepare a transmission measurement, you have to connect your DUT (which for simplicity we assume to have appropriate connectors) in-between a pair of analyzer test ports. It is recommended that you preset the R&S ZNC/ZND to start from a well-defined instrument state.



1. Connect the DUT between test ports 1 and 2 of the network analyzer as shown above.
2. Switch on the instrument and start the VNA application. Proceed as described in [Chapter 4.7, "Starting the Analyzer and Shutting Down"](#), on page 23.
3. Use the [PRESET] key to restore a well-defined instrument state. The analyzer is now set to its default state. The default measured quantity is the transmission S-parameter  $S_{21}$ .



Select TRACE – [TRACE CONFIG] and use the control elements in the "Traces" soft-tool tab if you wish to create additional traces and diagrams.

### 5.1.2 Selecting the Sweep Range and Other Parameters

After a system preset the display shows a diagram with a dB magnitude scale, and the S-parameter  $S_{21}$  is selected as a measured quantity. This S-parameter is the forward transmission coefficient of the DUT. It is defined as the ratio of the transmitted wave at the DUT's output port (port no. 2) to the incident wave at the DUT's input port (port no. 1).

The R&S ZNC/ZND automatically adjusts its internal source and receiver to the selected measured quantities: For an  $S_{21}$  measurement, a stimulus signal (termed  $a_1$ ) is transmitted at the analyzer port no. 1; the transmitted wave (termed  $b_2$ ) is measured at port 2. The stimulus signal from the analyzer port no. 2 is not needed except for some calibration types.

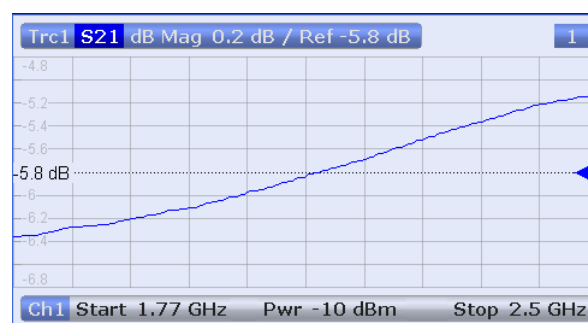
By default the sweep range is set to the frequency range of the analyzer, which can be unsuitable for your DUT. The following procedure shows you how to configure a smaller sweep range.

1. Select STIMULUS – [START] and set the "Start Frequency" to the lowest frequency you want to measure (e.g. 1.77 GHz). For convenient numeric entry, open the "Numeric Editor" (see [Chapter 6.5.2, "Using the Numeric Editor"](#), on page 55).

**Tip:** If you use the DATA ENTRY keys at the front panel for data entry, type [1][.][7] [7] and terminate the entry with the [G/n] key.

Refer to [Chapter 6.5, "Entering Data"](#), on page 54 to learn more about entering numeric values and characters.

2. In the "Stop Frequency" input field, enter the highest frequency you want to measure (e.g. 2.5 GHz).
3. Select TRACE – [SCALE] > "Scale Values" and activate the "Auto Scale Trace" function. The analyzer adjusts the scale of the diagram to fit in the entire  $S_{21}$  trace, leaving an appropriate display margin.



**Tip:** Refer to [Chapter 6.6, "Scaling Diagrams"](#), on page 57 to learn more about the different methods and tools for diagram scaling.

### 5.1.3 Calibrating the Instrument

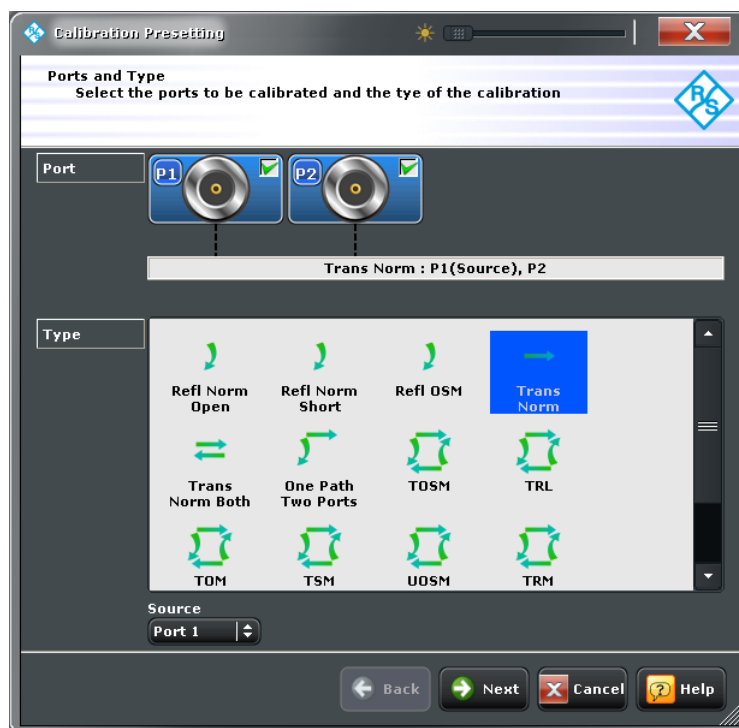
Calibration (system error correction) is the process of eliminating systematic, reproducible errors from the measurement results. E.g., in the current test setup, the connecting cables between the analyzer ports and the DUT introduce an attenuation and a phase shift of the waves. Both effects impair the accuracy of the S-parameter measurement.

The analyzer provides a wide range of sophisticated calibration methods for all types of measurements. The calibration method to select depends on the expected system errors, the accuracy requirements of the measurement, on the test setup and on the types of calibration standards available.

The following example requires a calibration kit with a male Through standard with known transmission characteristics for the related test port connector type and gender. With a single Through, it is possible to perform a transmission normalization, compensating for a frequency-dependent attenuation and phase shift in the signal paths.

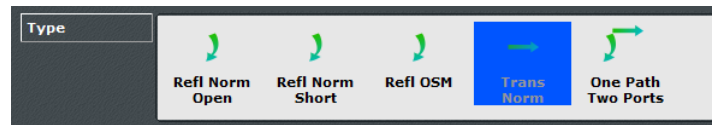
Due to the R&S ZNC/ZND's calibration wizard, calibration is a straightforward, guided process.

1. Replace the DUT by the Through standard of your calibration kit.
2. Select CHANNEL – [CAL] > "Start... (Manual)" to open the "Calibration Setting" wizard.
3. Select the port combination Port 1 (P1) and Port 2 (P2) and the calibration type "Trans Norm". Make sure to define port 1 as the source port.





**Tip:** For a unidirectional R&S ZND, only port 1 can be the source port. Hence calibrations that require both ports as driving port are not available.



4. Select "Next" to proceed to the next page of the "Calibration Setting" wizard.
5. Select the test port connector type and gender (here: N 50  $\Omega$ , female, corresponding to a male Through standard) and the calibration kit (here: R&S ZV-Z121), then click "Start".



6. The "Calibration" dock widget indicates the standard measurements that make up a "Trans Norm" calibration.  
Select "Through (mm)" to initiate the measurement of the connected Through standard. Measuring the isolation between ports 1 and 2 is optional. Skip it for now.



The analyzer performs a calibration sweep for the measured quantity  $S_{21}$ . The magnitude and phase of the result is displayed in two diagrams, together with the expected typical result for a Through standard. The similarity of real and expected traces indicates that the Through standard has been properly connected. After the R&S ZNC/ZND has completed the calibration sweep and calculated the correction data, the "Apply" button is enabled.

7. Select "Apply" to close the wizard and apply the system error correction to the current channel.

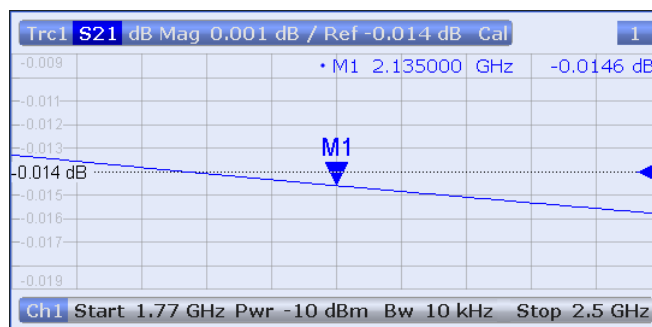
A "Cal" label appears in the trace list.

To proceed with the measurement, remove the Through standard and connect the DUT again.

#### 5.1.4 Evaluating Data

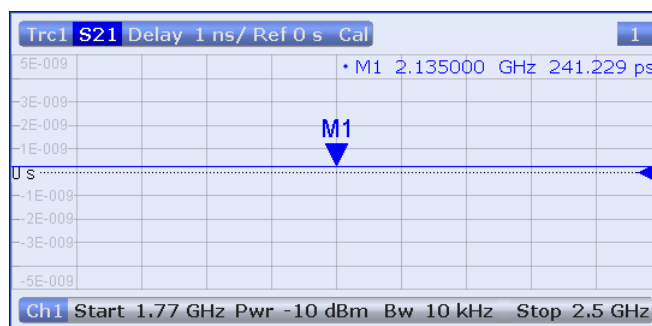
The analyzer provides various tools to optimize the display and analyze the measurement data. For instance, you can use markers to determine maxima and minima on the trace, and change the display format to obtain information about the group delay of the transmitted wave.

1. Select TRACE – [MARKER] > "Markers" > "Mkr 1".  
This places marker "M1" to its default position (center of the sweep range). A marker symbol (triangle) appears on the trace, a marker info field in the upper right corner of the diagram. The marker info field displays the stimulus value (frequency) and response value (magnitude of the transmission coefficient converted to a dB value) at the marker position.



2. Select TRACE – [MARKER], activate the "Marker Search" softtool tab and activate "Min" search.  
The marker jumps to the absolute minimum of the curve in the entire sweep range. The marker info field shows the coordinates of the new marker position.
3. Select TRACE – [FORMAT] and choose the "Delay" of the transmission coefficient as displayed quantity.

The group delay represents the propagation time of the wave through the DUT; it is displayed in a Cartesian diagram. The marker info field shows the frequency and group delay at the marker position.



Refer to section "Trace Formats" in the help system or in the user manual to learn more about the diagram properties.

### 5.1.5 Saving and Printing Data

The analyzer provides standard functions for saving measurement settings and for saving or printing the results. You can use these functions as if you were working on a standard PC. Moreover you can export your trace data to an ASCII file and reuse it in a later session or in an external application.



Data transfer is made easier if external accessories are connected to the analyzer or if the instrument is integrated into a LAN. Refer to [Chapter 4.9, "Connecting External Accessories"](#), on page 25, and [Chapter 7.3, "Remote Operation in a LAN"](#), on page 64 to obtain information about the necessary steps.

1. Activate the SYSTEM – [FILE] > "Trace Data" softtool tab.
2. In the "Trace Data" softtool tab, select "Export" – "ASCII..." to open the "Export Data - ASCII Files" dialog.
3. In the "Export Data - ASCII Files" dialog:
  - a) Select a file location ("Look in:").
  - b) Enter a file name ("File name:").
  - c) Select "Save".

The analyzer writes the data of the active trace to an ASCII file and closes the dialog.

4. Activate the "Print" softtool tab (SYSTEM – [FILE] > "Print") .
5. In the "Print" softtool tab, select "Print" to print the diagram area or "To Clipboard" to copy it to the Windows clipboard.
6. Select SYSTEM – [FILE] > "Recall Sets" > "Save..." to open the "Save" dialog for recall sets.
7. In the "Save" dialog:
  - a) Select a file location ("Look in:").
  - b) Enter a name for the recall set file ("File name:").
  - c) Select "Save".

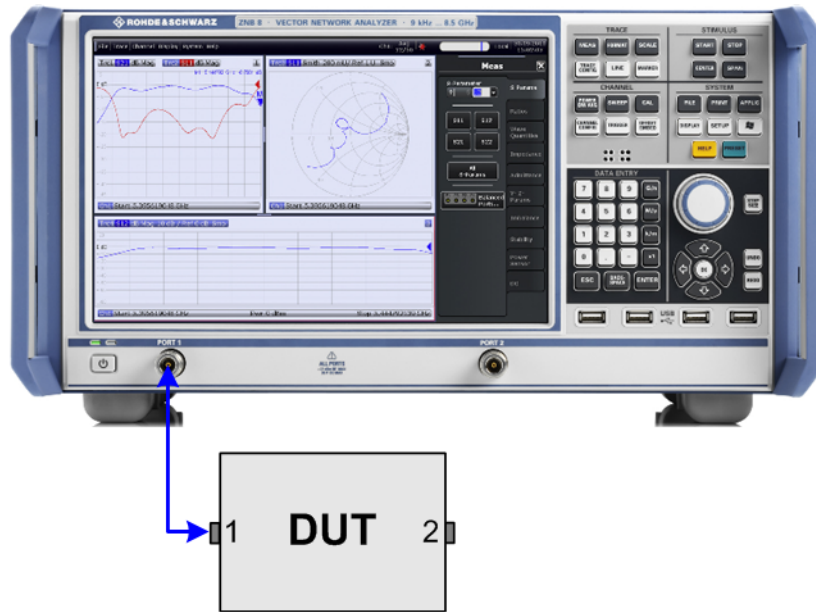
The analyzer saves the active recall set, containing channel, stimulus and trace settings, to a \*.znx file. This recall set can be restored in a later session.

## 5.2 Reflection S-Parameter Measurement

In a reflection measurement, the analyzer transmits a stimulus signal to the input port of the device under test (DUT) and measures the reflected wave. Different trace formats allow you to express and display the results, depending on what you want to learn from the data. Only one analyzer test port is required for reflection measurements.

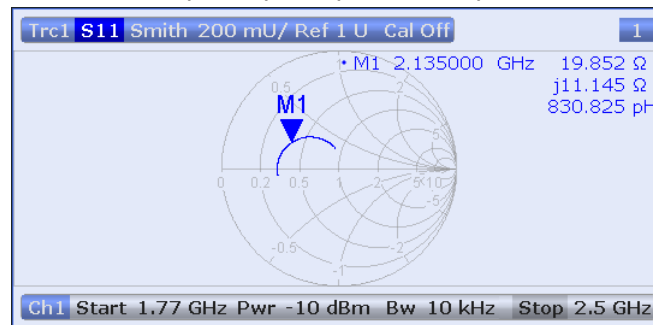
In principle, a reflection measurement involves the same steps as a transmission measurement. Note the following differences:

- The basic test setup for reflection measurements involves a single DUT and analyzer port. For instance, you can connect the input of your DUT to port 1 of the analyzer as shown below.



You can also use the basic transmission test setup, e.g. if you want to measure reflection and transmission parameters in parallel.

- The analyzer provides special calibration types for reflection measurements. Use the calibration wizard and select an appropriate type. A full 2-port calibration (TOSM, UOSM, TNA ...) corrects the system errors for all transmission and reflection S-parameters.
- Some of the trace formats are particularly suited for reflection measurements. For instance, you can display the measured reflection coefficient  $S_{11}$  in a Smith chart to obtain the complex input impedance at port 1.



Proceed as described in [Chapter 4.7, "Starting the Analyzer and Shutting Down"](#), on page 23 to shut down your analyzer.

## 6 Operating the Instrument

The following sections describe the basics of manual operation, i.e. how to access instrument functions and settings via the analyzer GUI. Manual operation is particularly useful for getting to know the instrument and for trouble shooting.

### Manual and remote control of the instrument

Manual control of the R&S ZNC/ZND is possible either via its touchscreen and frontpanel keys, via locally connected keyboard and mouse (see [Chapter 4.9, "Connecting External Accessories"](#), on page 25), or via Remote Desktop (see also [Chapter 7.3, "Remote Operation in a LAN"](#), on page 64). Alternatively it can be remote-controlled via the GPIB interface or a LAN connection.

To their full extent, manual operation and remote control are described in the GUI Reference and Command Reference chapters of the user manual, respectively. GUI functions and related remote commands are linked bidirectionally. Background information is provided in the Concepts and Features chapter of the user manual.

### 6.1 Manual Operation

The analyzer functions are accessible via several tabbed softtools, each presenting related functions and settings. The keys on the front panel or the on-screen "Hard Key Panel" open the most frequently used softtools.

Manual operation via function keys and softtools provides touch-friendly access to the instrument functions and settings, avoiding complicated menu structures and long operating sequences. In general, this approach is recommended. However, sometimes the toolbar or an object's context menu can offer a shortcut. As a full-fledged alternative for manual operation via mouse and keyboard, also the menu bar provides access to all instrument functions and settings.

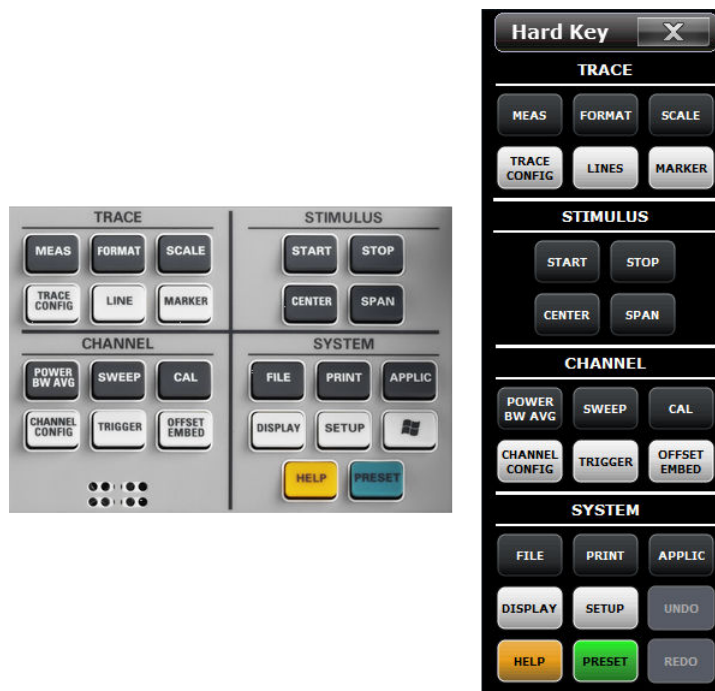


Figure 6-1: Function Keys



### Customizing the screen

The contents of the screen and the size and position of many display and control elements are not fixed. You can display or hide most elements. You can also drag and drop traces, info fields, and even the softtool panel to your preferred position; see [Chapter 6.4.4, "Using Drag and Drop"](#), on page 53.

For example, you can show/hide the on-screen hardkey panel by selecting/deselecting "Display" > "View Bar" > "Hard Key Panel On" from the main menu.

The following table shows possible touchscreen operations with the corresponding mouse operations.

Touchscreen	Mouse	Typical task
Tap control element for a short time	Click control element (left mouse button)	Select button or tab
Tap for an extended time (tap and hold)	Click (right button)	Open context menu
Tap twice (double-tap)	Double-click (left button)	Open on-screen keyboard

### Using the Front Panel

To access an instrument function:

1. Press a (virtual) key, e.g. the [MEAS] key in the TRACE section.

The corresponding softtool expands at the current docking position.



left = R&S ZNC or bidirectional R&S ZND  
 right = unidirectional R&S ZND

2. Activate the desired softtool tab, e.g. "Z←Sij".



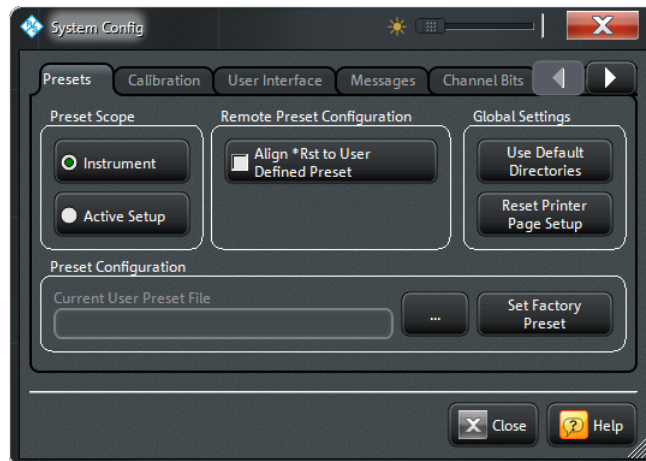
left = R&S ZNC or bidirectional R&S ZND  
 right = unidirectional R&S ZND

3. Select a control element, e.g. "Z←S11".

The diagram immediately reflects your selection. The active trace shows the measurement results for the selected measured quantity.

A control element with three dots (e.g. SYSTEM – [SETUP] > "Setup" > "System Config...") opens a dialog, containing a group of related settings, a wizard or additional information.





### Using the menu bar

The menu bar at the bottom of the application screen provides alternative access to **all** instrument functions. To repeat the measured quantity selection described above,

- ▶ Select TRACE – [MEAS] > "Z←Sij" > "Z←S11".

The diagram immediately reflects your selection. The active trace shows the measurement results for the selected measured quantity. At the same time, the related softtool tab is opened.

### Using context menus

Context menus are another alternative for quick access to instrument settings.

1. Touch and hold (right-click) the measured quantity section in the trace info for a couple of seconds until the context menu appears.



left = R&S ZNC or bidirectional R&S ZND  
 right = unidirectional R&S ZND

2. Select "S-Parameter" to open the "Meas" > "S-Params" softtool tab.



left = R&S ZNC or bidirectional R&S ZND  
 right = unidirectional R&S ZND

3. Select "Z←Sij" > "Z←S11".

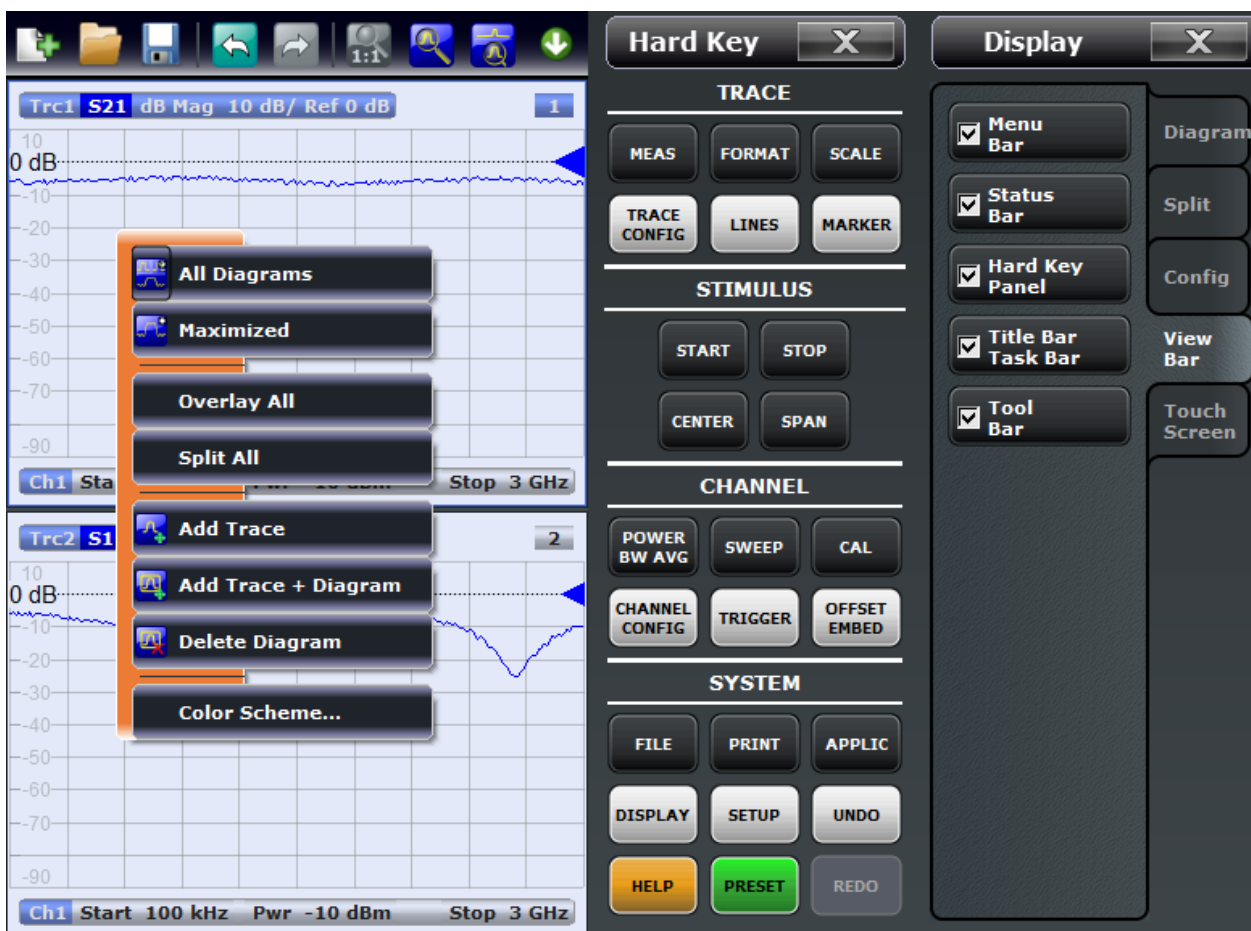


left = R&S ZNC or bidirectional R&S ZND  
right = unidirectional R&S ZND

## 6.2 Control Elements of the Application Window

The application window of the analyzer provides all control elements for the measurements and contains the diagrams for the results. There are several alternative ways for accessing an instrument function:

- Using a function key on the (virtual) hardkey panel to open the related softtool (recommended, provides all settings)
- Using the menus and submenus of the menu bar (alternative to the previous method)
- Using the context menus of certain display objects (for important actions in the context of this object)
- Using the icons in the toolbar above the diagram area (for frequent global actions)



These methods are described in more detail in the following sections.

### 6.2.1 Title Bar

By default, the analyzer GUI is shown in full screen mode, covering the whole screen and hiding the Windows taskbar. However, you can toggle the full screen mode using SYSTEM – [DISPLAY] > "View Bar" > "Title and Task Bar On".

If full screen mode is switched off, the main application window of the vector network analyzer application provides a standard Windows® title bar.



### 6.2.2 Toolbar

The toolbar above the diagram area contains the most frequently used control elements of the user interface. All controls are also accessible via [Softtools](#).



The toolbar is divided into five icon groups, separated by vertical lines.

- The leftmost group comprises recall set actions (SYSTEM – [PWR BW AVG] > "Recall Sets"): add a new recall set ("New..."), open a recall set file ("Open Recall..."), save the active recall set to a file ("Save...").
- The second group comprises the undo and redo actions that are also accessible via the SYSTEM – [UNDO] and SYSTEM – [REDO] front panel keys.
- The icons in the middle group control the graphical zoom function (TRACE – [SCALE] > "Zoom"): "Zoom Reset", "Zoom Select", and "Overview Select".
- The icons in the fourth group provide the following actions, from left to right:
  - Add a new trace and (possibly) a new diagram (TRACE – [TRACE CONFIG] > "Trace").
  - Add a marker (TRACE – [MARKER] > "Markers")
  - Delete a marker, trace, or diagram
- The icon in the rightmost group allows you to restart the sweep in all channels (CHANNEL – [SWEEP] > "Sweep Control" > "Restart Sweep").



You can hide the toolbar using SYSTEM – [DISPLAY] > "View Bar".

### 6.2.3 Softtools

Softtools display groups of related settings as a tabbed panel. They can be opened via function keys on the front panel or the on-screen "Hard Key" panel, or via menu bar and context menu items.



Figure 6-2: Scale softtool

A softtool consists of a title area with a close/re-open icon and a tabbed panel below it. The title area remains displayed when the softtool is closed, which allows you to reopen a closed softtool at any time.

Some controls on the softtool tabs allow you to read and modify settings (e.g. "Ref Value" in the screenshot above), some perform actions (e.g. "Auto Scale Trace"), while others open additional dialogs (button label ends with "...").

## 6.2.4 Menu Bar

All analyzer functions are arranged in drop-down menus. The menu bar is located across the bottom of the diagram:



As in any Windows® application, menus can be controlled with the touchscreen or a mouse. A short tap (left mouse click) expands a menu or submenu. If a menu command has no submenu assigned, a short tap (left mouse click) opens a dialog or directly activates the menu command. When a (sub)menu is selected, the R&S ZNC/ZND displays the corresponding softtool.

### Overview of menu functions

- The "File" menu provides standard Windows® functions that can be used to create, save, recall or print recall sets, to copy the current screen or to shut down the application.
- The "Trace" menu provides all trace settings, the limit check settings, and the marker functions including marker search.
- The "Channel" menu provides all channel settings and activates, modifies or stores different channels.
- The "Display" menu provides all display settings and the functions for activating, modifying and arranging different diagrams.
- The "Applications" menu gives access to applications and tools that extend the functionality of the analyzer firmware.
- The "System" menu provides functions that can be used to return to a defined instrument state, reverse operations, access service functions and define various system-related settings.
- The "Help" menu provides assistance with the network analyzer and its operation.



You can toggle the visibility of the menu bar using SYSTEM – [DISPLAY] > "View Bar" > "Menu Bar".

## 6.2.5 Menu Structure

All menus show an analogous structure.



- A menu command with a right arrow expands a submenu with further related settings.  
**Example:** "Marker" expands a submenu with marker-related properties.
- A menu command with three dots appended calls up a dialog providing several related settings.  
**Example:** "Search Range" opens a dialog to define the search range for the marker search.
- A menu command with no arrow or dots initiates an immediate action.  
**Example:** "Max" sets the active marker to the maximum of the active trace.

## 6.2.6 Hardkey Panel

The (virtual) "Hard Key" panel provides on-screen access to the function keys (plus the [UNDO] and [REDO] key) of the R&S ZNC/ZND. Most of the function keys open a related softtool. For a short description, refer to section [Chapter 3.1.2, "Function Keys"](#), on page 13.



The "Hard Key" panel is particularly useful if the analyzer is controlled from an external monitor or Remote Desktop.

For the R&S ZNC/ZND, it is hidden by default.

You can display the "Hard Key" panel using one of the following methods:

- Select SYSTEM – [DISPLAY] > "View Bar" > "Hard Key Panel".
- Select "Display" > "View Bar" > "Hard Key Panel On" from the menu bar.
- Select "Hard Key" from the context menu of the softtool panel.

## 6.2.7 Status Bar

The status bar shows

- the current channel's sweep averaging counter (e.g. "Ch<i>: Avg 9/10"), or "Ch<i>: Avg None" if averaging is disabled
- the active channel and drive port (P1, P2 ...)
- the progress of the sweep  
The progress bar also shows when the R&S ZNC/ZND prepares a sweep with new channel settings
- the External Reference symbol, if an external reference clock is used for synchronization
- the LXI status symbol (if enabled; see SYSTEM – [SETUP] > "Remote Settings" > "LXI settings")  
A green LXI status symbol indicates that a LAN connection has been established; a red symbol indicates that no LAN cable is connected.



- the current date and time



The progress bar shows a moving color gradient if the current sweep is too fast to be monitored, e.g. because the number of sweep points is low. You can hide/show the status bar using SYSTEM – [DISPLAY] > "View Bar" > "Status Bar".

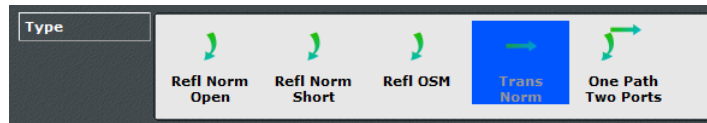
### 6.3 Working with Dialogs

Dialogs provide groups of related settings and allow to make selections and enter data in an organized way. The settings are visualized, if possible. An example is shown below.





For a unidirectional R&S ZND, the bidirectional calibrations are not available.



All dialogs are operated in a similar way.

- To open a dialog, select a softtool button with three dots appearing in its label (e.g. "Start... (Manual)").
- The title bar of each dialog contains some convenience functions:
  - Use the "Dialog Transparency" slider to make the display elements behind the dialog visible.
- Drag and drop the lower right corner of the dialog to modify its size.
- Some dialogs are subdivided into tabs, containing groups of related settings. Activate a tab to access those settings.



The Help system provides useful information about each dialog's specific settings. Select "Help" to open the Help.

## 6.4 Handling Diagrams, Traces, and Markers

The analyzer displays measurement results as traces in rectangular diagrams. Markers are used to read specific numerical values and to search for points or regions on a trace. The following section presents some of the graphical tools the R&S ZNC/ZND provides for trace and marker handling.



### For further reference

Refer to chapter "Concepts and Features" in the R&S ZNC/ZND Help or in the User Manual to learn more about traces, channels, and screen elements.

### 6.4.1 Adding New Traces and Diagrams

A new trace is required if you want to measure and display an additional quantity.

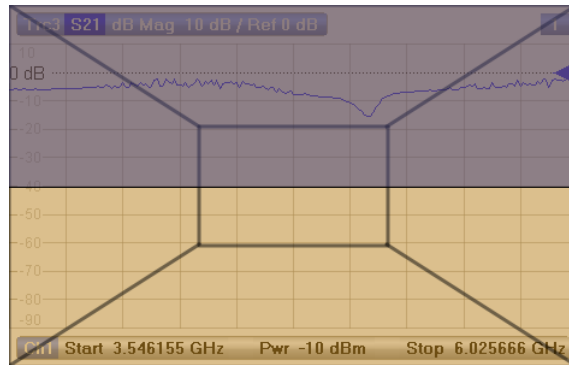
**Typical scenario:** The transmission coefficient  $S_{21}$  is measured as described in [Chapter 5.1, "Transmission S-Parameter Measurement"](#), on page 29. A trace is added to display the reflection coefficient  $S_{11}$  for comparison.



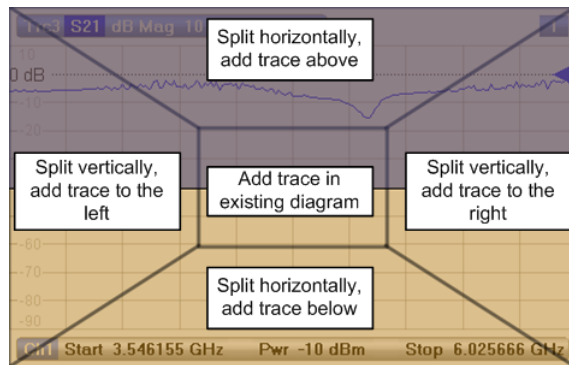
To create a trace:

1. Drag the "New Trace" icon from the toolbar into a diagram.

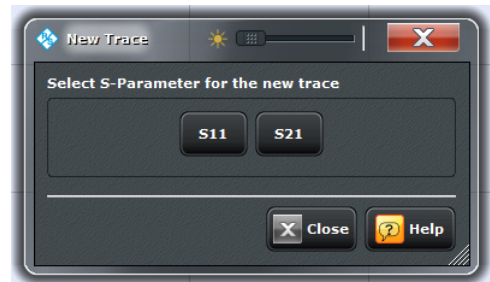
The diagram changes its color scheme and contents as shown below. A rectangle with diagonal lines divides the diagram into different sectors.



2. Select the sector, depending on whether you want to display the new trace in the existing diagram, or whether you want to add a new diagram.



3. In the dialog box that is opened when you release the "New Trace" icon, select the S-parameter to be measured.



left = R&S ZNC or bidirectional R&S ZND  
 right = unidirectional R&S ZND

The R&S ZNC/ZND generates a new trace for the selected S-parameter.



### Alternative control elements

To measure a different quantity, select TRACE – [MEAS]. Drag and drop a softkey representing a measured quantity to create a trace. Or simply select another softkey to change the measured quantity of the active trace.

Select TRACE – [TRACE CONFIG] to access more trace handling functions. Select SYSTEM – [DISPLAY] to access more diagram handling functions.

## 6.4.2 Adding New Markers

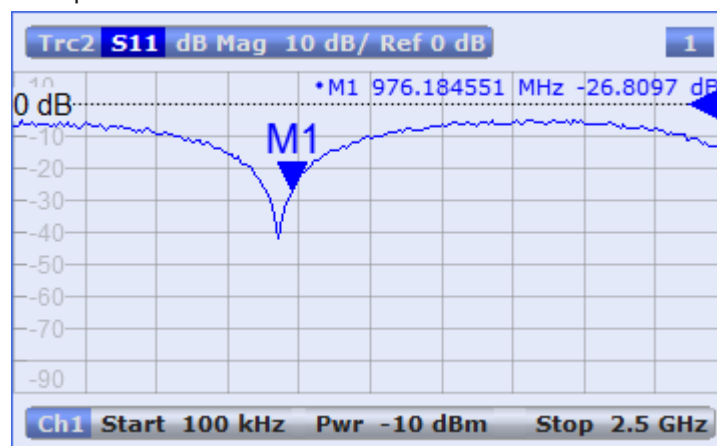
A marker is needed, for instance, to read a particular numerical trace value.



To add a new marker:

- Drag and drop the "New Marker" icon from the toolbar to the desired position in the target diagram.

The marker appears on the target diagram's active trace. The marker info field displays the stimulus value (x-axis value) and response value (y-axis value) at the marker position. The response value varies as the analyzer continues performing sweeps.



### Active trace, alternative control elements

The trace line of the active trace in the upper part of the diagram is highlighted. If the diagram contains several traces, first activate the target trace, then add the marker.

The TRACE – [MARKER] softtool provides more functions for marker handling. In particular, any marker offered in the "Markers" tab can be positioned on the active trace using drag & drop.

## 6.4.3 Deleting Display Elements



Markers, traces, diagrams, and other display elements are most conveniently deleted using the "Delete" icon in the toolbar above the diagram area.

- To delete a single marker, drag it into vertical direction to release it from the trace and drop it onto the "Delete" icon.

To delete a set of markers, drag and drop their marker info field onto the "Delete" icon.

Deleting a marker and its info field also disables the associated marker function.

- To delete a trace, drag and drop its trace line onto the "Delete" icon. Note however, that the last remaining trace cannot be deleted.
- To delete a diagram, drag and drop its diagram number label onto the "Delete" icon. Note however, that the last remaining diagram cannot be deleted.
- To delete a channel, drag and drop all associated traces onto the "Delete" icon. Note however, that the last remaining channel cannot be deleted.
- To hide the limit lines and disable the limit check, drag and drop the PASS / FAIL message onto the "Delete" icon. The limit line itself is not deleted; you can re-use it any time.

The context menu of some display elements also provides the "Delete" function.



### Undo function

If you happen to delete a display element unintentionally, you can restore it using the "Undo" toolbar icon.

## 6.4.4 Using Drag and Drop

You can drag and drop many of the R&S ZNC/ZND's control and display elements to change their size and position. The drag and drop functionality is often more convenient to use than the equivalent buttons of the softtool panels. The following table gives an overview.

**Table 6-1: Drag and drop functionality for various screen elements**

Screen element	Action	Drag and drop...
Diagram	Create	See <a href="#">Chapter 6.4.1, "Adding New Traces and Diagrams"</a> , on page 50
	Resize	Separator between adjacent diagrams
	Delete	See <a href="#">Chapter 6.4.3, "Deleting Display Elements"</a> , on page 52
Trace	Create	See <a href="#">Chapter 6.4.1, "Adding New Traces and Diagrams"</a> , on page 50
	Move vertically	Reference line marker (right diagram edge)
	Move into other or new diagram	Trace line
	Delete	See <a href="#">Chapter 6.4.3, "Deleting Display Elements"</a> , on page 52
	Reset / suspend graphic zoom	"Zoom" element in additional trace line --> "Delete" icon; see <a href="#">Chapter 6.6.1, "Using the Graphical Zoom"</a> , on page 57
Marker	Create	See <a href="#">Chapter 6.4.2, "Adding New Markers"</a> , on page 52
	Move horizontally	Marker symbol
	Delete	Marker or marker info field --> "Delete" icon; see <a href="#">Chapter 6.4.3, "Deleting Display Elements"</a> , on page 52

Screen element	Action	Drag and drop...
Marker info field	Add	See <a href="#">Chapter 6.4.2, "Adding New Markers"</a> , on page 52
	Move within diagram	Marker info field (move to one of several pre-defined positions)
	Delete	See <a href="#">Chapter 6.4.3, "Deleting Display Elements"</a> , on page 52
Softtool panel	Move	Softtool panel (move to the right or left edge of the screen)

## 6.5 Entering Data

The analyzer provides dialogs with various types of input fields where you can enter numeric values and character data. Data entry with a mouse and an external keyboard is a standard procedure known from other Windows® applications. However, there are various other ways to enter data.

### 6.5.1 Using Front Panel Keys

You can use the keys in the DATA ENTRY keypad to enter numbers, units, and characters.



To enter a numeric value:

1. Select a numeric data input field to activate it.
2. Press the data entry keys.
  - Use [0] to [9] to enter the corresponding numbers.
  - Use [.] to enter a decimal point.
  - Use [-] to change the sign of the value.
  - Use [G/n], [M/μ], [k/m], or [x1] to multiply the entered value with factors of  $10^{(-)9}$ ,  $10^{(-)6}$ ,  $10^{(-)3}$  or 1 and to add the appropriate physical unit.

To enter a character string:

1. Tap a character data input field to activate it.
2. Press the DATA ENTRY keys as if you were writing a short message on your mobile phone.
  - Use [0] to [9] to enter the corresponding numbers.
  - Use [.] and [-] to enter a dot or hyphen.
  - Use Use [G/n], [M/μ], or [k/m] to enter the letters G, M or K (case-insensitive).
  - Use the [←] key to correct wrong entries, deleting the character to the left of the current cursor position.
  - Press [ENTER] to complete an entry.
  - Press [ESC] to discard the entries made.
3. To enter letters other than G, M or K, you can also use one of the methods described in the following sections:
  - [Chapter 6.5.3, "Using the Analyzer's On-Screen Keyboard"](#), on page 56
  - [Chapter 6.5.4, "Using the Windows® On-Screen Keyboard"](#), on page 56

## 6.5.2 Using the Numeric Editor

The "Numeric Editor" is a tool for convenient entry and modification of numeric values. It is available for all numeric input fields in the analyzer GUI.

Operation with touchscreen or mouse:

1. Double-tap (double-click) a numeric input field in a dialog or on a softtool to open the numeric editor.



2. Use the buttons in the numeric keypad to compose the numeric input value.
3. If desired, select a "Step Size" and use the cursor up/down buttons to increment/decrement the current value. If a marker is active, you can also set the numeric value to the current marker value ("Set to Marker").

4. After completing the input string, select "ENTER" to apply your selection and close the numeric editor.

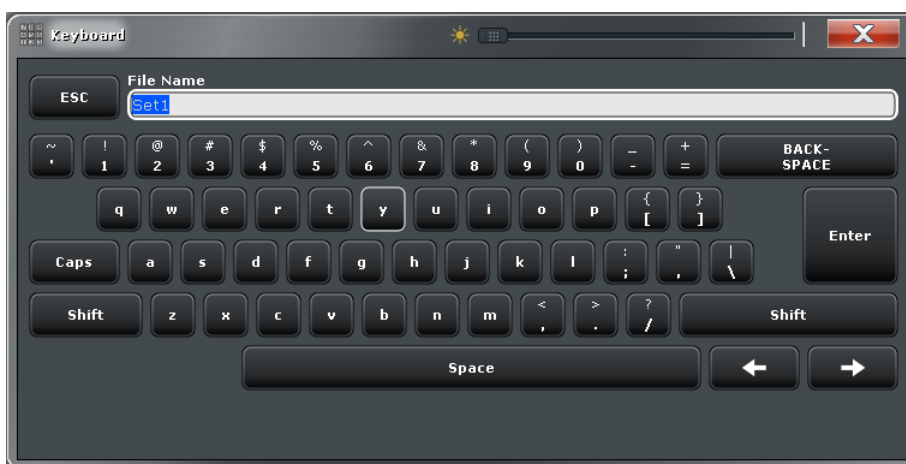


### [STEP SIZE] key

If a numeric input field is active, the [STEP SIZE] front panel key opens a dialog box containing the "Step Size" panel of the numeric editor. Use this box for efficient operation of the rotary knob (and mouse wheel).

## 6.5.3 Using the Analyzer's On-Screen Keyboard

The on-screen "Keyboard" allows you to enter characters, in particular letters, without an external keyboard. It is available for all text input fields in the analyzer GUI.



1. Activate a character data input field in a softtool or a dialog.
2. Double-tap/click the input field to open the on-screen keyboard.
3. Select character buttons to compose the input string.
4. Select "Enter" to apply your selection and close the keyboard.

## 6.5.4 Using the Windows® On-Screen Keyboard

The Windows® on-screen keyboard allows you to enter characters, in particular letters, even if an input field cannot call up the analyzer's own on-screen keyboard. Examples are input fields in standard Windows® dialogs.



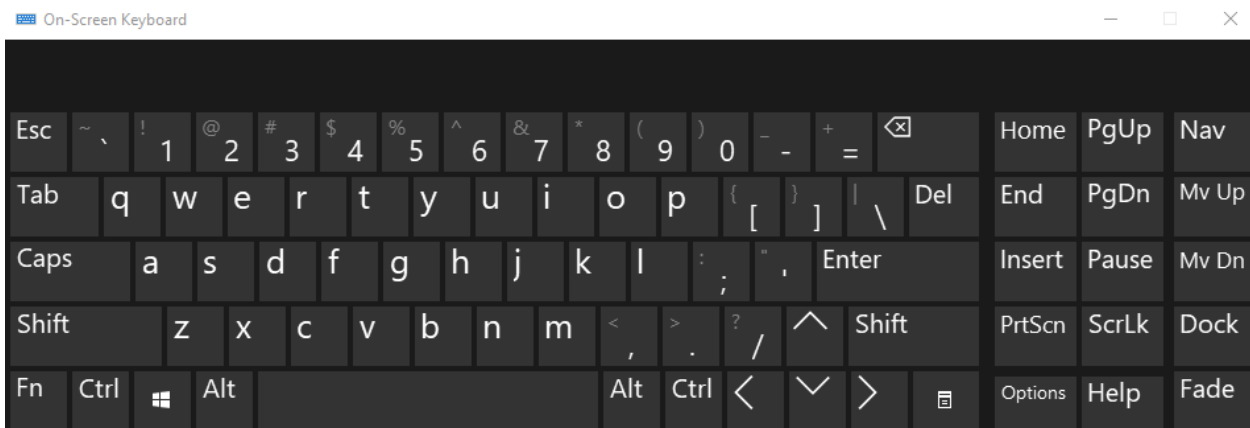


Figure 6-3: Windows 10 on-screen keyboard

To call up the on-screen keyboard:

1. Open the SYSTEM – [APPLIC] softtool.
2. In the "External Tools" tab, select "Screen Keyboard".

## 6.6 Scaling Diagrams

The analyzer provides various tools for customizing the diagrams and for setting the sweep range. Choose the method that is most convenient for you.

### 6.6.1 Using the Graphical Zoom

The graphical zoom function magnifies a rectangular portion of the diagram (zoom window) to fill the entire diagram area. The sweep points are not affected.



The graphical zoom function is only supported for cartesian trace formats. For (inverted) Smith and polar diagrams, it is not available.



To activate the graphical zoom:

- Select the "Zoom Select" toggle button in the toolbar above the diagram area. The icon changes its background color from black to blue.
- In the active diagram area, select an appropriate rectangular area.



The zoomed view shows the selected rectangle, scaled in both horizontal and vertical direction. In general, the zoom window covers only a part of the sweep range; the horizontal distance between the sweep points increases. The reduced display range is indicated in an additional zoom line in the channel info area.



If the active diagram is graphically zoomed, the "Overview Select" button in the toolbar toggles an overview. The upper part of the diagram then shows a small version of the unzoomed diagram. You can move the zoomed part of the trace by moving the selected rectangular area in the overview.



Use the "Zoom Reset" icon to restore the original diagram. Alternatively, you can drag and drop the "Zoom" label from the additional channel info line onto the "Delete" toolbar button.



### Alternative settings

- The TRACE – [SCALE] > "Zoom" softtool tab allows you to define the displayed zoom range numerically.
- To zoom the stimulus range (keeping the number of sweep points constant), use the "Zoom Stimulus" function in the "Stimulus" tab of the "Stimulus" softtool. The latter can be opened using the keys in the STIMULUS section.

## 6.6.2 Setting the Sweep Range

The sweep range for all related channels is displayed in the channel info area at the bottom of each diagram:

Ch1	Start	100 kHz	—	Pwr	-10 dBm	Bw	10 kHz	Stop	3 GHz
Ch2	Start	100 kHz	—	Pwr	-10 dBm	Bw	10 kHz	Stop	3 GHz
Ch3	Freq	1 GHz	—	Pwr	-10 dBm	Bw	10 kHz	Stop	1 s
Ch4	Start	100 kHz	—	Pwr	-10 dBm	Bw	10 kHz	Stop	3 GHz
Trc4	Start	-1 ns	—	Time Domain				Stop	4 ns

To change the sweep range of the active channel, use one of the following methods:

- Use the [START], [STOP], [CENTER], and [SPAN] function keys from the STIMULUS section.
- Double-tap (with a mouse: double-click) the "Start" or "Stop" label in the channel list.
- Tap and hold (with a mouse: right-click) the "Start" or "Stop" label in the channel list and select "Start Frequency", "Stop Frequency", "Center Frequency", or "Frequency Span" from the context menu.
- Select "Start Frequency", "Stop Frequency", "Center Frequency", "Span Frequency" from the "Channel" > "Stimulus" menu.
- Use the "Set by Marker" functions (TRACE – [MARKER] > "Set by Marker"; see [Chapter 6.6.6, "Set by Marker"](#), on page 60).

## 6.6.3 Reference Value and Position

The analyzer provides three parameters for changing the scale of the vertical (response) axis:

- Changing the "Ref Value" or "Ref Pos" shifts the trace in vertical direction and adjusts the labels of the vertical axis. "Ref Value" also works for radial diagrams.
- Changing the "Scale/Div" modifies the value of the vertical or radial diagram divisions and thus the entire range of response values displayed.

The "Scale/Div" and the "Ref Value" are indicated in the scale section of the trace info. In the example below, a "Scale/Div" of 10 dB and a "Ref Value" of 0 dB is used.

Trc1 S21 dB Mag 10 dB / Ref 0 dB Math

To change such a scale parameter, use one of the following methods:

- Open the TRACE – [SCALE] > "Scale Values" softtool tab and proceed from there.

- Tap and hold (with a mouse: right-click) the scale section in the trace info and select a setting from the context menu.
- Select a setting from the "Trace" > "Scale" menu.
- Use "Set by Marker" functions (TRACE – [MARKER] > "Set by Marker"; see [Chapter 6.6.6, "Set by Marker"](#), on page 60).

#### 6.6.4 Auto Scale

The "Auto Scale" function adjusts the scale divisions and the reference value so that the entire trace fits into the diagram. To access "Auto Scale", use one of the following methods:

- Open the TRACE – [SCALE] > "Scale Values" softtool tab and select "Auto Scale Trace" or "Auto Scale Diagram".
- Tap and hold (with a mouse: right-click) the scale section in the trace info and select "Auto Scale Trace" from the context menu.
- Select "Auto Scale Trace" or "Auto Scale Diagram" from the "Trace" > "Scale" menu.

#### 6.6.5 Circular Diagrams

The radial scale of a circular diagram ("Polar", "Smith" or "Inverted Smith") can be changed with a single linear parameter, the "Ref Value". The reference value defines the radius of the outer circumference.

- Increasing the "Ref Value" scales down the polar diagram.
- Decreasing the "Ref Value" magnifies the polar diagram.

The "Ref Value" is indicated in the scale section of the trace info.

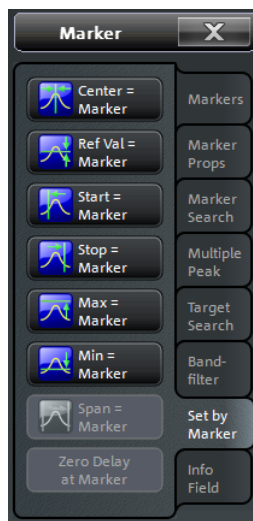
Trc1 S21 Polar 400 mU/ Ref 2 U

To change the "Ref Value" setting, use one of the following methods:

- Locate it on the TRACE – [SCALE] > "Scale Values" softtool tab.
- Tap and hold (with a mouse: right-click) the scale section in the trace info and select the parameter from the context menu.
- Select the parameter from the "Trace" > "Scale" menu.
- Use the "Set by Marker" functions; see [Chapter 6.6.6, "Set by Marker"](#), on page 60.

#### 6.6.6 Set by Marker

The "Set by Marker" functions are a convenient tool for scaling (in particular: magnifying) diagrams without entering explicit numeric values. You simply place a marker to a trace point and use the marker values to change the sweep range or move the trace relative to the vertical axis. The touchscreen or a mouse makes it easier to activate (touch/click) or move (drag and drop) markers.



To set the sweep range using markers, use one of the following methods.

Set "Start" and "Stop" values in the diagram:

1. Create two normal markers, e.g. the markers "Mkr 1" (default label "M1") and "Mkr 2" (default label "M2").  
See [Chapter 6.4.2, "Adding New Markers"](#), on page 52.
2. Place "M1" to the start value of the desired sweep range and tap TRACE – [MARKER] > "Set by Marker" > "Start = Marker".
3. Place "M2" to the stop value of the desired sweep range and tap TRACE – [MARKER] > "Set by Marker" > "Stop = Marker".

Use a definite "Span:"

1. Create a marker.
2. Enable "Delta Mode" for this marker.  
The analyzer automatically creates an additional reference marker.
3. Place the reference marker to the start value of the desired sweep range.
4. Set the value of the delta marker to the desired sweep range and tap TRACE – [MARKER] > "Set by Marker" > "Span = Marker".

To move the trace in vertical direction, proceed as follows:

1. Create a normal marker, e.g. the marker "Mkr 1" (default label "M1").
2. Place "M1" to a particular trace point, e.g. use the "Marker Search" functions to locate a maximum or minimum on the trace.
3. Select TRACE – [MARKER] > "Set by Marker" > "Max = Marker" to move the trace towards the upper diagram edge, leaving the values of the vertical divisions ("Scale/Div") and the overall vertical scale unchanged. Analogously, select "Min =

Marker" to move the trace towards the lower diagram edge, or select "Ref Val = Marker" to move the trace towards the "Ref Value".



You can also use marker values in the "Numeric Editor"; see [Chapter 6.5.2, "Using the Numeric Editor"](#), on page 55.

### 6.6.7 Enlarging a Diagram

The analyzer provides different tools for customizing the contents and size of the diagrams:

- Double-tap/click a diagram to maximize it. Or equivalently, select SYSTEM – [DISPLAY] > "Diagram" > "Maximize".  
If enabled the active diagram is always maximized.
- The "Menu Bar", the "Status Bar", the "Hard Key Panel", and the "Title Bar" can be hidden to gain space for the diagrams (SYSTEM – [DISPLAY] > "View Bar").
- The SYSTEM – [DISPLAY] > "Config" softtool tab defines optional display elements for the interior of the diagrams.

Use the context menu of the diagram, the SYSTEM – [DISPLAY] key or the "Display" menu to access the display settings.

## 7 Administrative Tasks

This chapter describes some topics that are only needed occasionally, or if a special instrument configuration is required.

### 7.1 Windows Operating System

The analyzer is equipped with a Windows® operating system which has been configured according to the instrument's features and needs. Changes in the system configuration can be necessary to:

- Establish a LAN connection
- Customize the properties of the external accessories connected to the analyzer
- Call up additional software tools

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#### **NOTICE**

##### **Modifications of the operating system**

The operating system is adapted to the network analyzer. To avoid impairment of instrument functions, only change the settings described in this manual. Existing software must be modified only with update software released by Rohde & Schwarz. Likewise, only programs authorized by Rohde & Schwarz for use on the instrument must be executed.

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All necessary settings can be accessed from the Windows "Start" menu, in particular from the "Control Panel". To open the "Start" menu, press the Windows key in the SYSTEM keypad or on an external keyboard.



##### **User accounts and password protection**

The analyzer uses a user name and password as credentials for remote access. Two user accounts with different levels of access are available on the instrument:

- "instrument" is the default account with standard rights to change system settings. Use this account for normal operation of the analyzer.
- "Administrator" is the account for administering the operating system. This account is required, for instance, if you wish to install programs on the analyzer.

In the factory configuration, "894129" is preset as a password for both users. To protect the analyzer from unauthorized access, it is recommended to change the preset passwords.

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To switch from one user account to another, log off from Windows and then log on again. The "switch user" functionality is disabled on the R&S ZNC/ZND.



## 7.2 Firmware Update

Upgrade versions of the analyzer firmware are supplied as single Windows® installer files (\*.msi).



### Administrator account

You need administrator rights to install a new firmware version. See note on "[User accounts and password protection](#)" on page 63 for details.

To perform a firmware update:

1. Copy the setup file to any storage medium accessible from the analyzer. This can be either the internal mass storage drive, an external storage medium (USB memory stick, external CD-ROM drive) or a network connection (LAN).
2. Run the setup file from the Windows® Explorer. Follow the instructions of the setup wizard.

Setup files can be reinstalled. The default name of the internal drive is C: . External storage devices are automatically mapped to the next free drive, i.e. D: , E: etc.



### Factory calibration

A firmware update does not affect the factory calibration.

### NOTICE

#### External accessories

Calibration units must be disconnected during a firmware update.

## 7.3 Remote Operation in a LAN

A LAN connection is used to integrate the analyzer into a home/company network. LAN connectivity offers several applications, e.g.:

- Transfer data between a controller and the analyzer, e.g. to run a remote control program.
- Control the measurement from a remote computer using Remote Desktop or a similar application.



- Use external network devices (e.g. printers).

---

**NOTICE****Virus protection**

An efficient virus protection is a prerequisite for secure operation in the network. Never connect your analyzer to an unprotected network. For useful hints, see the following Rohde & Schwarz application note:

- [1EF96: Malware Protection Windows 10](#)
- Windows 7: [1DC01: Malware Protection Windows 7](#)

---

The analyzer uses a user name and password as credentials for remote access; see note on "[User accounts and password protection](#)" on page 63 for details. To protect the analyzer from unauthorized access, it is recommended to change the factory setting.

### 7.3.1 Assigning an IP Address

Depending on the network capacities, the TCP/IP address information for the analyzer can be obtained in different ways.

- If the network supports dynamic TCP/IP configuration using the Dynamic Host Configuration Protocol (DHCP), all address information can be assigned automatically.
- If the network does not support DHCP, or if the analyzer is set to use alternate TCP/IP configuration, the addresses must be set manually.

By default, the analyzer is configured to use dynamic TCP/IP configuration and obtain all address information automatically. This means that it is safe to establish a physical connection to the LAN without any previous analyzer configuration.

---

**NOTICE****Manual TCP/IP configuration**

If your network does not support DHCP, or if you choose to disable dynamic TCP/IP configuration, you must assign valid address information **before** you connect the analyzer to the LAN. Contact your network administrator to obtain a valid IP address, because connection errors can affect the entire network.

**Administrator account**

You need administrator rights to change the TCP/IP configuration. See note on "[User accounts and password protection](#)" on page 63 for details.

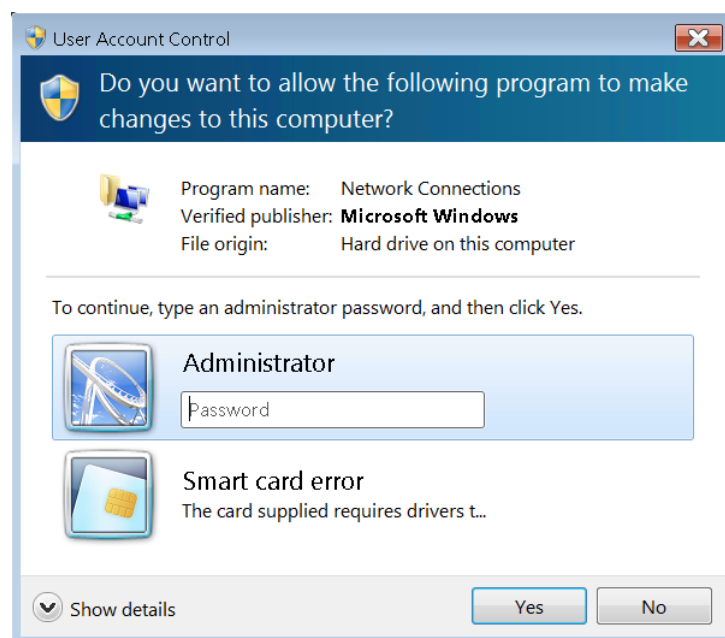
---

**To enter the TCP/IP address information manually**

1. Obtain the IP address and subnet mask for the analyzer and the IP address for the local default gateway from your network administrator. If necessary, also obtain the

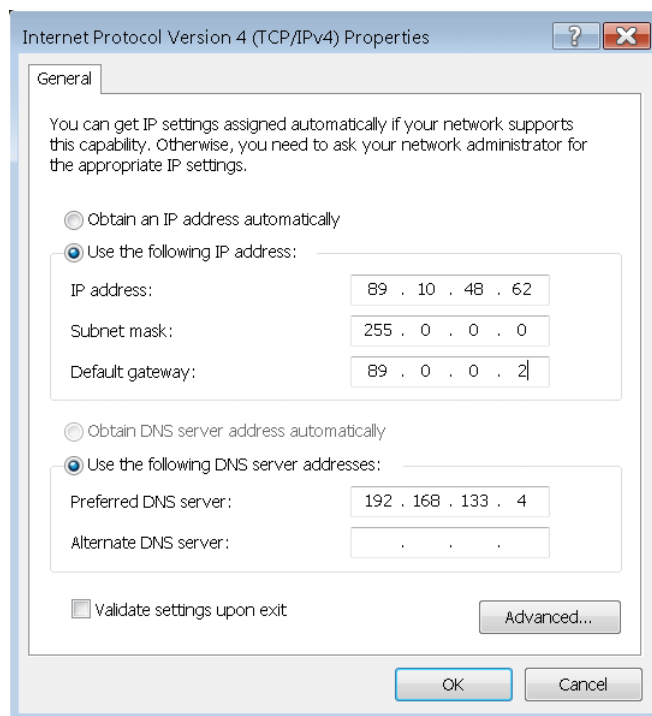
name of your DNS domain and the IP addresses of the DNS and WINS servers on your network.

2. Press the Windows key in the SYSTEM keypad or on an external keyboard to access Windows®.
3. Open the "Control Panel" > "Network and Sharing Center" > "Change adapter settings" dialog and right-click the local connection.  
Windows 7: open the "Control Panel" > "Network and Internet" > "Network and Sharing Center" > "Local Area Connection Status" dialog.
4. Select "Properties" and confirm the user account control message, depending on your current user account.
  - If your current account is an administrator account, select "Yes".
  - If your account is an account with standard user rights, enter the password of the administrator account and select "Yes".



*Figure 7-1: Windows 7 User Account Control dialog*

5. In the "Connection Properties" dialog opened, select "Internet Protocol Version 4 (TCP/IPv4) > Properties" and enter the IP address information.



### 7.3.2 Remote Desktop Connection

Remote Desktop is a Windows® application which you can use to access and control the analyzer from a remote computer through a LAN connection. While the measurement is running, the analyzer screen contents are displayed on the remote computer, and Remote Desktop provides access to all of the applications, files, and network resources of the analyzer.



At the R&S ZNC/ZND by default remote connections are enabled using a local group policy and remote access is granted to users instrument and administrator.

For detailed information about Remote Desktop and the connection refer to the Windows® Help ("Windows Start Menu > Help and Support").

To establish a remote desktop connection, proceed as follows:

1. Connect remote Windows PC and VNA to the LAN and make sure that an IP connection can be established.
2. At the remote Windows PC, open a remote desktop connection (type "Remote Desktop Connection" at the Windows Start/Search menu and hit enter).
3. In the "Remote Desktop Connection" dialog, enter the VNA's computer name or IP address and select "Connect"

### 7.3.3 Windows® Firewall Settings

A firewall protects an instrument by preventing unauthorized users from gaining access to it through a network. In the default configuration of the R&S ZNC/ZND, the firewall is enabled. A remote desktop connection does not require any changes in the firewall settings.



#### Administrator account

You need administrator rights to change the firewall settings. See note on "[User accounts and password protection](#)" on page 63 above for details.

Some actions require a different firewall configuration, e.g.:

- To transfer data with other hosts in the LAN, you have to allow "File and Printer Sharing".

To change the firewall settings, proceed as follows:

1. Access the operating system by pressing the Windows® key on the external keyboard. Open the "Control Panel".
2. Select "Windows Defender Firewall"  
("System and Security > Windows Firewall" in Windows 7)
  - Select "Allow an app or feature through Windows Defender Firewall" to enable "File and Printer Sharing".  
(Windows 7: select "Change Settings > Allow a program or feature through Windows Firewall" to enable "File and Printer Sharing").
  - Select "Turn Windows Firewall on or off" to enable or disable the firewall.

You must confirm a user account control message to allow the desired changes (see [Figure 7-1](#)). For detailed information about the firewall refer to the Windows® Help.

#### **NOTICE**

##### Risks of changing the firewall settings

Disabling the firewall or allowing exceptions may make your instrument more vulnerable to viruses and intruders. It is recommended to restore the default firewall configuration after completing a task which requires modified settings.

## 8 Maintenance

The R&S ZNC/ZND vector network analyzer does not require any special maintenance.

For our support center address and a list of useful R&S contact addresses, refer to the "Contact" page at the beginning of the Help system.

### 8.1 Cleaning

#### **WARNING**

##### **Risk of electric shock**

If moisture enters the casing, for example if you clean the instrument using a moist cloth, contact with the instrument can lead to electric shock. Before cleaning the instrument other than with a dry cloth, make sure that the instrument is switched off and disconnected from all power supplies.

#### **NOTICE**

##### **Instrument damage caused by cleaning agents**

Cleaning agents contain substances such as solvents (thinners, acetone, etc.), acids, bases, or other substances. Solvents can damage the front panel labeling, plastic parts, or screens, for example.

Never use cleaning agents to clean the outside of the instrument. Use a soft, dry, lint-free dust cloth instead.

#### **NOTICE**

##### **Risk of instrument damage due to obstructed fans**

If the instrument is operated in dusty areas, the fans become obstructed by dust or other particles over time. Check and clean the fans regularly to ensure that they always operate properly. If the instrument is run with obstructed fans for a longer period, the instrument overheats, which can disturb the operation and even cause damage.

1. Clean the outside of the instrument using a soft, dry, lint-free dust cloth.
2. Check and clean the fans regularly to ensure that they always operate properly.
3. Clean the touchscreen as follows:
  - a) Apply a small amount of standard screen cleaner to a soft cloth.
  - b) Wipe the screen gently with the moist, but not wet, cloth.

- c) If necessary, remove any excess moisture with a dry, soft cloth.

## 8.2 Storing and Packing the Instrument

The vector network analyzer can be stored at the temperature range quoted in the data sheet. When it is stored for a longer period of time, the unit must be protected against dust.

If possible, use the original packing when the instrument is to be transported or dispatched; please also observe the notes in [Chapter 4.1, "Unpacking and Checking the Instrument"](#), on page 20.

## 8.3 Replacing Fuses

The R&S ZNC is protected by two time lag fuses (IEC60127 T3.15H / 250 V, stock no. 0099.6729.00), located in the fuse drawer below the AC power switch on the rear panel. For the R&S ZND, there are no such fuses.

---

### **WARNING**

#### **Risk of electric shock**

The fuse is part of the main power supply. Therefore, handling the fuse while power is on can lead to electric shock. Before opening the fuse holder, make sure that the instrument is switched off and disconnected from all power supplies.

Always use fuses supplied by Rohde & Schwarz as spare parts, or fuses of the same type and rating.

---

#### **To replace the fuses**

1. Use a small screwdriver to bend the small clamps on both sides of the fuse drawer inward so that you can lift the fuse drawer out of its slot.
2. Exchange the fuses.
3. Push the drawer back into the slot.

## 9 Obtaining Technical Support

The instrument generates error messages which are usually sufficient for you to detect the cause of an error and find a remedy. Error message types are described in the R&S ZNC/ZND User Manual; refer to section "Error Messages and Troubleshooting".

In addition, the system **"Info" dialog** offers valuable troubleshooting information. This dialog can be opened via the "Info..." button in the SYSTEM – [SETUP] > "Setup" soft-tool tab.

Finally, our customer support centers are there to assist you in solving any problems with your network analyzer.

The required troubleshooting information can also be generated in the system "Info" dialog. **"Save Report"** collects the following information:

- Setup, option, and hardware information, error log, and selftest results.  
This information can also be retrieved using the "Save..." function of the "Info" dialog.
- Current eeprom data.
- A screenshot of the VNA display.
- The latest 5 exception dumps.

The resulting \*.zip file is written to the report directory

C:\Users\Public\Documents\Rohde-Schwarz\Vna\Report. Its file name contains the current date and time, e.g. report\_20180228\_1658.zip.

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