R&S® ZNA
Vector Network Analyzers
Getting Started

1178645602

Getting Started
Version 10

ROHDE&SCHWARZ

This manual describes the following R&S® ZNA vector network analyzer models:

- R&S® ZNA26, 10 MHz to 26.5 GHz, 2 test ports, 3.5 mm (m) connectors, order no. 1332.4500.22
- R&S® ZNA26, 10 MHz to 26.5 GHz, 4 test ports, 3.5 mm (m) connectors, order no. 1332.4500.24
- R&S® ZNA43, 10 MHz to 43.5 GHz, 2 test ports 2.92 mm, order no. 1332.4500.42
- R&S® ZNA43, 10 MHz to 43.5 GHz, 4 test ports 2.92 mm, order no. 1332.4500.44
- R&S® ZNA43, 10 MHz to 43.5 GHz, 2 test ports 2.4 mm, order no. 1332.4500.43
- R&S® ZNA43, 10 MHz to 43.5 GHz, 4 test ports 2.4 mm, order no. 1332.4500.45

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1178.6456.02 | Version 10 | R&S® ZNA

Throughout this guide R&S® is abbreviated as R&S.

Contents

1 Safety Information

The product documentation helps you use the R&S ZNA 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 ZNA is intended for the development, production and verification of electronic components and devices in industrial, administrative, and laboratory environments. Use the R&S ZNA 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 ZNA.
- 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 ZNA user documentation. Unless specified otherwise, you find the documents on the R&S ZNA product page at:

https://www.rohde-schwarz.com/manual/ZNA

2.1.1 Getting Started Manual

Introduces the R&S ZNA 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 are available as help in the R&S ZNA. 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):

https://gloris.rohde-schwarz.com

2.1.4 Instrument Security Procedures

Deals with security issues when working with the R&S ZNA 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 ZNA. 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/ZNA

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/ZNA

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/ZNA

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. This also applies to the virtual keys in the control window of the R&S ZNA.
"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.
Input	Input to be entered by the user is displayed in italics.
Links	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

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 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 6, "Performing Measurements", on page 58; for a description of the operating concept refer to Chapter 5, "Operating the Instrument", on page 29. 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.

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.

3.1 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.

As the R&S ZNA **is very heavy** (over 30 kg fully equipped), it must always be carried by two people using both carrying handles to avoid personal injury or damage to the instrument.

3.2 Positioning the Instrument

The network analyzer is designed for use under laboratory conditions, either on a bench top or in a rack.

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.

NOTICE

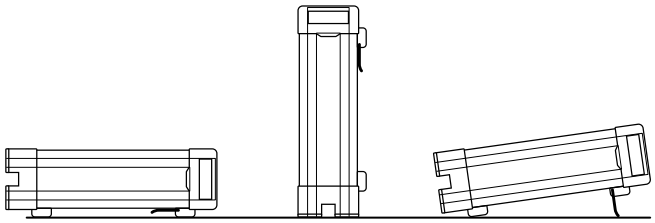
Instrument damage caused by electrostatic discharge

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.

During operation, if the firmware observes a serious unexpected disturbance (e.g. due to ESD), it resets all hardware components to ensure proper instrument functioning. It then restores the user settings to the state before the disturbance and indicates the foregone hardware reset by an "Hardware communication problem [...]" information popup.

3.3 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.

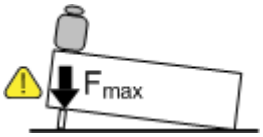


WARNING

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.



3.4 Operation in a 19" Rack

The R&S ZNA can be mounted in 19" racks using the adapter R&S ZZA-KN6 (order number 1332.4498.02). 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.

3.5 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 length and quality, the following requirements have to be met for cable that are directly connected to the R&S ZNA:

Table 3-1: 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
Digital I/Q (External Handler IO, External Data Logger, Direct Control)	R&S order no. 1402.4990.00 only
GPIB	Standard cable
RFFE/GPIO	R&S ZN-Z25 (order no. 1334.3424.02) only
DisplayPort (Monitor)	Standard cable
DVI-D (Monitor)	2 ferrite cores
LAN	At least CAT6, S/FTP
PCIe	Standard cable
USB	Standard cables, length ≤ 3m

3.6 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. A line frequency of 400 Hz is also supported.

The mains connector is located in the upper part of the rear panel (see Chapter 4.2, "Rear Panel", on page 27).

► 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.

3.7 Starting the Analyzer and Shutting Down

The AC power switch is located in the upper part of the rear panel, above the mains connector; see Chapter 4.2, "Rear Panel", on page 27.

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 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 ZNA, 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.

3.8 Standby and Ready State

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

The standby power only supplies the power switch circuits and the optional high precision quartz (R&S ZNA-B4, "Precision Oven Quartz Frequency Reference"). In this

state, it is safe to switch the AC power off and disconnect the instrument from the power supply. In ready state, 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 3.7, "Starting the Analyzer and Shutting Down", on page 14.

3.9 Connecting External Accessories

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

- An external monitor displays the Windows® desktop plus the Vector Network Analyzer (VNA) application windows.
- 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.
- The R&S ZNA can also be remote controlled via USB.

External monitor, keyboard and mouse are not required for local operation. The R&S ZNA can be fully controlled by tapping the touchscreen.

3.9.1 Connecting a Monitor

A standard monitor can be connected to the DVI-D connector of the R&S ZNA. No extra configuration is required.

The R&S ZNA also offers a DisplayPort.

NOTICE

Safety aspects

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

3.9.2 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.

To access Windows®, use the ⊞ button in the toolbar of the application window.

3.9.3 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.

To access Windows®, use the ⊞ button in the toolbar of the application window.

3.9.4 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 – [File Print] > "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.

To access Windows®, use the ⊞ button in the toolbar of the application window.

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 ana-

lyzer 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 – [File Print] > "Print" > "Print...") or the Windows® printer management to configure the printer properties and printing preferences.

3.9.5 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 69.
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.

3.9.6 Connecting a USB Cable for Remote Control

The R&S ZNA can also be remote controlled via USB. To prepare for remote control operation, connect a suitable USB cable to the type B "USB Device" port on the rear panel of the instrument. With direct connection to a master device, a connecting cable A-B (plug type A onto plug type B) must be used.

For more information, refer to the Remote Control chapter of your analyzer's help system or user manual.

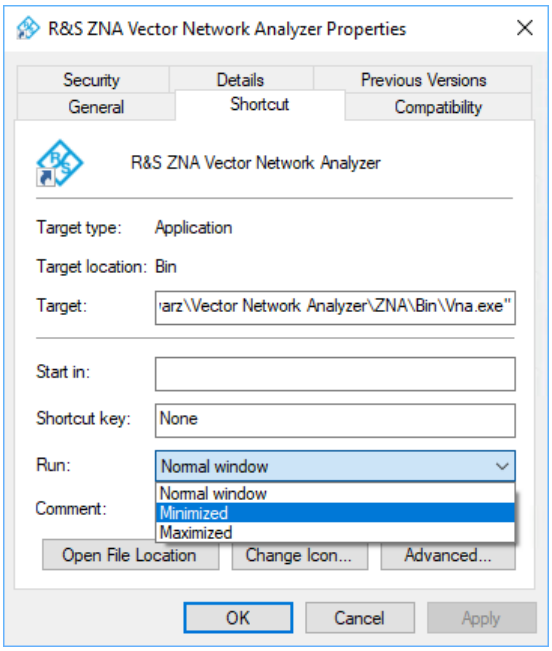
3.10 Minimizing the VNA Application

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.

4 Instrument Tour

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

4.1 Front Panel

The front panel of a R&S ZNA consists of a large-scale capacitive touchscreen and the test port area below it.

Brief explanations on the controls and connectors can be found on the next pages.

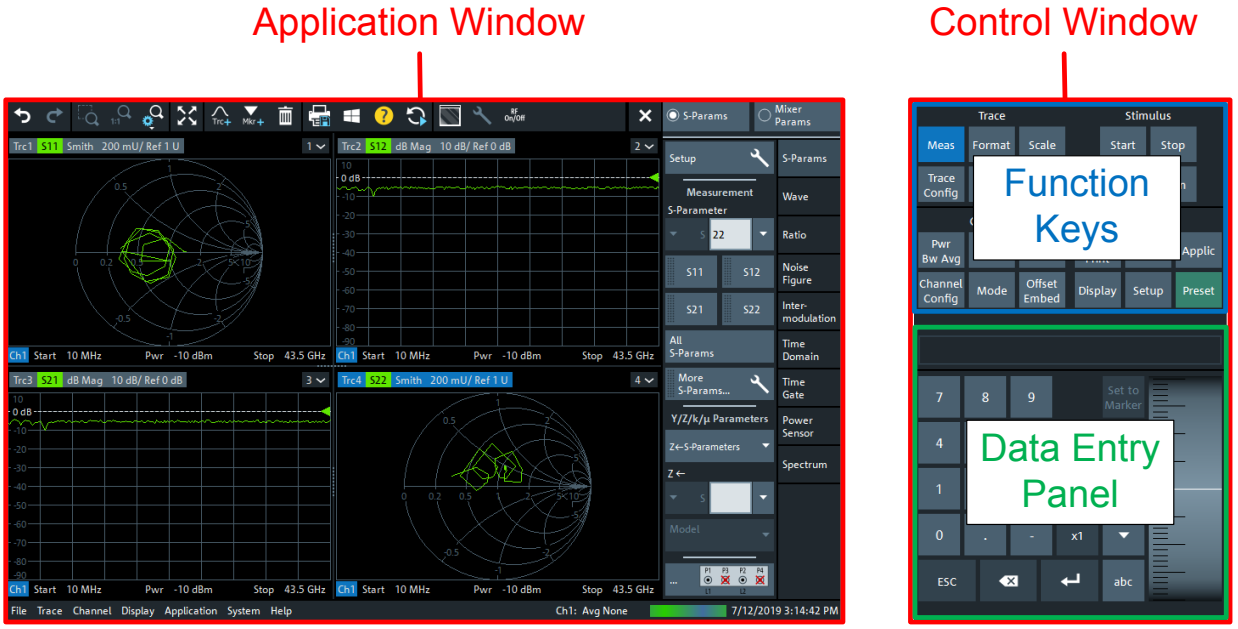
Two-port and four-port network analyzers

The figures and examples in this Getting Started guide show a four-port network analyzer. Everything described in this guide is also valid for two-port analyzers. The extended measurement functionality of the four-port instruments is described in the help system and in the user manual.

4.1.1 Touchscreen

The touchscreen is split into two parts: the application window with diagrams and softtools on the left, and the control window with its (virtual) function keys and data entry controls on the right. User interaction is touch-only, i.e. all hardkeys commonly used in Rohde & Schwarz VNAs have been implemented in software.

Refer to the data sheet for the technical specifications of the touchscreen.



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 when the touchscreen is touched.

4.1.1.1 Application Window

The left part of the touchscreen is reserved for the application window.

The application window presents the measurement results, mostly in form of diagrams. The toolbar, softtools and menu bar give access to all instrument functions. For an introduction to touchscreen operation, refer to Chapter 5.1, "Manual Operation ", on page 29.

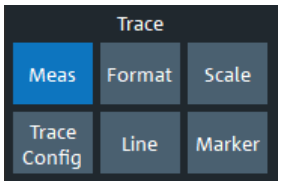
The following sections contain further useful information about manual control of the instrument.

- Refer to Chapter 5, "Operating the Instrument", on page 29 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 the description of the "Display" softtool (System – [Display]) in the user manual or help system to learn how to customize the screen.

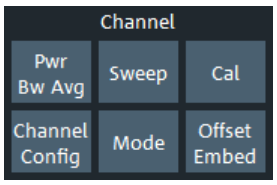
4.1.1.2 Control Window: Function Keys

Most of the (virtual) keys in the upper part of the control window call up a related softtool of the analyzer GUI. Every softtool, in turn, provides access to a group of related settings and actions (see Chapter 5.2.3, "Softtools", on page 35).



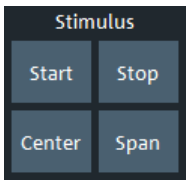
The Trace keys give access to all trace settings, to the limit check settings, and to the marker functions including marker search.

- [Meas]: select the measured and displayed quantity.
- [Format]: define how measured data (traces) are presented.
- [Scale]: define how traces are scaled.
- [Trace Config]: store traces to memory and perform mathematical operations on traces.
- [Line]: define limits for measurement results, visualize them in the diagrams and activate/deactivate the limit check.
- [Marker]: 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.



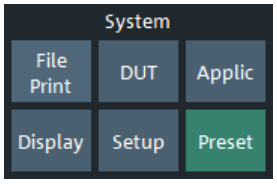
The Channel keys give access to channel-related settings.

- [Pwr Bw Avg]: define the power of the internal signal source, the IF bandwidth, and the sweep average.
- [Sweep]: define the scope of measurement, including the sweep type and the number of measured sweeps.
- [Cal]: functions that are necessary to perform and manage calibrations.
- [Channel Config]: functions for channel management.
- [Mode]: set up channels for particular (non-standard) measurements.
- [Offset Embed]: functions for embedding and deembedding a DUT.



The Stimulus keys define the sweep range, depending on the sweep type.

- [Start]
- [Stop]
- [Center]
- [Span]



The System keys give access to (or provide) general system functions.

- [File Print]
  - Create, save or load recall sets.
  - Save or load trace data.
  - Send the contents of the active diagrams to a file, to the clipboard, or to an external printer (incl. content definition and printer setup).
- [DUT]: starting point for DUT-centric measurement setup.
  - Define DUTs to be measured (type, properties)

– Choose the measurements to be performed on a selected DUT.

The analyzer firmware then helps you to set up the channels accordingly.

- [Applic]: external software tools and optional extensions of the analyzer firmware.
- [Display]: display settings and functions that activate, modify and arrange different diagrams.
- [Setup]: general system settings that are not restricted to a particular recall set.
- [Preset]: restores preset values.

4.1.1.3 Control Window: Data Entry Panel

The controls in the data entry panel are used to enter numbers, units, and characters. The appearance of the panel depends on the data type of the setting selected in the Application Window.

Figure 4-1: Data Entry panel

left = numeric value
right = string value

While most of the keys have their standard keyboard functionality, some keys and controls provide additional functionality:

- The [abc] and [123] keys switch between the numeric and the string keyboard.
- The wheel control at the right of the numerical data input panel increases and decreases numerical values, and scrolls within lists.
  [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 up and down keys. See also Chapter 5.6.2, "Using the Numeric Editor", on page 48.

4.1.2 Status LEDs

Multi-color LEDs, indicating various HW and FW states:

- **Ext. Ref.**
  Indicates whether an external reference clock is used.
  - Off: the internal reference clock is used
  - Green: the R&S ZNA is synchronized to an external reference clock
  - Yellow, flashing: the R&S ZNA is configured for external synchronization, but cannot lock on the external reference clock.
- **Cal.**
  Indicates the calibration state of the active setup.
  - Off: none of the traces (in the active setup) has a valid calibration
  - Yellow: some of the traces have a valid calibration
  - Green: all the traces have a valid calibration
- **RF Interlock**
  RF interlock mode is activated by “RF Off Control” BNC connector on the rear panel of the R&S ZNA (see Chapter 4.2, "Rear Panel", on page 27. In this mode, RF sources are forced off.
  - If the connector is terminated (electrical short), the RF interlock mode is inactive and the LED is off (see picture below)
  - If the connector is open, the RF interlock state is active and the LED is on (red).

Figure 4-2: RF Off Control, terminated with attached Short

- **Remote**
  Indicates whether a remote control (RC) connection is established.
  - Off: no RC connection established
  - Green: RC connection established
- **User Defined**
  Persistent, user defined state indicator. Can be set to off, green, green flashing, red, or red flashing

4.1.3 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 3.8, "Standby and Ready State", on page 15.
- Shut down the instrument; see Chapter 3.7, "Starting the Analyzer and Shutting Down", on page 14.

4.1.4 Front Panel Connectors

The test ports and three USB connectors are located on the front panel of the R&S ZNA.

4.1.4.1 Test Ports

Numbered connectors:

- 3.5 mm male for R&S ZNA26
- 2.92 mm (K) or 2.4 mm male for R&S ZNA43

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 6.2, "Reflection S-Parameter Measurement", on page 65.
- With more than one test port, it is possible to perform full two-port, 3-port, ... , or n-port measurements; see Chapter 6.1, "Transmission S-Parameter Measurement", on page 58.

NOTICE

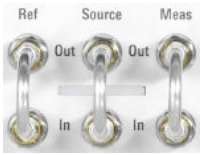
Maximum input levels

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.

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

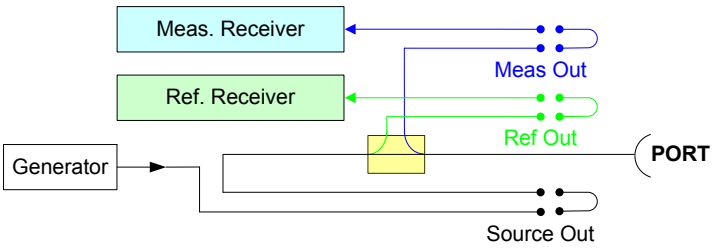
4.1.4.2 Direct Generator and Receiver Access



Hardware options R&S ZNA<frequency>-B16 "Direct Generator/Receiver Access", provide 3 pairs of SMA connectors for each test port, where <frequency> corresponds to the network analyzer type. For detailed ordering information, refer to the product brochure.

These connectors give direct access to the RF input and output signal paths.

- The Source Out signal comes from the internal RF signal source. The Source In signal goes to the test port. A power amplifier can be inserted between Source Out and Source In to boost the test port power.
- The Ref Out signal comes from the coupler and provides the reference signal. The Ref In signal goes to the receiver input for the reference signal.
- The Meas Out signal comes from the coupler and provides the received signal (to be measured). The Meas In signal goes to the receiver input for the measured signal.



The direct generator/receiver access can be used to insert external components (external signal separating devices, power amplifiers, extension units etc.) into the signal path. This feature enables custom measurements, e.g. to test high-power devices or to extend the dynamic range.

If no external components are connected, each Out/In loop must be closed using a jumper.

NOTICE

Maximum input levels

The maximum RF input levels at all SMA inputs must not be exceeded.

In addition, it is important that the signal fed in at the SMA inputs contains no DC offset. A DC offset can impair the measurements and can even damage the instrument.

See the front panel labeling and the data sheet for applicable limits.

4.1.4.3 USB Connectors

The front panel offers three USB connectors of type A (master USB).

The USB ports can be used to connect external devices, e.g.:

- 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 calibration units, power meters, frequency converters, extension units, signal generators, or switch matrices

4.2 Rear Panel

This section gives an overview of the rear panel elements of the network analyzer.

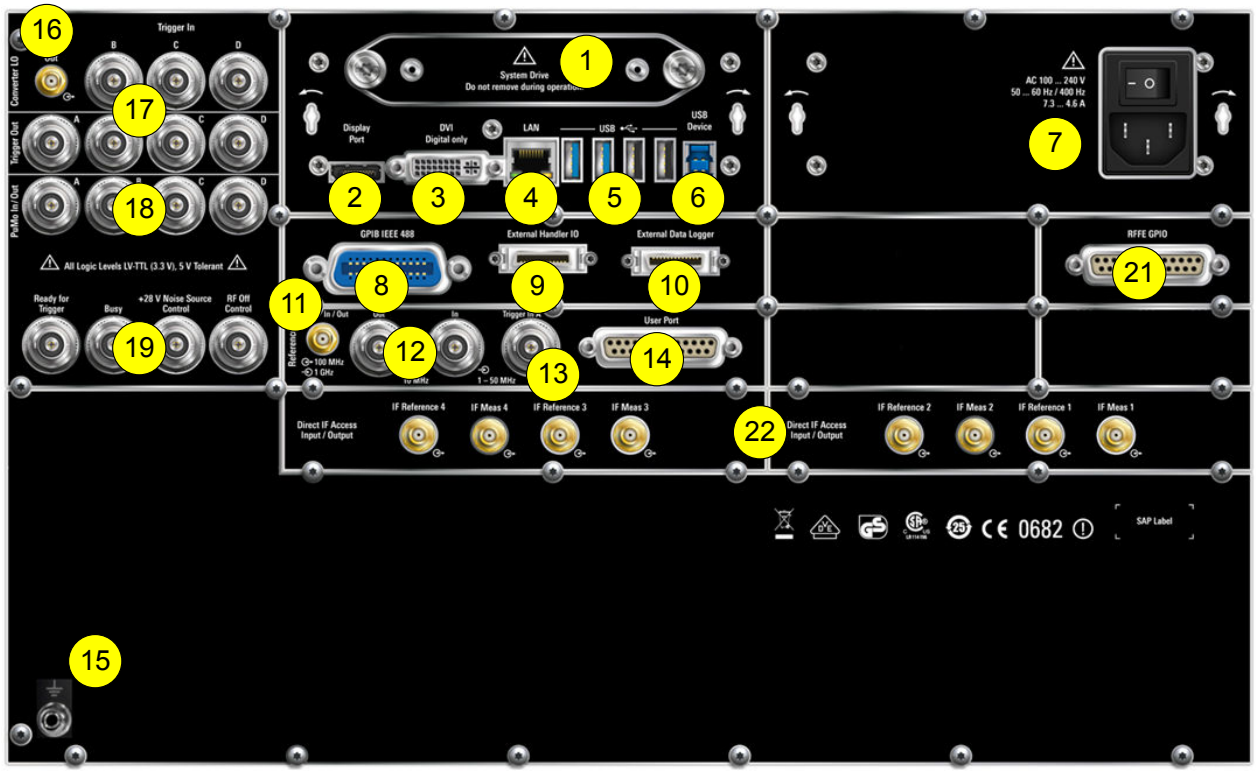


Table 4-1: Rear panel elements available on all instruments

Index	Label	Description
1	System Drive	Removable system drive of the R&S ZNA, containing all software (including the operating system and the VNA application) and data. No other drive is built in. Do not remove the system drive during operation. Option R&S ZNA-B19 provides an additional removable system drive (including operating system and firmware).
2	Display Port	External monitor connector (DisplayPort); see Chapter 3.9.1, "Connecting a Monitor", on page 16.
3	DVI Digital only	External monitor connector (DVI-D); see Chapter 3.9.1, "Connecting a Monitor", on page 16.
4	LAN	RJ-45 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 69.
5	USB	Type A USB host (master) connectors. Similar functionality as the USB connectors on the front panel (see Chapter 4.1.4.3, "USB Connectors", on page 26).
6	USB Device	Type B USB device (slave) connector for remote control of the instrument (see Chapter 3.9.6, "Connecting a USB Cable for Remote Control", on page 18).
7	I/O	Power on/off switch, see Chapter 3.7, "Starting the Analyzer and Shutting Down", on page 14
8	GPIB IEEE 488	GPIB bus connector according to standard IEEE 488 / IEC 625.

Index	Label	Description
9	External Handler IO	Used to connect an external Handler I/O (option R&S ZNBT-Z14), providing a Centronics 36 input/output connector. Not yet supported.
10	External Data Logger	Digital interface for data streaming. Requires "Data Streaming Memory" option R&S ZNA-B7 (not yet available).
11	(Reference) In/Out	SMA connector for external reference clock input or output. • Input: 100 MHz or 1 GHz • Output: 100 MHz
12	(Reference) In / (Reference) Out	BNC connectors for external reference clock input and output. • Input: 50 kHz to 100 MHz • Output: 10 MHz
13	Trigger In A	BNC connector for an incoming external trigger signal (LV-TTL 3.3 V, 5 V tolerant). The optional trigger board R&S ZNA-B91 provides three additional trigger inputs (and four trigger outputs).
14	User Port	25-pin D-Sub connector used as an input and output for other control signals (LV-TTL 3.3 V, 5 V tolerant).
15	(Ground connector)	The ground connector provides the ground of the analyzer's supply voltage. Use this connector for ESD protection; see "Instrument damage caused by electrostatic discharge" on page 12.

Table 4-2: Optional rear panel elements

Index	Label	Description
16	Converter LO	Hardware option R&S ZNA-B8 provides a local oscillator output that is particularly useful for driving mmWave converters.
17	Trigger In / Trigger Out	BNC connectors for incoming/outgoing trigger signals (LV-TTL 3.3 V, 5 V tolerant). Trigger inputs B to D and trigger outputs A to D are provided by the optional trigger board R&S ZNA-B91.
18	PuMo In/Out	BNC connectors for incoming/outgoing external pulse modulator control signals (LV-TTL 3.3 V, 5 V tolerant). Requires the optional trigger board R&S ZNA-B91.
19		BNC connectors for other incoming/outgoing control signals (LV-TTL 3.3 V, 5 V tolerant). • Ready for Trigger (outgoing) • Busy (outgoing) • +28 V Noise Source Control (outgoing) • RF Off Control (incoming) Requires the optional trigger board R&S ZNA-B91.
21	RFFE GPIO	Option R&S ZNA-B15 provides 2 independent RF Front-End (RFFE) interfaces and 10 General Purpose Input/Output (GPIO) pins on a single connector (25 pins, female). The RFFE interfaces meet the MIPI® Alliance "System Power Management Interface Specification". Not yet available.
22	Direct IF Access Input / Output	Option R&S ZNA-B26 provides direct access to the IF signal paths.

5 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 ZNA is possible either via its touchscreen (without using a mouse and/or keyboard), via locally connected monitor + mouse + keyboard (see Chapter 3.9, "Connecting External Accessories", on page 16), or via Remote Desktop (see also Chapter 7.3, "Remote Operation in a LAN", on page 68). 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.

5.1 Manual Operation

The analyzer functions are accessible via several tabbed softtools, each presenting related functions and settings. The function keys on the control window open the most frequently used softtools (see Chapter 4.1.1.2, "Control Window: Function Keys", on page 22).

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.

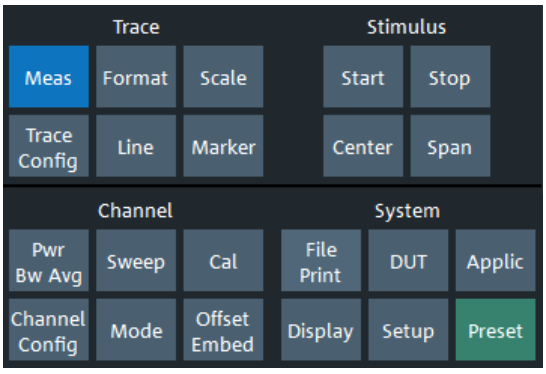


Figure 5-1: Function Keys

Customizing the screen

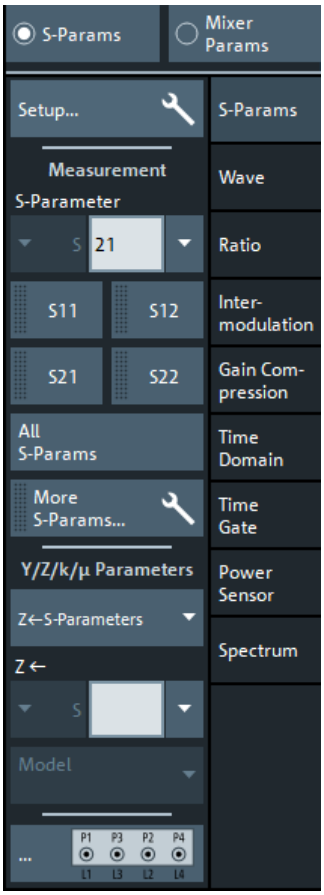
The contents of the screen and the size and position of many display and control elements are not fixed. You can display or hide most elements. You can also drag and drop traces and info fields.

Using the Touchscreen

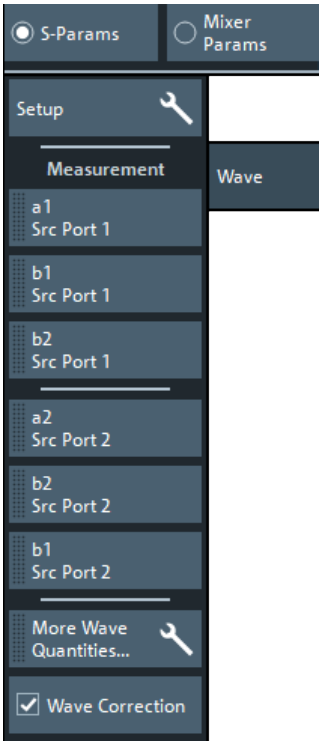
To access an instrument function:

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

   The corresponding softtool expands at the current docking position.



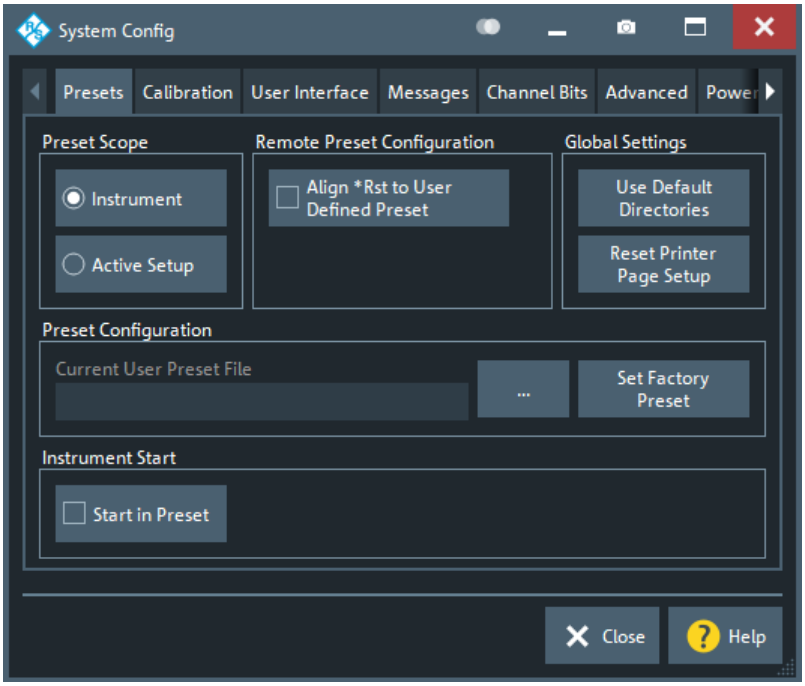
2. Make sure the "S-Params" radio button is selected.
3. Activate the desired softtool tab, e.g. "Wave".



4. Select a control element, e.g. "a1 Src Port 1".

   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,

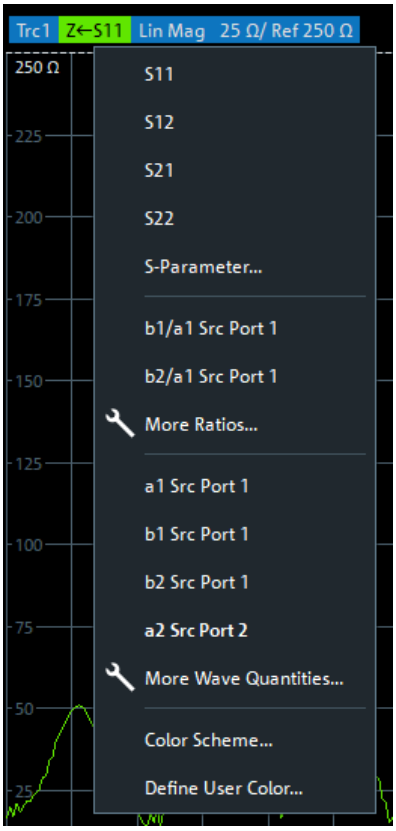
► Select Trace – [Meas] > "S-Params" > "Wave" > "a1 Src Port 1".

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.

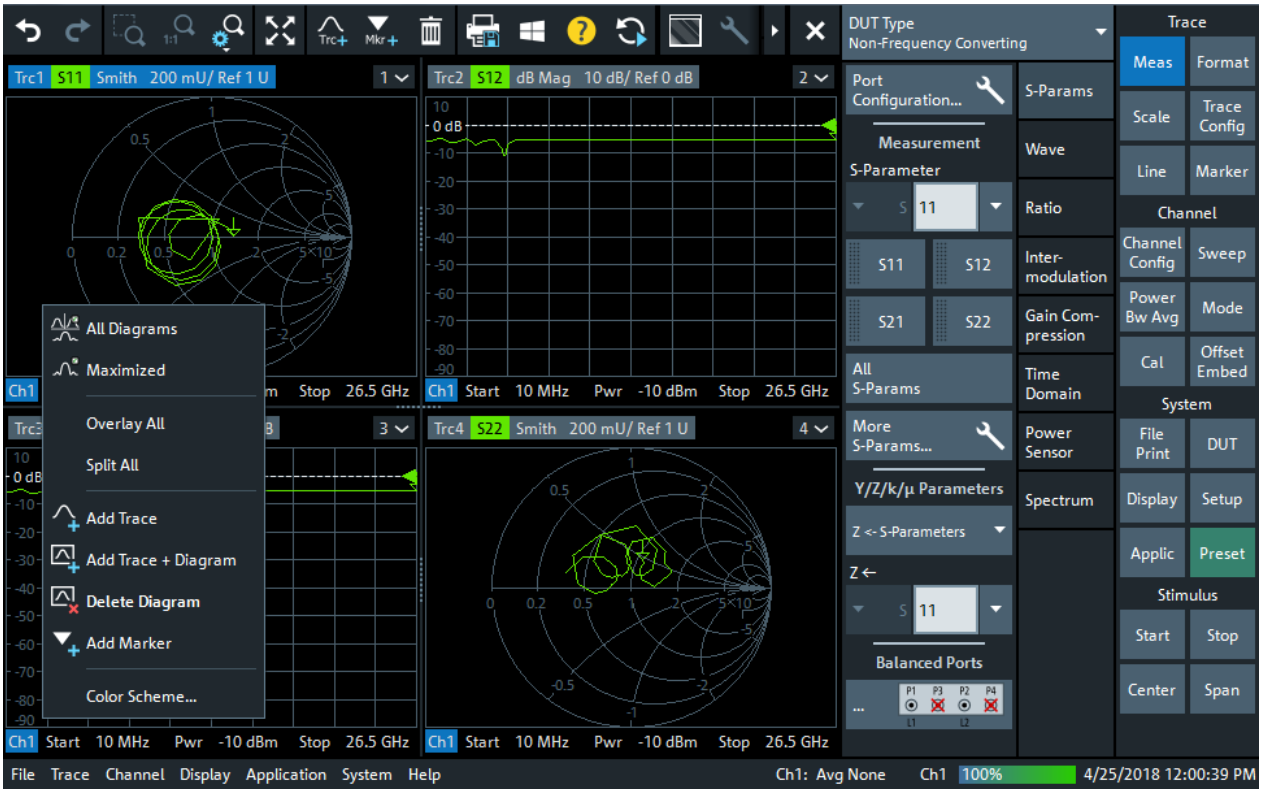


2. Select "a1 Src Port 2".

5.2 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.

5.2.1 Title Bar

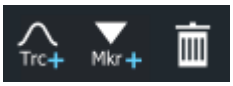
By default, the analyzer GUI is shown in full screen mode, covering the whole screen and hiding the Windows taskbar. However, you can toggle the full screen mode using System – [Display] > "View Bar" > "Title and Task Bar On".

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

5.2.2 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 six icon groups, separated by vertical lines.

	These icons represent the undo and redo actions that are also available via the menu bar items "System" > "Undo" / "Redo". Undo reverses the last action, redo reverses the last undo action (if possible).
	These icons control the zoom function (Trace – [Scale] > "Zoom").
	If multiple diagrams are configured, this icon toggles the "Maximize Diagram" action for the active diagram (System – [Display] > "Diagram" > "Maximize Diagram").
	These icons implement the following actions, from left to right: • Add a clone of the active trace to the active diagram (single tap; same as Trace – [Trace Config] > "Traces" > "Add Trace") or to an arbitrary/new one (drag & drop the "Trc+" icon to the diagram area). • Add a new marker to the active diagram (single tap; similar to Trace – [Marker] > "Markers" > "Mkr<i>") or to an arbitrary one (drag & drop the "Mkr+" icon). • Delete the active trace (single tap the trash icon), or an arbitrary trace (drag & drop its trace info field to the trash icon). Or delete all markers of a trace (drag & drop the marker info field to the trash icon).
	These icons provide the following actions, from left to right: • Print the current diagrams to a bitmap file (same as System – [File Print] > "Print" > "To File..."). By default, all diagrams are printed, no matter if displayed or not. However you can also choose to print only the active diagram (see System – [File Print] > "Print" > "Print..."). • Open the Windows® Start menu. • Open the context-sensitive help. • Restart the sweep in all channels (same as Channel – [Sweep] > "Sweep Control" > "Restart Sweep")
	These icons provide the following actions, from left to right: • Toggle advanced diagram area editing, which makes rearranging and/or deleting diagrams a breeze. • Open the "METAS Reconnection" dialog This button is only visible if, option R&S ZNA-K50 "Measurement Uncertainty Analysis"" is installed. It is only enabled, if a METAS calibration is active. • Open the configuration dialog for non-standard channel modes. • Switch on/off all sources.
	• Open the "ALC Config" dialog This button is only visible while ALC (automatic level control) is enabled • Open the "Source Coherence" dialog This button is only visible while source coherence is enabled, which requires option R&S ZNAK6.

You can hide the toolbar using System – [Display] > "View Bar".

5.2.3 Softtools

Softtools display groups of related settings as a tabbed panel. They can be opened via function keys, or via menu bar and context menu items.

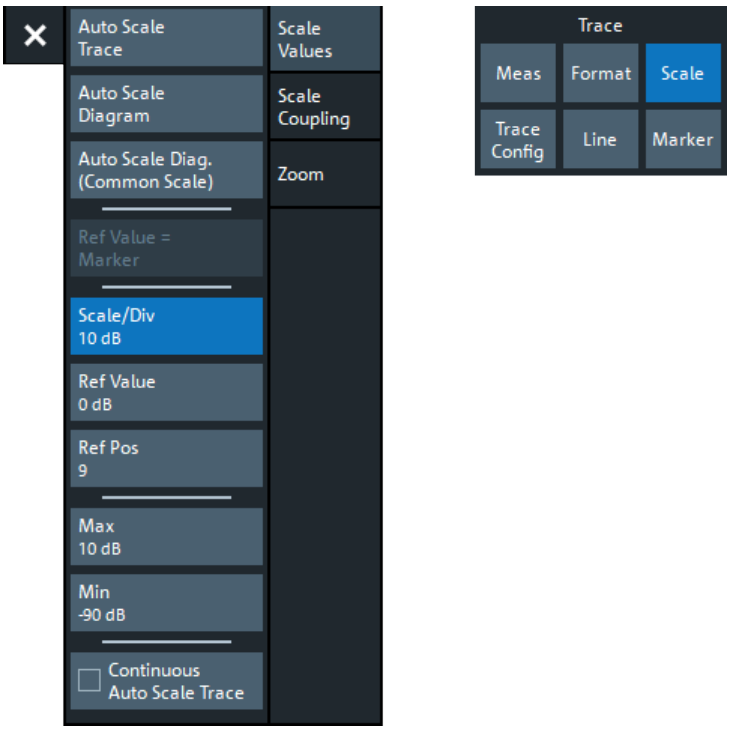


Figure 5-2: Scale softtool

A softtool is a tabbed panel with a close icon. When the softtool is closed, the close icon is replaced by a "hamburger" icon. The latter allows you to reopen the softtool.

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 "...").

5.2.4 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 ZNA displays the corresponding softtool.

Overview of menu functions

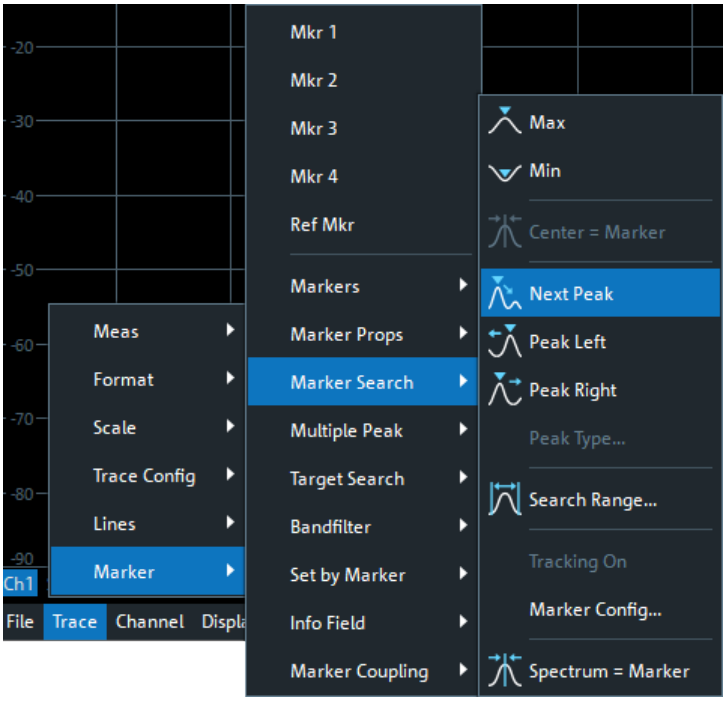
- The "File" menu provides standard Windows® functions that can be used to create, save, recall or print recall sets, to copy the current screen or to shut down the application.
- The "Trace" menu provides all trace settings, the limit check settings, and the marker functions including marker search.

- 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".

5.2.5 Menu Structure

All menus show an analogous structure.

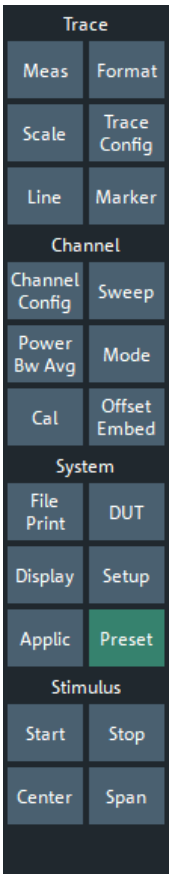


- A menu command with a right arrow expands a submenu with further related settings.
  Example: "Marker" expands a submenu with marker-related properties.
- A menu command with three dots appended calls up a dialog providing several related settings.
  Example: "Search Range" opens a dialog to define 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.

5.2.6 Hardkey Panel

The (virtual) "Hard Key" panel displays the control window's function keys inside the main application window. For a short description of the function keys, refer to section Chapter 4.1.1.2, "Control Window: Function Keys", on page 22.



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

For the R&S ZNA, it is hidden by default. In "Single Window Mode", it is visible (see Chapter 5.6.1, "Dual-Window Mode vs. Single-Window Mode", on page 47).

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.

5.2.7 Status Bar

The status bar shows

- the active channel
- the current channel's sweep averaging counter (e.g. "Ch<i>: Avg 9/10"), or "Ch<i>: Avg None" if averaging is disabled
- the progress of the sweep
  The progress bar also shows when the R&S ZNA prepares a sweep with new channel settings
- the "EXT REF" symbol, if an external reference clock is used for synchronization
- a frequency converter symbol, if frequency converters are configured
- a symbol for redefined S-parameters, if the physical ports have been redefined
- the LXI status symbol (if enabled; see System – [Setup] > "Remote Settings" > "LXI settings")
  A flashing 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

Figure 5-3: R&S ZNA with frequency converters

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".

5.3 Touchscreen Gestures

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

Tapping

Touch the screen quickly, usually on a specific element.

You can tap most elements on the screen; in particular, any elements you can also click on with a mouse pointer.

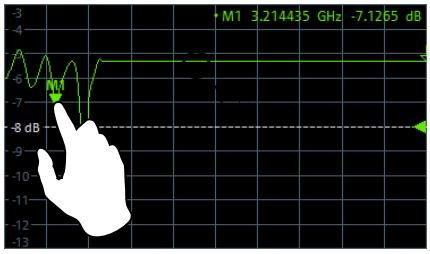
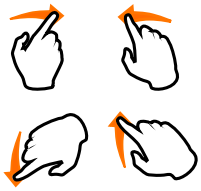


Figure 5-4: Tapping

Double-tapping

Tap the screen twice, in quick succession.

Double-tap a diagram to maximize it or to restore its original size..



Dragging

Move your finger from one position to another on the display, keeping your finger on the display the whole time.

By dragging your finger over a table or diagram you can pan the displayed area of the table or diagram to show results that were previously out of view.

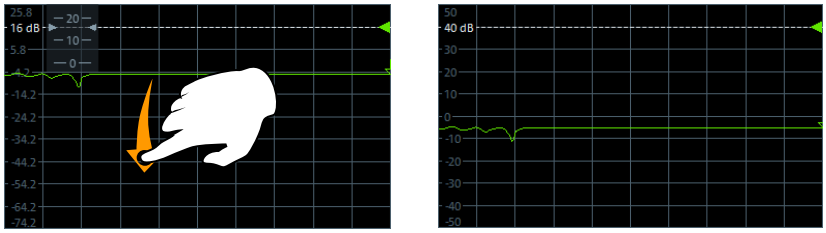
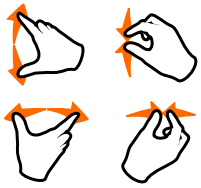


Figure 5-5: Dragging

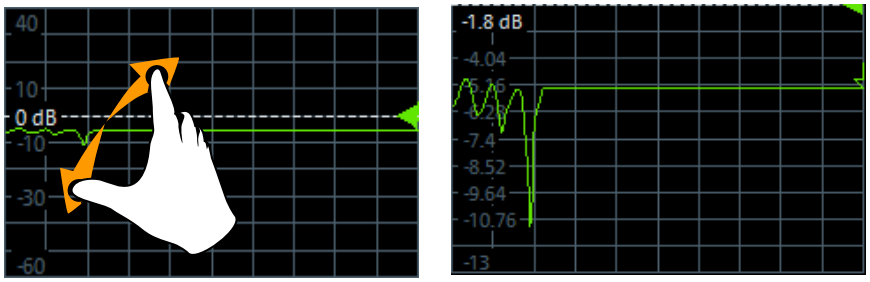


Spreading and pinching two fingers

Move two fingers apart on the display (spread) or move two fingers together on the display (pinch).

On the R&S ZNA, these gestures take effect for diagrams only. The effect depends on the current zoom mode (see Chapter 5.7, "Scaling Diagrams", on page 51).

- In graphical zoom mode, when you spread two fingers in the display, you graphically zoom in vertically.



When you pinch two fingers in the display, you graphically zoom out vertically.

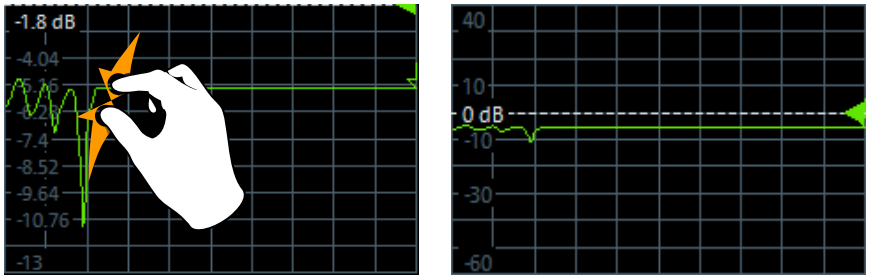


Figure 5-6: Pinching

While "Zoom Select" is active (toolbar icon or softtool button is toggled on), spreading and pinching is disabled. You can only select a rectangular area (using one finger) then.

- In stimulus zoom mode, spreading and pinging is disabled by default. Only while "Stim. Zoom Select" is active (toolbar icon or softtool button is toggled on), you can use spreading and pinching to modify the sweep area and/or the vertical scaling.

Mouse vs. touch actions

Any user interface elements that react to actions by a mouse pointer also react to finger gestures on the screen, and vice versa. The following touch actions correspond to mouse actions:

Table 5-1: Correlation of mouse and touch actions

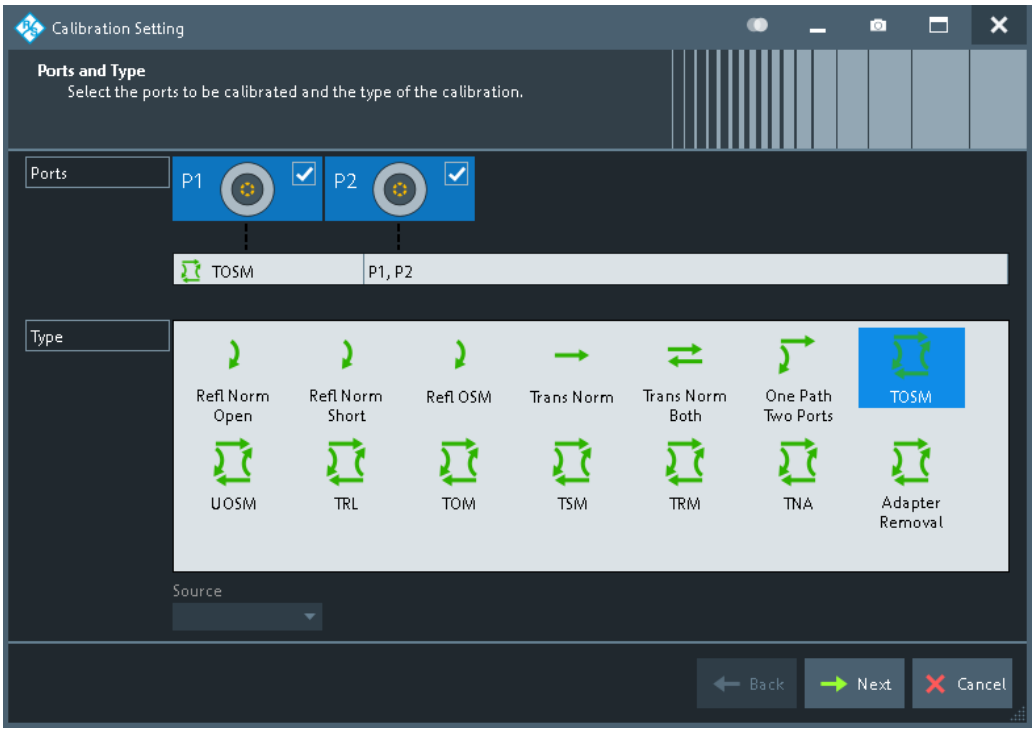
Mouse operation	Touch operation
Click	Tap
Double-click	Double-tap
Click and hold	Touch and hold
Right-click	Touch, hold for 1 second and release
Drag&drop (= click and hold, then drag and release)	Touch, then drag and release
n.a. (Change hardware settings)	Spread and pinch two fingers
Mouse wheel to scroll up or down	Swipe
Dragging scrollbars to scroll up or down, left or right	Swipe
In (graphical) Zoom mode only: dragging the borders of the displayed rectangle to change its size	Touch, then drag and release

Example:

You can scroll through a long table in conventional mouse operation by clicking in the table's scrollbar repeatedly. In touchscreen operation, you would scroll through the table by dragging the table up and down with your finger.

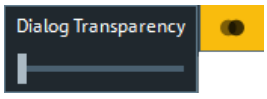
5.4 Working with Dialogs

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.



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" function to make the display elements behind the dialog visible.

    Note: The "Dialog Transparency" is a global setting, i.e. it applies to all dialogs.
  - Use the icon to create a screenshot of the dialog.
- 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.

5.5 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 ZNA provides for trace and marker handling.

For further reference

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

5.5.1 Adding New Traces and Diagrams

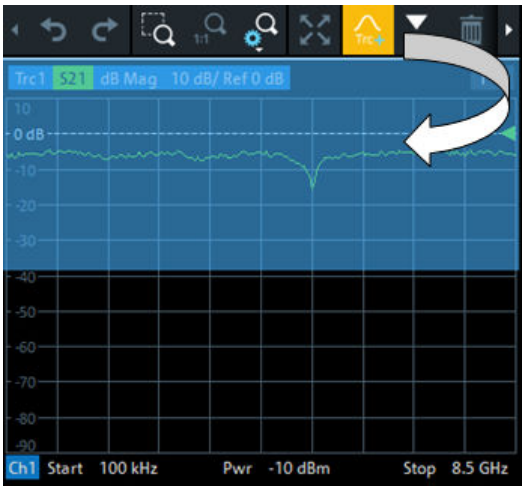
A new trace is required if you want to measure and display an additional quantity.

Typical scenario: The transmission coefficient S_{21} is measured as described in Chapter 6.1, "Transmission S-Parameter Measurement", on page 58. A trace is added to display the reflection coefficient S_{11} for comparison.

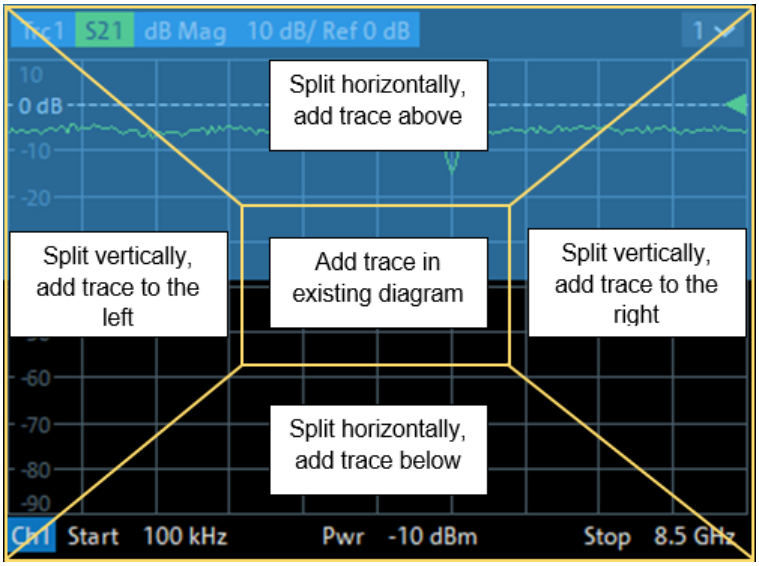
To create a trace:

1. Drag the "Trc+" icon from the toolbar into a diagram.

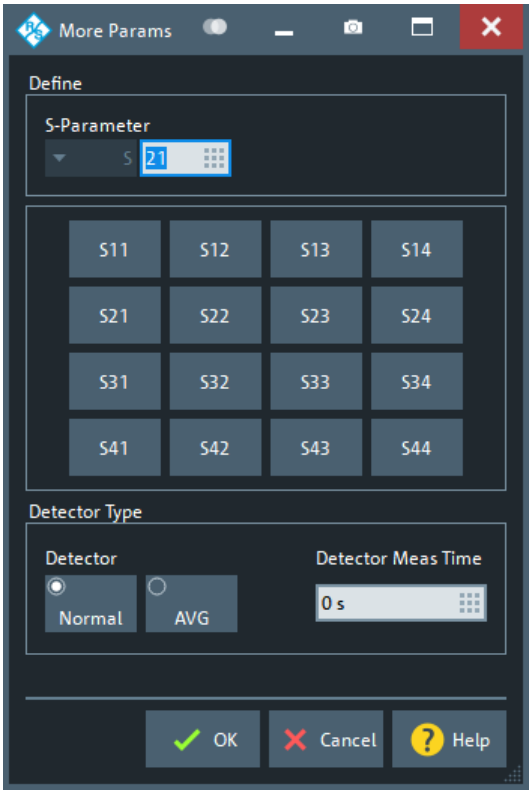
   The diagram changes its color scheme and contents as shown below.



2. Select the adequate drop position, depending on whether you want to display the new trace in the existing diagram, or whether you want to add a new diagram. The highlighted area indicates the target diagram.



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



   The R&S ZNA 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.

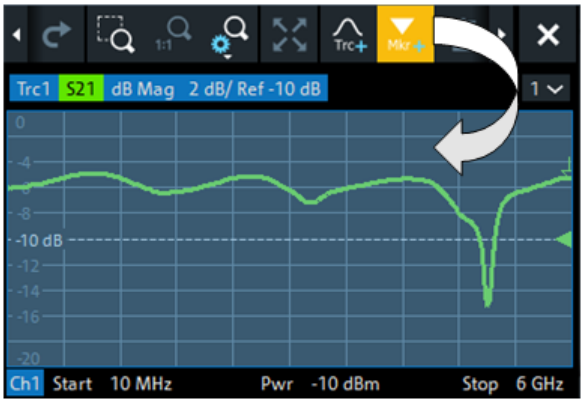
Select Trace – [Trace Config] to access more trace handling functions. Select System – [Display] to access more diagram handling functions.

5.5.2 Adding New Markers

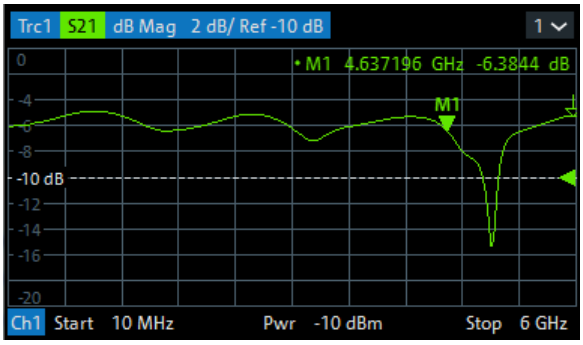
A marker is needed, for instance, to read a particular numerical trace value.

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.

5.5.3 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. The active trace can also be deleted by tapping/clicking 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.

5.5.4 Using Drag and Drop

You can drag and drop many of the R&S ZNA'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 5-2: Drag and drop functionality for various screen elements

Screen element	Action	Drag and drop...
Diagram	Create	See Chapter 5.5.1, "Adding New Traces and Diagrams", on page 43
	Resize	Separator between adjacent diagrams
	Delete	See Chapter 5.5.3, "Deleting Display Elements", on page 46
Trace	Create	See Chapter 5.5.1, "Adding New Traces and Diagrams", on page 43
	Move vertically	Reference line marker (right diagram edge)
	Move into other or new diagram	Trace line
	Delete	See Chapter 5.5.3, "Deleting Display Elements", on page 46
	Reset / suspend graphic zoom	"Zoom" element in additional trace line --> "Delete" icon; see Chapter 5.7.1, "Using the Graphical Zoom", on page 51
Marker	Create	See Chapter 5.5.2, "Adding New Markers", on page 45
	Move horizontally	Marker symbol
	Delete	Marker or marker info field --> "Delete" icon; see Chapter 5.5.3, "Deleting Display Elements", on page 46
Marker info field	Add	See Chapter 5.5.2, "Adding New Markers", on page 45
	Move within diagram	Marker info field (move to one of several pre-defined positions)
	Delete	See Chapter 5.5.3, "Deleting Display Elements", on page 46

5.6 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.

5.6.1 Dual-Window Mode vs. Single-Window Mode

In dual-window mode (default), both the application window and the control window are shown. Whenever you select an editable value, a suitable editor is displayed in the data entry part of the control window.

See Chapter 4.1.1.3, "Control Window: Data Entry Panel", on page 23.

In **single-window mode** (System – [Display] > "Config" > "Single Window Mode") only the application window is shown, with its virtual Hardkey Panel enabled. The values can be edited in place, either using an external keyboard or by calling the VNA's numeric editor or on-screen keyboard (see Chapter 5.6.2, "Using the Numeric Editor", on page 48, or Chapter 5.6.3, "Using the Analyzer's On-Screen Keyboard", on page 49).

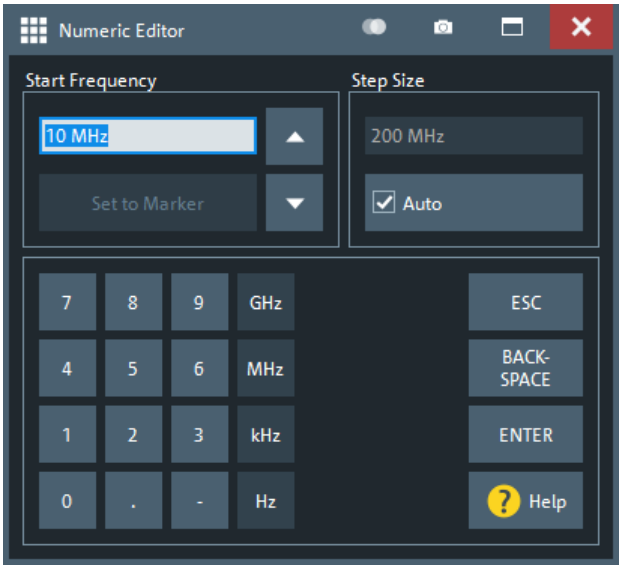
5.6.2 Using the Numeric Editor

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.

The numeric editor is particularly useful in single-window mode. In dual-window mode, a suitable editor is automatically displayed: whenever an editable value is selected in the main window or a dialog, the data entry part of the control window is adjusted accordingly. Hence in dual-window mode there is typically no need to open the numeric editor.

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.

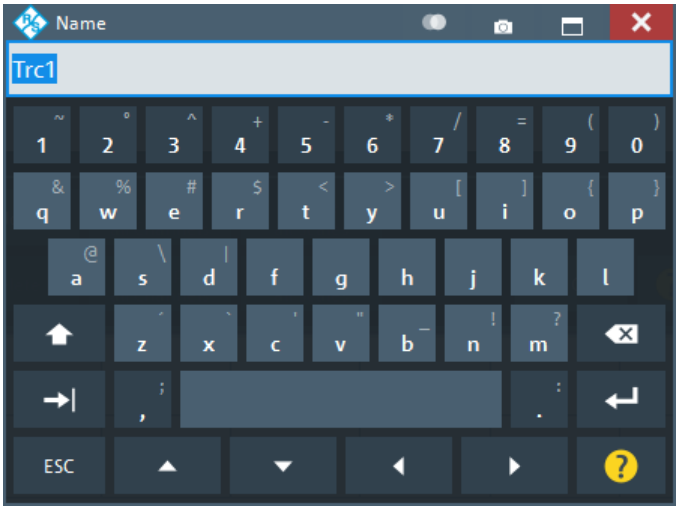
[Step Size] key

In dual-window mode, if a numeric input field is active, the [Step Size] key in the data entry panel opens a dialog containing the "Step Size" panel of the numeric editor. Select the adequate step size for efficient operation of the on-screen wheel (and mouse wheel).

5.6.3 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.

The on-screen keyboard is particularly useful in single-window mode. In dual-window mode, a suitable editor is automatically displayed: whenever an editable value is selected in the main window or a dialog, the data entry part of the control window is adjusted accordingly. Hence in dual-window mode there is typically no need to open the on-screen keyboard.



For the following procedure, we assume single-window mode.

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.

5.6.4 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.

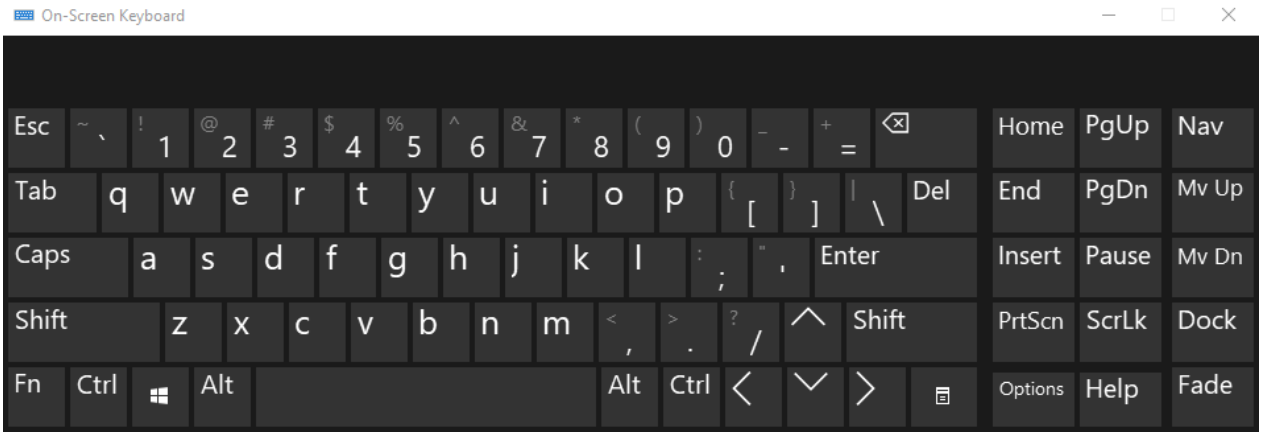


Figure 5-7: Windows 10 on-screen keyboard

To call up the on-screen keyboard:

1. Open the System – [Applic] softtool.

2. Select "External Tools"
3. Select "Screen Keyboard".

5.7 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.

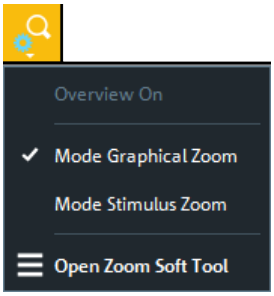
5.7.1 Using the Graphical Zoom

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.

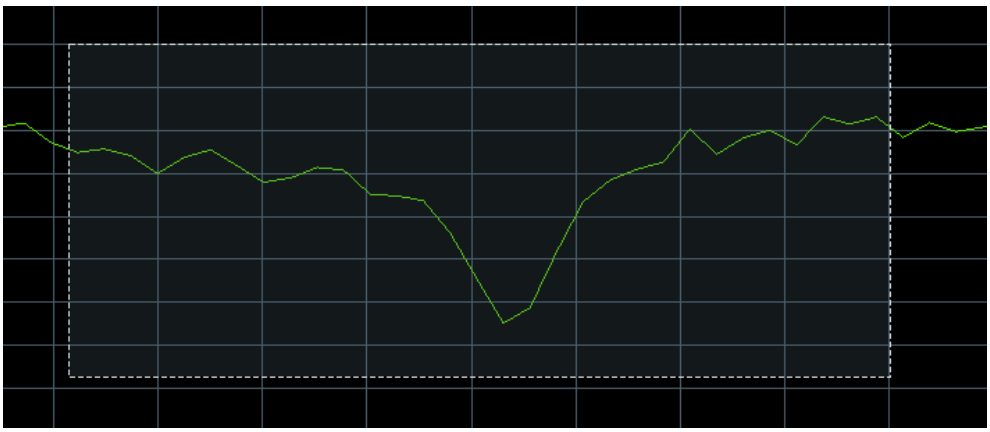
To activate the graphical zoom:

- Select the "Zoom Config" icon in the toolbar above the diagram area and make sure that the graphical zoom mode is active:



- 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.

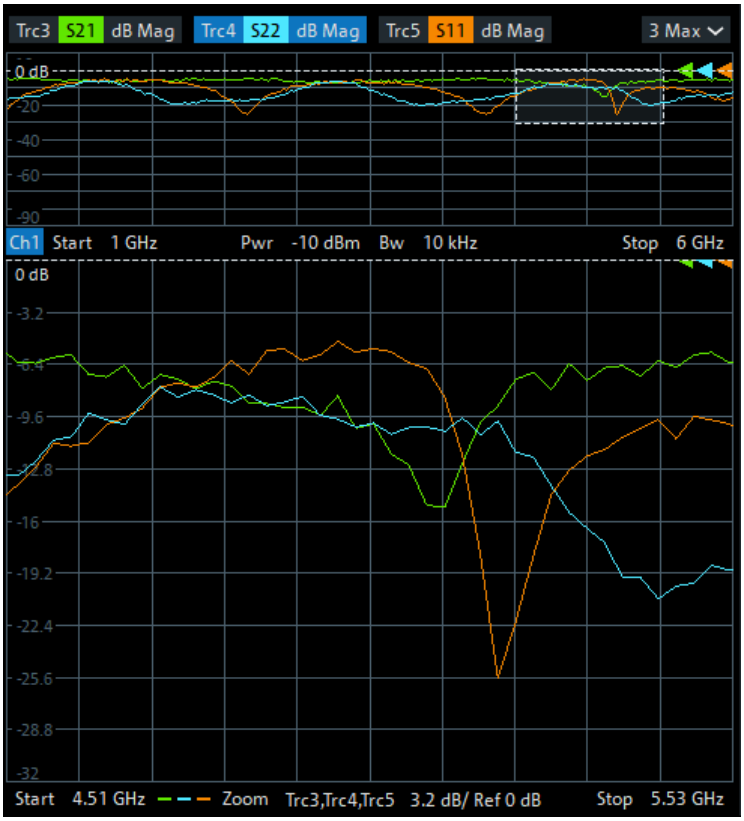


The zoomed view shows the selected rectangle, scaled in both horizontal and vertical direction. In general, the zoom window covers only a part of the sweep range; the horizontal distance between the sweep points increases. The reduced display range is indicated in an additional zoom line in the channel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

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 toolbar button.

Alternative settings

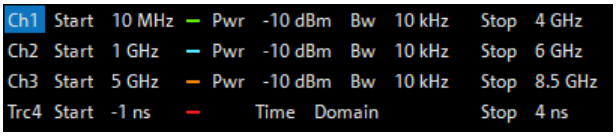
- The Trace – [Scale] > "Zoom" softtool tab allows you to define the displayed zoom range numerically.
  It can also be opened from the menu of the "Zoom Config" toolbar icon.
- If the active diagram is graphically zoomed, "Overview On" in the "Zoom" softtool tab toggles an overview. The upper part of the diagram then shows a small version of the unzoomed diagram. You can move the zoomed part of the trace by moving the rectangular area in the overview.



- To zoom the stimulus range (keeping the number of sweep points constant), use the "Zoom Config" toolbar icon and select "Mode Stimulus Zoom". Then use the "Zoom Select" icon to narrow the sweep range and adjust the vertical scaling.

5.7.2 Setting the Sweep Range

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



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 5.7.6, "Set by Marker", on page 55).

5.7.3 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.

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 5.7.6, "Set by Marker", on page 55).

5.7.4 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.

5.7.5 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.

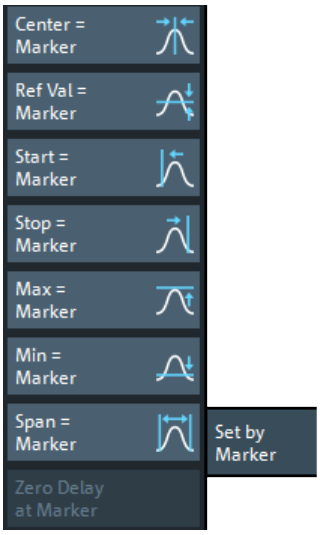
The "Ref Value" is indicated in the scale section of the trace info.

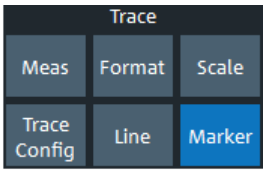
To change the "Ref Value" setting, use one of the following methods:

- 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 5.7.6, "Set by Marker", on page 55.

5.7.6 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 5.5.2, "Adding New Markers", on page 45.
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 5.6.2, "Using the Numeric Editor", on page 48.

5.7.7 Enlarging a Diagram

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

- Select ⛶ from the toolbar to maximize the active diagram. Or, equivalently, select System – [Display] > "Diagram" > "Maximize Diagram".
  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.

6 Performing Measurements

This chapter takes you through a sample session with a R&S ZNA 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 3, "Putting the Analyzer into Operation", on page 11.

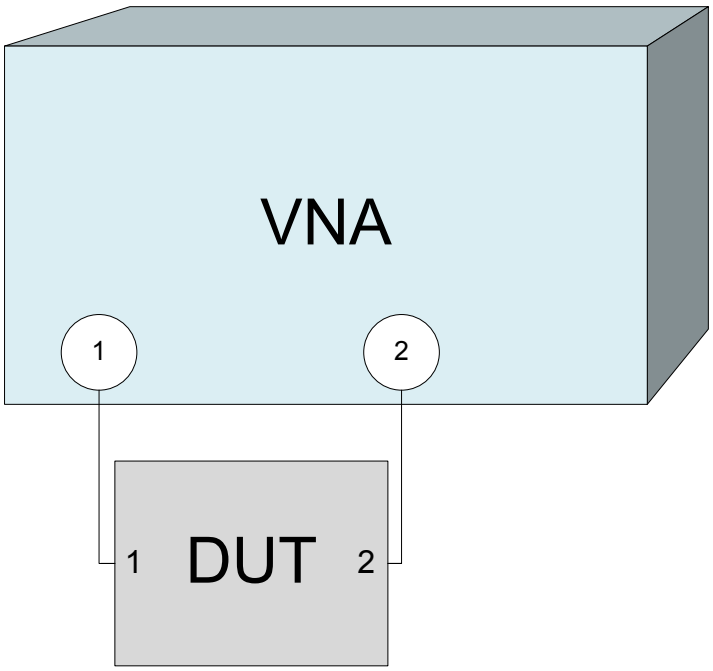
6.1 Transmission S-Parameter Measurement

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.

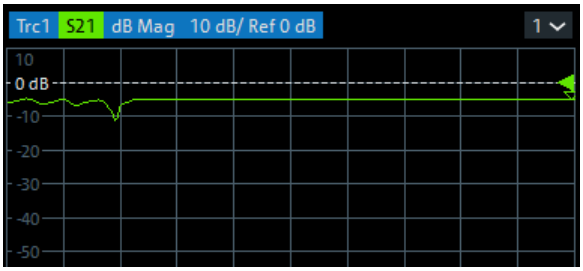
6.1.1 Connecting the Instrument for Transmission Measurements

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 ZNA 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 3.7, "Starting the Analyzer and Shutting Down", on page 14.
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" softtool tab if you wish to create additional traces and diagrams.

6.1.2 Selecting the Sweep Range and Other Parameters

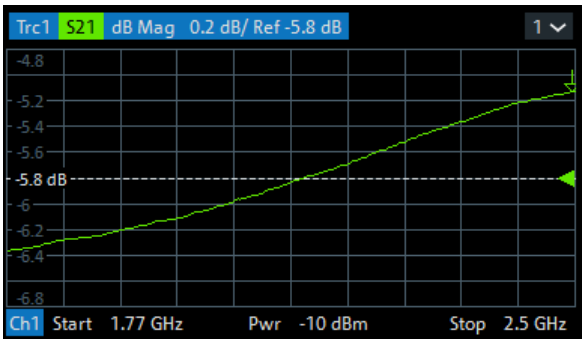
After a system preset the display shows a diagram with a dB magnitude scale, and the S-parameter S_{21} is selected as a measured quantity. This S-parameter is the forward

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 ZNA 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).
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 5.7, "Scaling Diagrams", on page 51 to learn more about the different methods and tools for diagram scaling.

6.1.3 Calibrating the Instrument

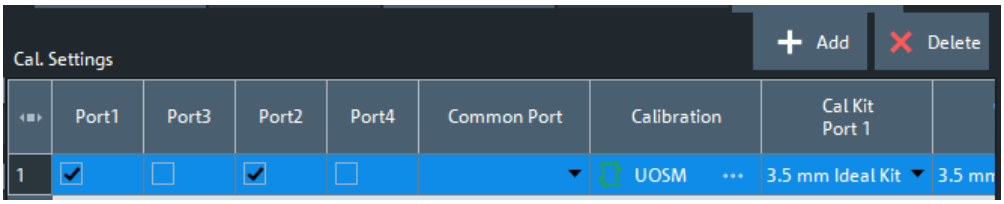
Calibration (system error correction) is the process of eliminating systematic, reproducible errors from the measurement results. E.g., in the current test setup, the connecting cables between the analyzer ports and the DUT introduce an attenuation and a phase shift of the waves. Both effects impair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

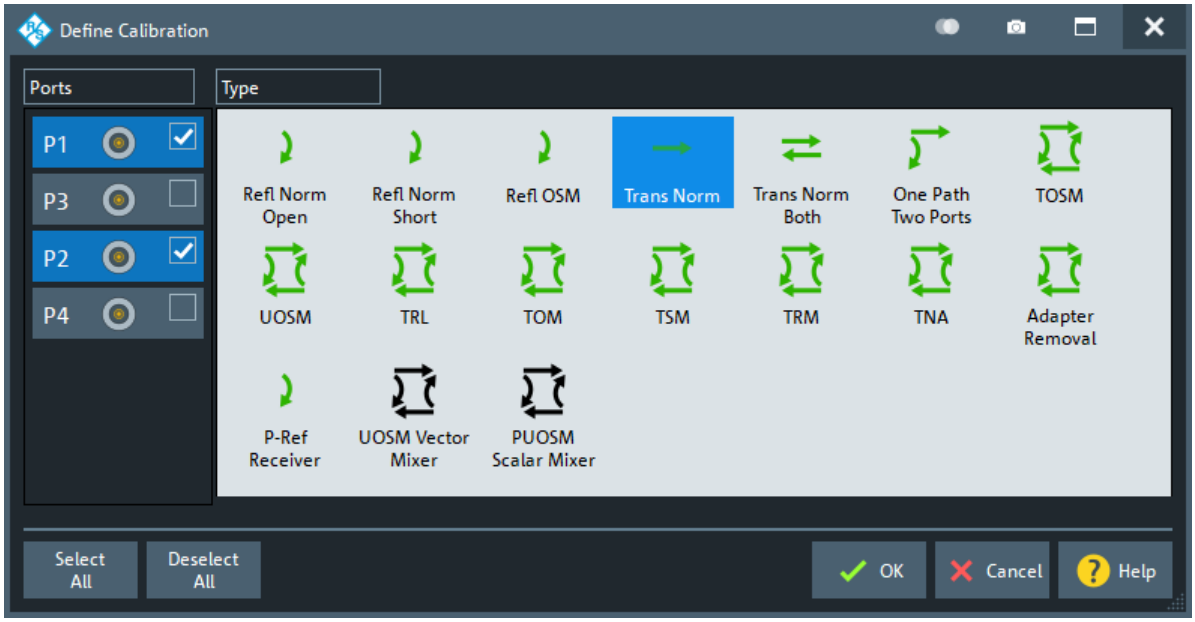
The following example requires a calibration kit with a male Through standard with known transmission characteristics for the related test port connector type and gender. With a single Through, it is possible to perform a transmission normalization, compensating for a frequency-dependent attenuation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

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

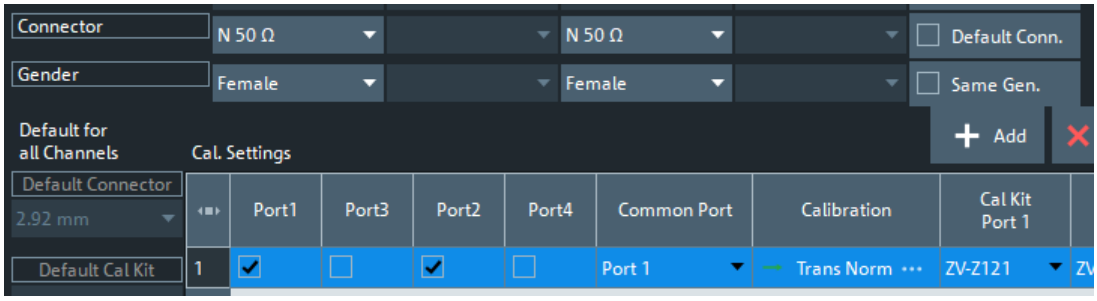
1. Replace the DUT by the Through standard of your calibration kit. Make sure to disconnect all calibration units.
2. Select Channel – [Cal] > "Configure/Start Calibration..." to open the calibration setup dialog.
3. "Delete" all except the first row in the "Cal Settings" table. If the table is empty, use "Add" to create a calibration setup.



4. Tap on the "Calibration" cell of the first row in the "Cal Settings" table to open the "Define Calibration" dialog.
5. Select port 1 (P1) and port 2 (P2) and the calibration type "Trans Norm".



6. Select "OK" to apply your settings and return to the calibration setup dialog "Calibration Setting" wizard.
7. Select the test port connector type and gender (here: N 50 Ω, female, corresponding to a male Through standard), and the calibration kit (here: R&S ZV-Z121).



8. Tap "Start Cal".
9. 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 ZNA has completed the calibration sweep and calculated the correction data, the "Apply" button is enabled.
10. Select "Apply" to close the wizard.

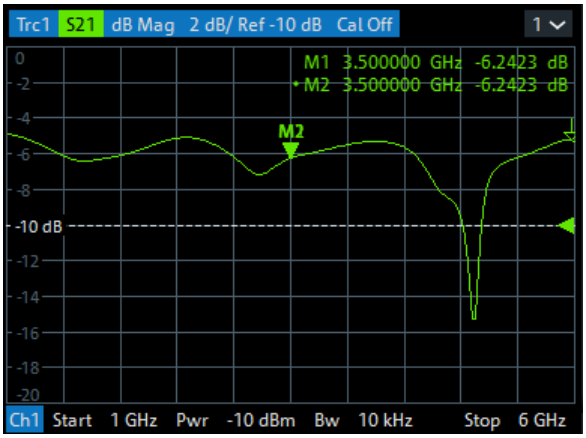
    The system error correction is calculated and applied to the current channel. A "Cal" label appears in the trace list.

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

6.1.4 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.

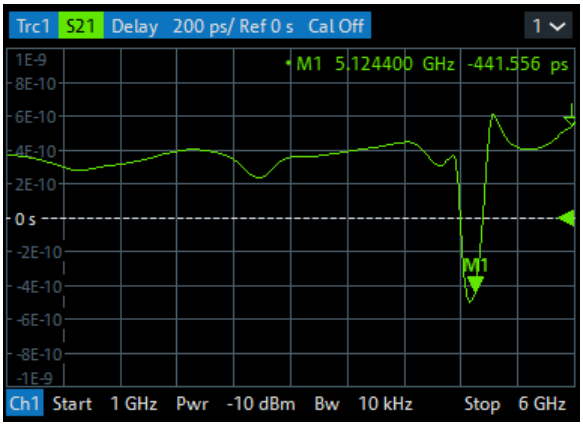
1. Select Trace – [Marker] > "Markers" > "Mkr 1".
   This places marker "M1" to its default position (center of the sweep range). A marker symbol (triangle) appears on the trace, a marker info field in the upper right corner of the diagram. The marker info field displays the stimulus value (frequency) 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 the information on trace formats in the help system or in the user manual to learn more about the diagram properties.

6.1.5 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 3.9, "Connecting External Accessories", on page 16, and Chapter 7.3, "Remote Operation in a LAN", on page 68 to obtain information about the necessary steps.

1. Activate the System – [File Print] > "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] > "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 Print] > "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".

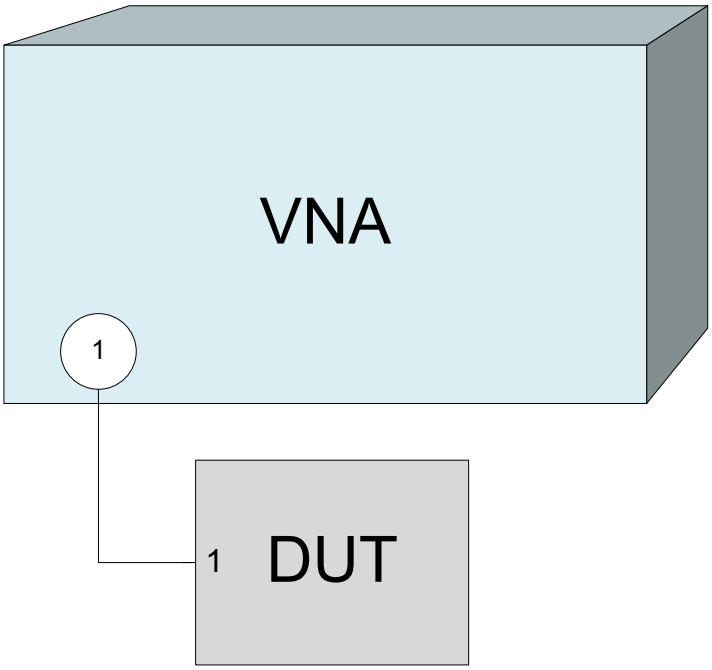
   The analyzer saves the active recall set, containing channel, stimulus and trace settings, to a `znxml` file. This recall set can be restored in a later session.

6.2 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:

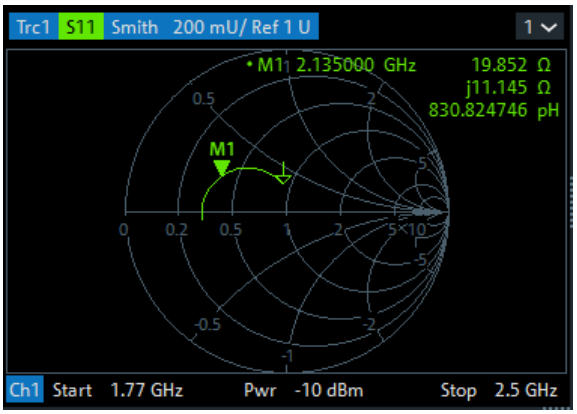
- The basic test setup for reflection measurements involves a single DUT and analyzer port. For instance, you can connect the input of your DUT to port 1 of the analyzer as shown below.



  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 n-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 3.7, "Starting the Analyzer and Shutting Down", on page 14 to shut down your analyzer.

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

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.

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 toolbar 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.

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 ZNA.

7.2 Firmware Installation

Upgrade versions of the analyzer firmware are supplied as single executable setup files (`*.exe`).

Administrator account

You need administrator rights to install a new firmware version. See note on "User accounts and password protection" on page 67 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).
   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.
2. Run the setup file from the Windows® Explorer. Follow the instructions of the setup wizard.
   Setup files can be reinstalled.

Factory calibration

A firmware update does not affect the factory calibration.

However, for a R&S ZNA that was factory calibrated with a firmware version < 2.0, an upgrade to a firmware version ≥ 2.0 makes the factory calibration slightly less accurate. A changed signal path in firmware versions ≥ 2.0 can result in an offset of approximately 0.3 dB for uncalibrated wave measurements. Calibrated measurements are not affected. The offset can be eliminated by a new factory calibration at Rohde&Schwarz service.

Downgrade to a firmware version < 1.90

Instruments shipped with a REFBOARD version > 001_000_000 cannot be downgraded to a firmware version < 1.90 simply by executing the related firmware setup file. Please contact R&S service if you plan such a downgrade.

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

The analyzer uses a user name and password as credentials for remote access; see note on "User accounts and password protection" on page 67 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 67 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. Use the Windows icon in the toolbar (or the Windows key 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.
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".

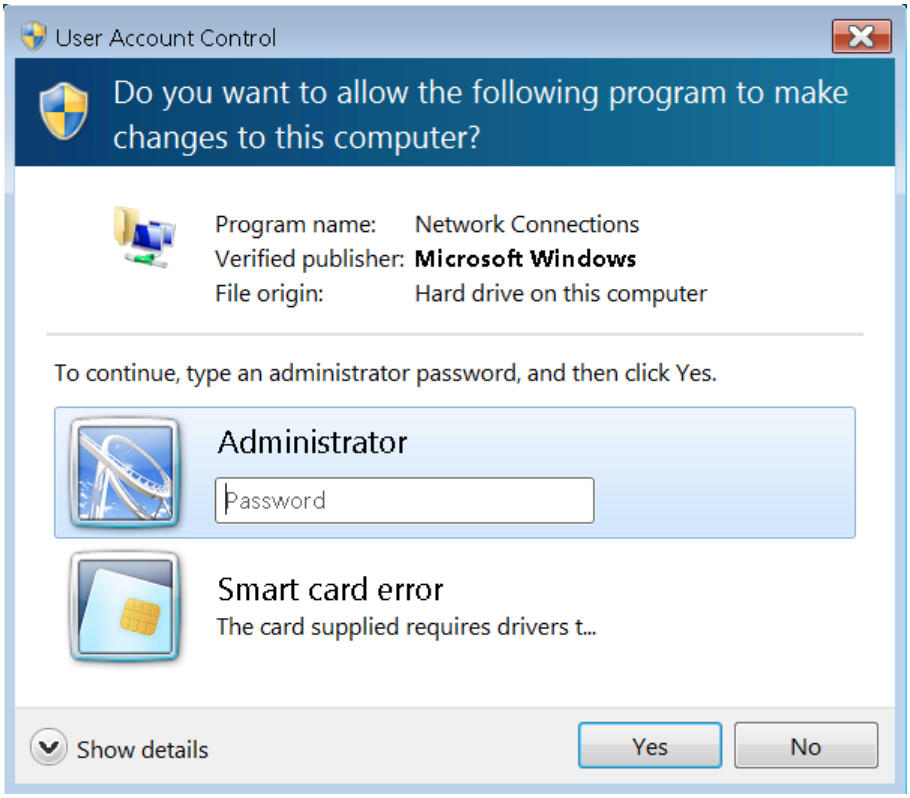
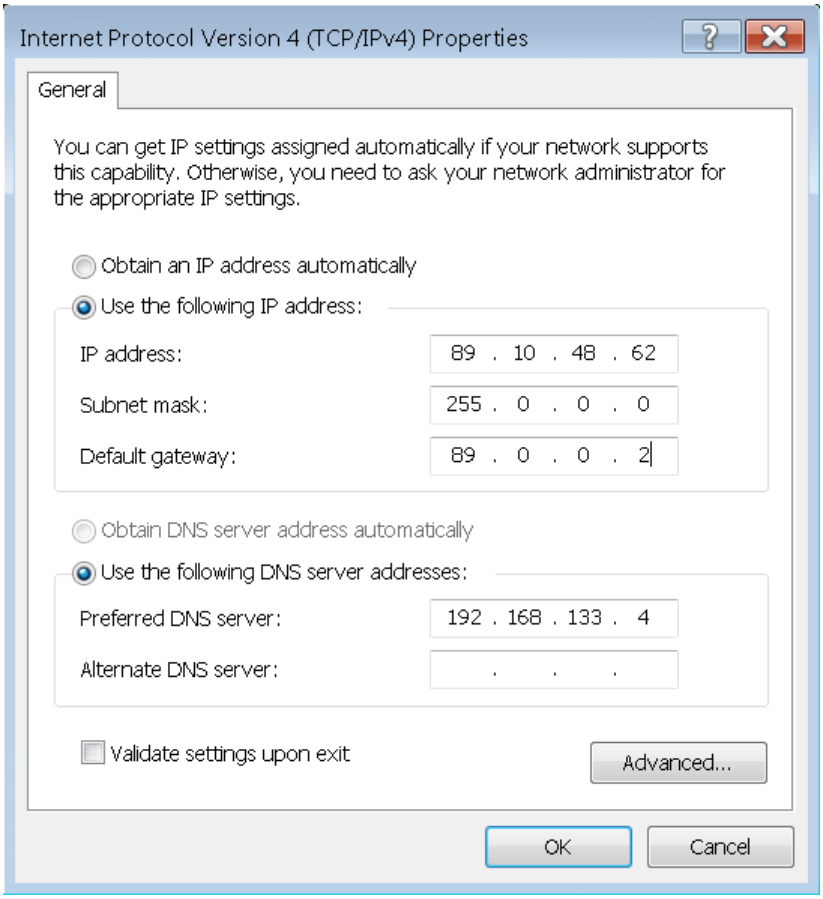


Figure 7-1: Windows 7 User Account Control dialog

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



7.3.2 Using Computer Names

In a LAN that uses a DNS server (Domain Name System server), each PC or instrument connected in the LAN can be accessed via an unambiguous computer name instead of the IP address. The DNS server translates the host name to the IP address. This is especially useful when a DHCP server is used, as a new IP address may be assigned each time the instrument is restarted.

Each instrument is delivered with an assigned computer name, but this name can be changed. The default instrument name is a case-insensitive string with the following syntax:

<Type><max freq [GHz]>-<serial_number>

The serial number can be found on the rear panel of the instrument. It is the third part of the device ID printed on the bar code sticker:

For example ZNA43-102030

7.3.3 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 ZNA 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"

7.3.4 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 ZNA, 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 67 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"
   - Select "Allow an app or feature through Windows Defender 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 ZNA 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.

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 3.1, "Unpacking and Checking the Instrument", on page 11.

9 Contacting Customer Support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz product, contact our customer support center. A team of highly qualified engineers provides support and works with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz products.

Contact information

Contact our customer support center at www.rohde-schwarz.com/support, or follow this QR code:

Figure 9-1: QR code to the Rohde & Schwarz support page

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