R&S®SZV100A Q-/V-Band RF-Upconverter 36-56 GHz

Manual

1431006002

Manual

Version 01

ROHDE&SCHWARZ

This manual applies to the following R&S®SZV100A models:

- R&S SZV100A (1431.0002.02)

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1431.0060.02 | Version 01 | R&S®SZV100A

The following abbreviations are used throughout this manual: R&S®SZV100A is abbreviated as R&S SZV, R&S®SMW200A is abbreviated as R&S SMW, R&S®SMA100B is abbreviated as R&S SMAB.

Contents

1 Preface

1.1 Key Features

The RF Upconverter RF upconverter features:

- Q-/V-Band RF-Upconverter 36 GHz to 56 GHz continuous frequency coverage
- Up to +16 dBm output power
- Up to 2 GHz RF bandwidth
- Transparent loop-through of superior R&S SMW signal quality
- Small form factor, low weight
- Mounting points for remote operation closest to a DUT in TVAC
- Remote control via LAN (IP)

1.2 About This Manual

This Manual describes general instrument functions, the operation of the instrument.

The main focus of this manual is on the signal generation capabilities of the instrument and the tasks required to achieve them. The following topics are included:

- **Preparing for Use**
  Set up the R&S SZV100A for the first time
- **Instrument Control**
  Start and use the R&S SZV Control software via step-by-step procedures
  Detailed reference description of the R&S SZV Control configuration settings
- **Remote-Control Commands**
  Remote commands required to set up the environment and to perform common tasks on the instrument, sorted by tasks
  Programming examples demonstrate the use of many commands and can usually be executed directly for test purposes
- **Maintenance, Storage and Disposal**

Information on tasks required to maintain the operability of the instrument

- **Appendix**
  Extensive reference information on remote control, hardware interfaces, etc.
- **Glossary**
  List of often used terms and abbreviations
- **List of Commands**
  Alphabetical list of all remote commands described in the manual
- **Index**

Notes on screenshots

When describing the functions of the product, we use sample screenshots. These screenshots are meant to illustrate as much 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.

1.3 Documentation Overview

This section provides an overview of the R&S SZV100A user documentation. Unless specified otherwise, you find the documents on the R&S SZV100A product page at:

1.3.1 Manual

The manual contains the description of all instrument modes and functions. It also provides a complete description of the remote control commands with programming examples, and information on maintenance and instrument interfaces.

For information on how to use the R&S SZV100A in setups with R&S SMW/ R&S SMAB, see the R&S SMW/R&S SMAB user manual.

1.3.2 Safety Instructions

Contains safety instructions and information on operating conditions in many languages.

The printed document is delivered with the instrument.

1.3.3 Data Sheet

The data sheet contains the technical specifications of the R&S SZV100A. It also lists the firmware applications and their order numbers, and optional accessories.

1.3.4 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.

2 Safety and Regulatory Information

The product documentation helps you use the product safely and efficiently. Follow the instructions provided here and in the Chapter 2.1, "Safety Instructions", on page 10.

Intended use

The product is intended for the development, production and verification of electronic components and devices in industrial, administrative, and laboratory environments. Use the product 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 of potential dangers and gives instructions on how to prevent personal injury or damage caused by dangerous situations. Safety information is provided as follows:

- In Chapter 2.1, "Safety Instructions", on page 10. The same information is provided in many languages as printed "Safety Instructions". The printed "Safety Instructions" are delivered with the product.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

2.1 Safety Instructions

Products from the Rohde & Schwarz group of companies are manufactured according to the highest technical standards. To use the products safely, follow the instructions provided here and in the product documentation. Keep the product documentation nearby and offer it to other users.

Use the product only for its intended use and within its performance limits. Intended use and limits are described in the product documentation such as the data sheet, manuals and the printed safety instructions. If you are unsure about the appropriate use, contact Rohde & Schwarz customer service.

Using the product requires specialists or specially trained personnel. These users also need sound knowledge of at least one of the languages in which the user interfaces and the product documentation are available.

If any part of the product is damaged or broken, stop using the product. Never open the casing of the product. Only service personnel authorized by Rohde & Schwarz are allowed to repair the product. Contact Rohde & Schwarz customer service at http://www.customersupport.rohde-schwarz.com.

Lifting and carrying the product

The maximum weight of the product is provided in the data sheet. To move the product safely, you can use lifting or transporting equipment such as lift trucks and forklifts. Follow the instructions provided by the equipment manufacturer.

Choosing the operating site

Only use the product indoors. The product casing is not waterproof. Water that enters can electrically connect the casing with live parts, which can lead to electric shock, serious personal injury or death if you touch the casing. If Rohde & Schwarz provides a carrying bag designed for your product, you can use the product outdoors.

Unless otherwise specified, you can operate the product up to an altitude of 2000 m above sea level. The product is suitable for pollution degree 2 environments where nonconductive contamination can occur. For more information on environmental conditions such as ambient temperature and humidity, see the data sheet.

Setting up the product

Always place the product on a stable, flat and level surface with the bottom of the product facing down. If the product is designed for different positions, secure the product so that it cannot fall over.

If the product has foldable feet, always fold the feet completely in or out to ensure stability. The feet can collapse if they are not folded out completely or if the product is moved without lifting it. The foldable feet are designed to carry the weight of the product, but not an extra load.

If stacking is possible, keep in mind that a stack of products can fall over and cause injury.

If you mount products in a rack, ensure that the rack has sufficient load capacity and stability. Observe the specifications of the rack manufacturer. Always install the products from the bottom shelf to the top shelf so that the rack stands securely. Secure the product so that it cannot fall off the rack.

Connecting to power

The product is an overvoltage category II product and has to be connected to a fixed installation used to supply energy-consuming equipment such as household appliances and similar loads. Be aware that electrically powered products have risks, such as electric shock, fire, personal injury or even death.

Take the following measures for your safety:

- Before switching on the product, ensure that the voltage and frequency indicated on the product match the available power source. If the power adapter does not adjust automatically, set the correct value and check the rating of the fuse.
- If a product has an exchangeable fuse, its type and characteristics are indicated next to the fuse holder. Before changing the fuse, switch off the instrument and disconnect it from the power source. How to change the fuse is described in the product documentation.
- Only use the power cable delivered with the product. It complies with country-specific safety requirements. Only insert the plug into an outlet with protective conductor terminal.
- Only use intact cables and route them carefully so that they cannot be damaged. Check the power cables regularly to ensure that they are undamaged. Also ensure that nobody can trip over loose cables.
- If the product needs an external power supply, use the power supply that is delivered with the product or that is recommended in the product documentation or a power supply that conforms to the country-specific regulations.
- Only connect the product to a power source with a fuse protection of maximum 20 A.
- Ensure that you can disconnect the product from the power source at any time. Pull the power plug to disconnect the product. The power plug must be easily accessible. If the product is integrated into a system that does not meet these requirements, provide an easily accessible circuit breaker at the system level.

Cleaning the product

Use a dry, lint-free cloth to clean the product. When cleaning, keep in mind that the casing is not waterproof. Do not use liquid cleaning agents.

Meaning of safety labels

Safety labels on the product warn against potential hazards.

	Potential hazard Read the product documentation to avoid personal injury or product damage.
	Electrical hazard Indicates live parts. Risk of electric shock, fire, personal injury or even death.
	Hot surface Do not touch. Risk of skin burns. Risk of fire.
	Protective conductor terminal Connect this terminal to a grounded external conductor or to protective ground. This protects you against electric shock should an electric problem occur.

2.2 Labels on R&S SZV100A

Labels on the casing inform about:

- Personal safety, see "Meaning of safety labels" on page 12
- Product and environment safety, see Table 2-1.
- Identification information printed on the bar code sticker at the bottom of the instrument. The sticker also displays the 6-digit serial number of the R&S SZV100A:

Table 2-1: Labels regarding R&S SZV100A and environment safety

	Labeling in line with EN 50419 for disposal of electrical and electronic equipment after the product has come to the end of its service life. For more information, see "Electrical and electronic equipment" on page 48.
	Take care when handling electrostatic sensitive devices.

3 Welcome to the R&S SZV100A

The R&S SZV100A is an RF upconverter designed for the Q/V frequency bands ranging from 36 GHz to 56 GHz. These frequencies are used in satellite communication applications.

About Q/V bands

The table below gives an overview on frequency allocation and satellite service types for Q and V bands.

Band	Frequency range	Spectrum	Satellite service	Satellite link type
Q	37.5 GHz to 39.5 GHz	shared	Fixed satellite, earth exploration satellite	space-to-earth
Q	40.5 GHz to 42.5 GHz	shared	Fixed satellite, mobile satellite Broadcasting: ranging from 40.5 GHz to 41 GHz	space-to-earth
V	42.5 GHz to 43.5 GHz	shared	Fixed satellite, radio astronomy	earth-to-space
V	47.2 GHz to 48.9 GHz	shared	Fixed satellite	earth-to-space
V	48.9 GHz to 50.2 GHz 50.2 GHz to 50.4 GHz	shared	Fixed satellite Fixed satellite, earth exploration satellite	earth-to-space
V	50.4 GHz to 51.4 GHz	shared	Fixed satellite	earth-to-space

R&S SZV100A band plan

The table below gives an overview on LO, IF and RF output frequencies at 2 GHz modulation bandwidth using the R&S SMAB as LO source and the R&S SMW as IF input.

Band	Designation	LO	LO x 4	IF range	RF range	Effective RF range	Mixer bandwidth
1	Band1	13 GHz	52 GHz	9 GHz to 16 GHz	36 GHz to 43 GHz	36 GHz to 43 GHz	(4 x LO) - IF
2	Band2	14.25 GHz	57 GHz	10 GHz to 16 GHz	41 GHz to 47 GHz	41 GHz to 47 GHz	(4 x LO) - IF

Band	Designa-tion	LO	LO x 4	IF range	RF range	Effective RF range	Mixer band-width
3	Band3 HighLo	14.25 GHz	57 GHz	7 GHz to 12 GHz	45 GHz to 50 GHz	45 GHz to 50 GHz	(4 x LO) - IF
4	Band3 LowLo	10.5 GHz	42 GHz	6 GHz to 9 GHz	48 GHz to 51 GHz	48 GHz to 51 GHz	(4 x LO) + IF
5	Band4	10.5 GHz	42 GHz	7 GHz to 14 GHz	49 GHz to 56 GHz	49 GHz to 56 GHz	(4 x LO) + IF

4 Preparing for Use

This chapter describes the basic steps to be taken when setting up the product for the first time.

4.1 Lifting and Carrying

See "Lifting and carrying the product" on page 11.

4.2 Unpacking and Checking

1. Unpack the R&S SZV100A carefully.
2. Retain the original packing material. Use it when transporting or shipping the R&S SZV100A later.
3. Using the delivery notes, check the equipment for completeness.
4. Check the equipment for damage.

   If the delivery is incomplete or equipment is damaged, contact Rohde & Schwarz.

4.3 Choosing the Operating Site

Specific operating conditions ensure accurate measurements and avoid damage to the product and connected devices. For information on environmental conditions such as ambient temperature and humidity, see the data sheet.

See also "Choosing the operating site" on page 11.

Electromagnetic compatibility classes

The electromagnetic compatibility (EMC) class indicates where you can operate the product. The EMC class of the product is given in the data sheet under "General data".

- Class B equipment is suitable for use in:
  - Residential environments
  - Environments that are directly connected to a low-voltage supply network that supplies residential buildings
- Class A equipment is intended for use in industrial environments. It can cause radio disturbances in residential environments due to possible conducted and radiated disturbances. It is therefore not suitable for class B environments.
  If class A equipment causes radio disturbances, take appropriate measures to eliminate them.

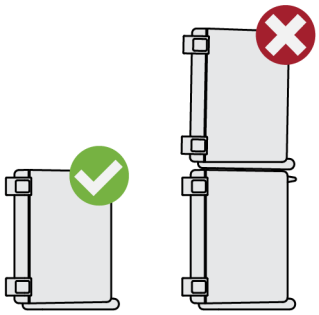
4.4 Setting Up the R&S SZV100A

See also:

- "Setting up the product" on page 11
- "Intended use" on page 10

To place the product on a bench top

1. Place the product on a stable, flat and level surface. Ensure that the surface can support the weight of the product. For information on the weight, see the data sheet.
2. **CAUTION!** The product can fall over and cause injury. The top surface is too small for stacking. Never stack another product on top of the product.



As an alternative, you can mount several products in a rack.

3. **NOTICE!** Overheating can damage the product.
   Prevent overheating as follows:
   - Keep a minimum distance of 10 cm between the fan openings of the product and any object in the vicinity.
   - Do not place the product next to heat-generating equipment such as radiators or other products.

4.5 Considerations for Test Setup

Cable selection and electromagnetic interference (EMI)

Electromagnetic interference (EMI) can affect the measurement results.

- To suppress electromagnetic radiation during operation:
  Use high-quality shielded cables, especially for the following connector types:
  - 1.85 mm/2.92 mm
    Double-shielded cables. Match the signal with 50 Ω.
    How to: Chapter 4.8, "Connecting to RF", on page 20
  - LAN
    At least CAT6 STP cables.
    How to: Chapter 4.7, "Connecting to LAN", on page 19
- Always terminate open cable ends.
- Ensure that connected external devices comply with EMC regulations.

Signal input and output levels

Information on signal levels is provided in the data sheet. Keep the signal levels within the specified ranges to avoid damage to the product and connected devices.

Preventing electrostatic discharge (ESD)

Electrostatic discharge is most likely to occur when you connect or disconnect a DUT.

► **NOTICE!** Risk of electrostatic discharge. Electrostatic discharge can damage the electronic components of the product and the device under test (DUT).
Ground yourself to prevent electrostatic discharge damage:

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

4.6 Connecting to Power

For safety information, see "Connecting to power" on page 12.

1. **NOTICE!** Only use the external power supply as delivered with the instrument, to ensure proper operation.

   Plug the DC power cable into the DC power connector on the rear panel of the instrument. Only use the DC power cable delivered with the R&S SZV100A.

2. Plug the DC power cable into the power outlet.

   The required voltage and current is listed next to the DC power connector and in the data sheet.

4.7 Connecting to LAN

You can operate the R&S SZV100A via LAN (local area network). This section describes how to connect the instrument to a LAN to operate or control the instrument remotely via a PC in a LAN.

The connector is on the rear panel.

► Connect the LAN socket via an RJ-45 cable to the LAN.

By default, the R&S SZV100A is configured to use DHCP (dynamic host configuration protocol) and no static IP address is configured.

If switched on and connected to the LAN, the R&S SZV100A displays the address information on the screen.

Figure 4-1: IP address indication on the screen (example)

4.8 Connecting to RF

1. Use a high-quality cable that matches the connector type.
   See "Cable selection and electromagnetic interference (EMI)" on page 18.
2. **NOTICE!** Risk of connector damage and instrument due to high input power.
   Ensure, that the input level at an RF input connector ("IF In"/"LO In" is lower than the maximum permissible input level in the data sheet.
3. **NOTICE!** Risk of instrument damage and connector damage. Excessive tightening can damage the cables and the connectors. However, if you do not tighten the connectors enough, the measurement results can be inaccurate.
   To connect the cable with the connector, proceed as follows:
   a) Carefully align the connector of the cable and the connector along a common axis.
   b) Mate the connectors along the common axis until the male pin of the inner connector engages with the female socket of the outer connector.
   c) Turn the nut of the outer connector until the connectors are coupled firmly.
   d) Torque the nut to the specified limit using a calibrated torque wrench. Hold the opposite connector part stationary with a spanner.
   For torque limits of the most relevant connector types, see Table 4-1.
4. Torque the nut to the specified limit using a calibrated torque wrench. Hold the opposite connector part stationary with a spanner.

For more information, see chapter "Handling" of the application note 1MA99.

Table 4-1: Connector types and torque limits

Type	Torque limit		Nut opening	
	lb-Inch	Nm	Inch	mm
2.92 mm	8	0.9	5/16	8
1.85 mm	8	0.9	5/16	8

Preventing RF output switch-off

► **NOTICE!** If you set a too high output level, the reverse power can exceed a limit forcing the R&S SZV100A to switch off the RF output.

Set an RF output level that is not higher than the maximum permissible RF power as given in the data sheet.

4.9 Switching On or Off

The following table provides an overview of power states, LEDs and power switch positions.

To switch on the R&S SZV100A

The R&S SZV100A is off but connected to power. See Chapter 4.6, "Connecting to Power", on page 19

► Set the switch on the power supply to position [I].

The LED "Bd. 1" is lit. See Chapter 5.2.1, "Q/V Band LEDs", on page 24.

To disconnect from power

The R&S SZV100A is switched on.

1. **NOTICE!** Risk of data loss. If you disconnect the product from power when it is in the ready state, you can lose settings and data. Shut it down first.

   Set the switch on the power supply to position [0].

2. Disconnect the R&S SZV100A from the power source.

5 Instrument Tour

The following topics help you get familiar with the instrument and perform the first steps:

- Front Panel Tour
- Rear Panel Tour

This section explains the control elements and the connectors of the R&S SZV100A with the aid of the front and rear views. For specifications of the interfaces, refer to the data sheet.

The meanings of the labels on the R&S SZV100A are described in Chapter 2.2, "Labels on R&S SZV100A", on page 13.

5.1 Front Panel Tour

This section gives an overview of the front panel connectors of the R&S SZV100A. Signal flow is exclusively in output direction at the front. The signal is an upconverted coupled or non-coupled RF signal.

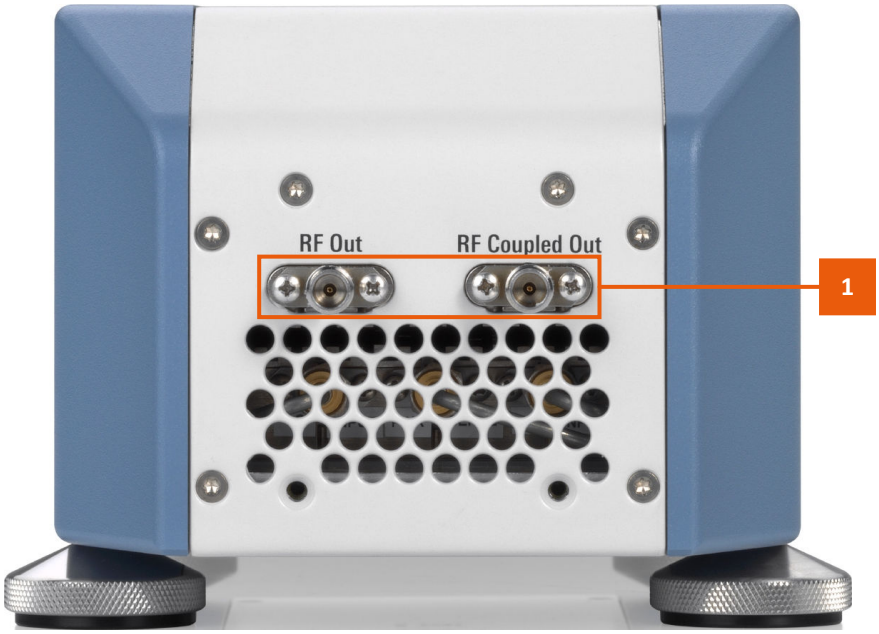


Figure 5-1: Front panel view

1 = RF connectors, see Chapter 5.1.1, "RF Connectors", on page 23

5.1.1 RF Connectors

RF Out/RF Coupled Out
Uni-directional female 1.85 mm connectors for uncoupled or coupled RF output.

Use "RF Out" for output of an upconverted RF signal to the DUT.

Use "RF Coupled Out" for output of an RF control signal, e.g. for a connected sensor in loop test setups.

Table 5-1: Overview of RF connector type and required option

Connector	Connector type	Required option
"RF Out"	PC 1.85 mm female	R&S SZV-B1056
"RF Coupled Out"	PC 1.85 mm female	R&S SZV-B1056

How to: Chapter 4.8, "Connecting to RF", on page 20

5.2 Rear Panel Tour

This section gives an overview of the rear panel control elements and the connectors of the R&S SZV100A. There are two ways of signal flow at the rear:

- Input signal from the R&S SMW (IF) R&S SMAB (LO) before frequency upconversion
- Coupled LO/IF output signal

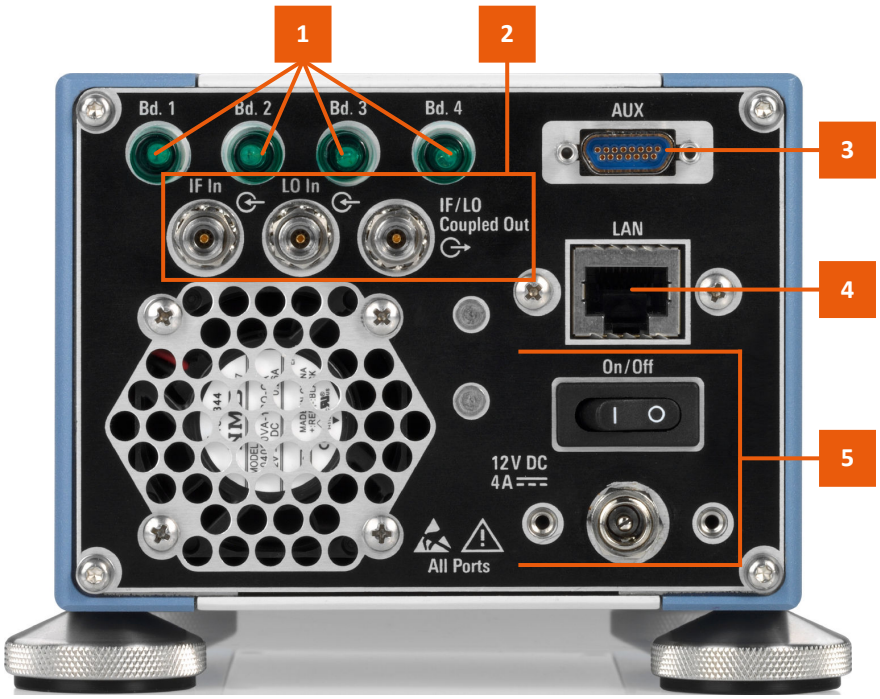


Figure 5-2: Rear panel view

1 = Q/V band LEDs, see "Bd. 1/Bd. 2/Bd. 3/Bd. 4" on page 24
2 = RF connectors, see IF In, LO In and "IF/LO Coupled Out" on page 25
3 = Auxiliary connector, see "AUX" on page 25
4 = LAN connector, see "LAN" on page 25
5 = DC power connector and switch, see "DC power connector and switch" on page 25

5.2.1 Q/V Band LEDs

Bd. 1/Bd. 2/Bd. 3/Bd. 4

Q/V band LEDs display activated/deactivated frequency bands. If the LED is lit, the frequency of the RF output signal belongs to the band.

Table 5-2: Overview band designation and frequency range

LED	RF output frequency range
"Bd. 1"	36 GHz to 43 GHz
"Bd. 2"	41 GHz to 47 GHz
"Bd. 3"	45 GHz to 51 GHz
"Bd. 4"	49 GHz to 56 GHz

See also "R&S SZV100A band plan" on page 14.

5.2.2 Connectors

DC power connector and switch
Connector and power switch to connect/disconnect the R&S SZV100A to/from the external power supply.

How to: Chapter 4.6, "Connecting to Power", on page 19

IF In
Uni-directional female 2.92 mm connector for IF input.

How to: Chapter 4.8, "Connecting to RF", on page 20

LO In
Uni-directional female 2.92 mm connector for local oscillator input.

How to: Chapter 4.8, "Connecting to RF", on page 20

IF/LO Coupled Out
Uni-directional female 2.92 mm connector for coupled IF/LO output.

How to: Chapter 4.8, "Connecting to RF", on page 20

AUX
Interface for direct control of additional external devices. For future use.

LAN
RJ-45 connector to connect the R&S SZV100A to a LAN for remote control, remote operation, and data transfer.

How to: Chapter 4, "Preparing for Use", on page 16

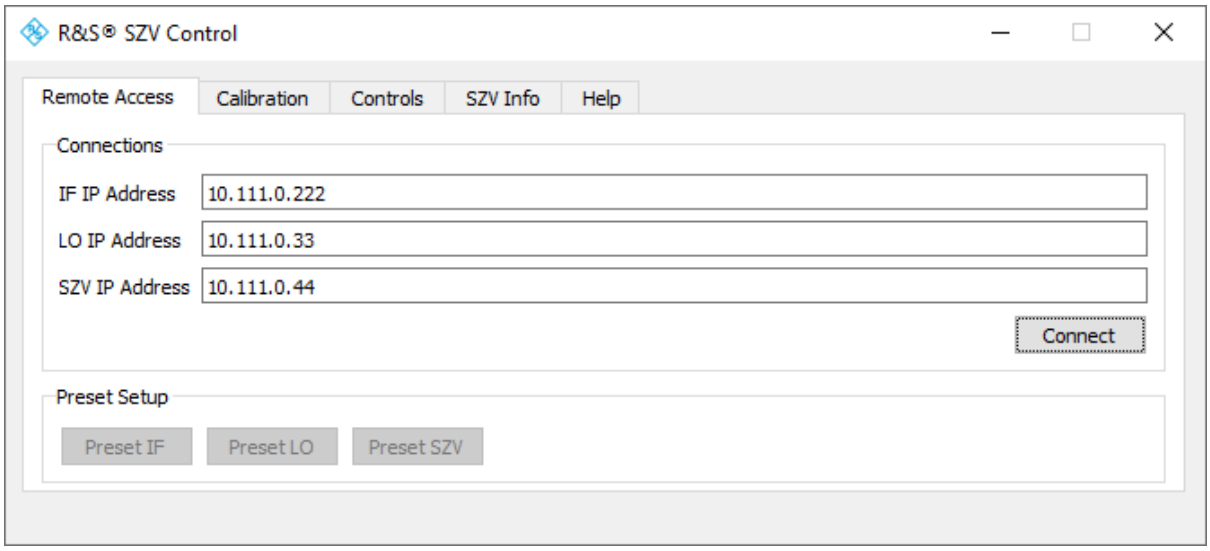
6 Instrument Control

This chapter provides an overview on how to work with the R&S SZV100A.

It covers the following topics:

6.1 Accessing the GUI

► Open the "R&S SZV Control" software as provided by the following file: `R&S SZV Control vX.Y.Z.exe`, where `vX.Y.Z` is the version number.



The "R&S SZV Control" dialog opens. The dialog provides settings necessary to configure remote access, calibration and RF signal characteristics. Also the dialog provides information on the operating conditions of the R&S SZV100A and the installed "R&S SZV Control" software.

To connect IF and LO instruments

1. Open the "R&S SZV Control" software.
2. In the "Remote Access" tab, set the IP address of the R&S SZV100A and IF and LO instruments:

a) Set "IF IP Address".
b) Set "LO IP Address".
c) Set "SZV IP Address".

3. Click "Connect".

To load calibration data

1. Open the "R&S SZV Control" software.
2. In the "Calibration" tab, select calibration data files with extension `*.s2p`.
   You can correct data for the IF and LO input connections and the R&S SZV100A output connection.
3. If you do not have calibration data, you can download internal calibration data for the R&S SZV100A.
   Click "Download".

6.2 R&S SZV Control Settings

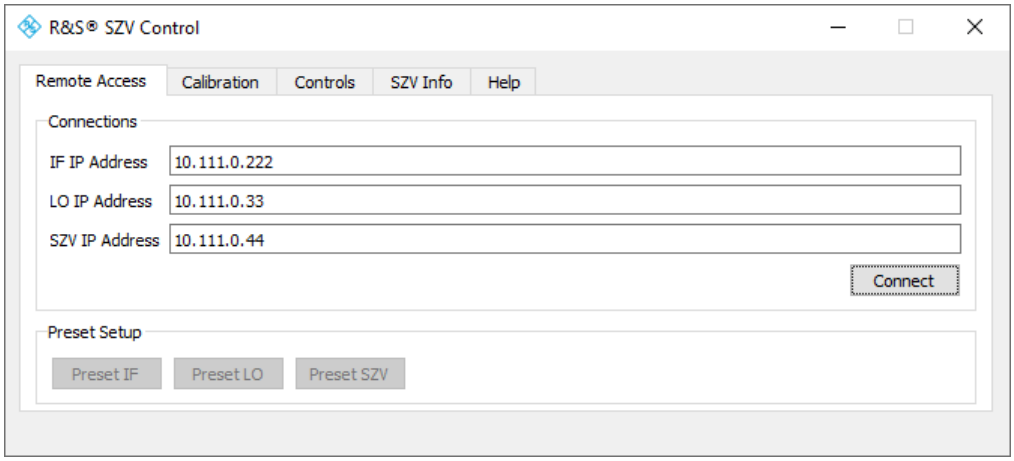
This chapter describes the settings of the "R&S SZV Control" software.

6.2.1 Remote Access Settings

Access:

► Select "R&S SZV Control > Remote Access".

In this tab, configure IP addresses of the IF/LO instruments and the R&S SZV100A.



Settings

Connections
Configure connections from and to the R&S SZV100A in the LAN.

You can set the IP addresses of the IF and LO instruments and the R&S SZV100A.

Preset Setup
Triggers a preset of the connections. The preset disconnects the instruments in the LAN

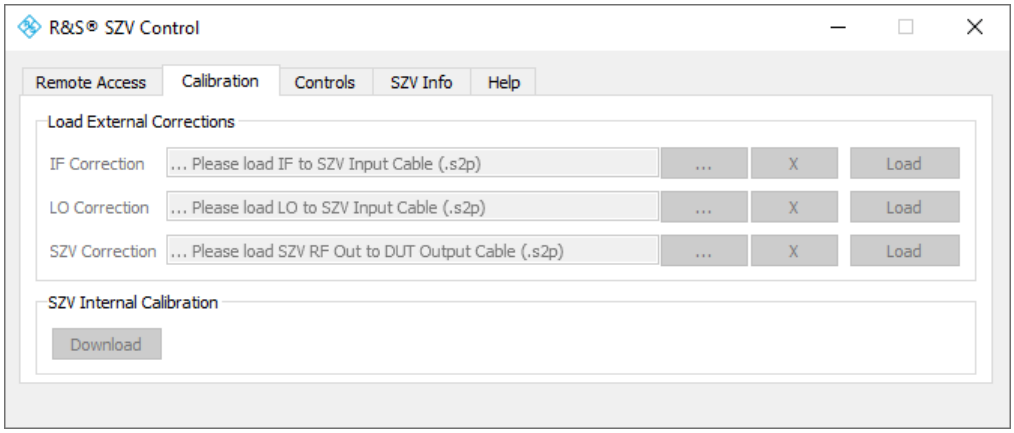
You can preset the IP address for each instrument.

6.2.2 Calibration Settings

Access:

► Select "R&S SZV Control > Calibration".

In this tab, set calibration settings of the R&S SZV100A.



Settings

Load External Corrections
Load calibration data from files with extension `*.s2p`.

You can load data for input and output signals. See "To load calibration data" on page 27.

Remote command:
`:CALibration:DATA:USER` on page 41

SZV Internal Calibration
Download SZV internal calibration data.

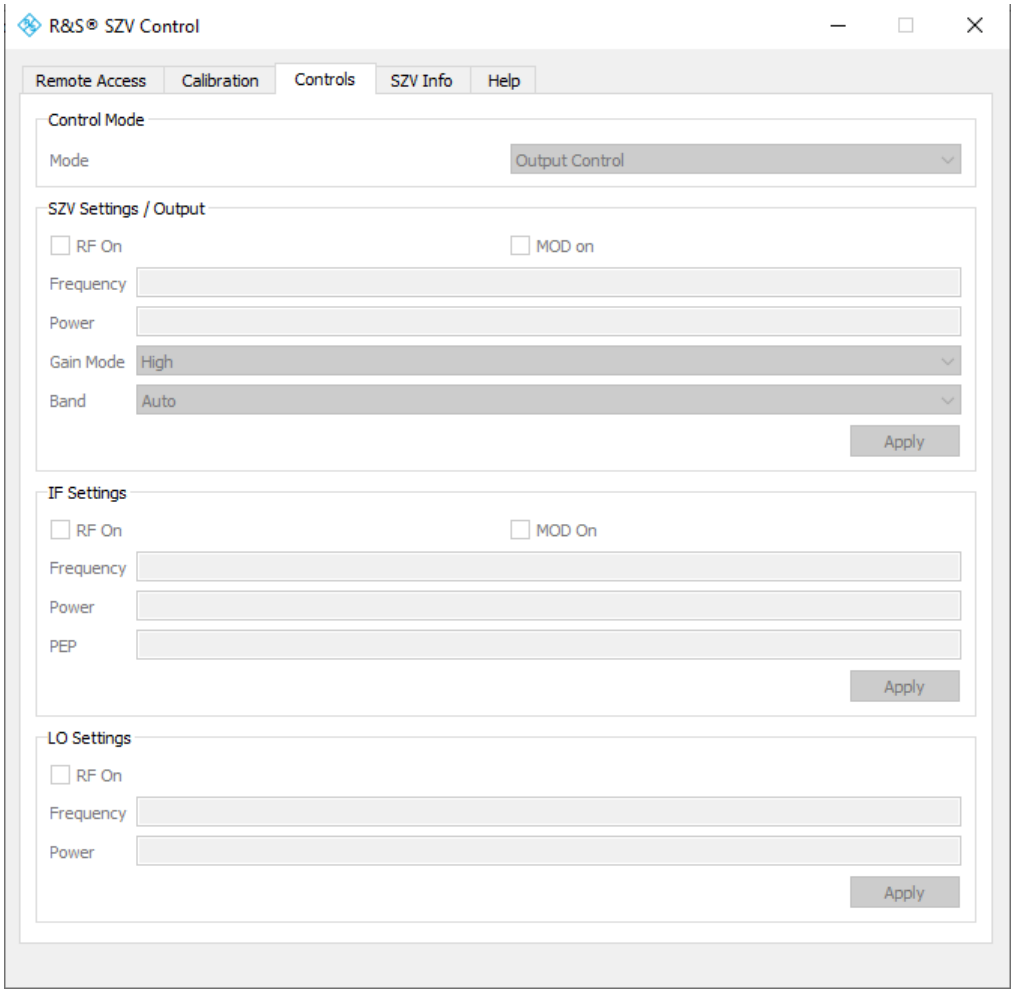
Remote command:
`:CALibration:DATA:FACTory` on page 41

6.2.3 Controls Settings

Access:

► Select "R&S SZV Control > Controls".

In this tab, set the control mode of the R&S SZV100A and RF signal characteristics.



Settings

Control Mode
Displays the mode to control the R&S SZV100A.

In the current software, you can control the R&S SZV100A via output control only.

You can control the R&S SZV100A by an externally connected instrument, e.g. R&S SMW or R&S SMAB.

SZV Settings / Output
Sets RF frequency settings of the RF output signal.

RF On ← SZV Settings / Output
Activates/deactivates the signal at the "RF"/"RF Coupled" output connector.

Remote command:
`:OUTPut:STATe` on page 42

MOD On ← SZV Settings / Output
Activates/deactivates modulation of the RF signal.

Remote command:
`:SOURce:IQ:STATe` on page 42

Frequency ← SZV Settings / Output
Sets the frequency of the RF output signal.

Remote command:
`:SOURce:FREQuency:CW` on page 42

Power ← SZV Settings / Output
Sets the level of the RF output signal.

Remote command:
`:SOURce:POWer:LEVel:IMM:AMPLitude` on page 43

Gain Mode ← SZV Settings / Output
Sets the gain mode of the RF output signal.

You can set for high and low output gain.

Remote command:
`:INPut:GAIN:STATe` on page 41

Band ← SZV Settings / Output
Sets the band of the RF output signal.

You can set the band manually or automatically select the band from the set "Frequency".

Remote command:
`:SOURce:FREQuency:CHANnel` on page 41

IF Settings
Sets RF frequency settings of the RF signal at the IF connector.

RF On ← IF Settings
Activates/deactivates the signal at the IF connector.

Remote command:
`:OUTPut:STATe` on page 42

MOD On ← IF Settings
Activates/deactivates modulation of the RF signal at the IF connector.

Remote command:
`:SOURce:IQ:STATe` on page 42

Frequency ← IF Settings
Sets the frequency of the RF at the IF connector.

Remote command:
`:SOURce:FREQuency:CW` on page 42

Power ← IF Settings
Sets the level of the RF signal at the IF connector.

Remote command:
`:SOURce:POWer:LEVel:IMM:AMPLitude` on page 43

PEP ← IF Settings
Displays the PEP value of the RF signal at the IF connector.

Remote command:
`:SOURce:POWer:PEP` on page 43

LO Settings
Sets RF frequency settings of the RF signal at the LO connector.

RF On ← LO Settings
Activates/deactivates the signal at the RF signal at the LO connector.

Remote command:
:OUTP:STAT on page 45

Frequency ← LO Settings
Sets the frequency of the RF signal at the LO connector.

Power ← LO Settings
Sets the level of the RF signal at the LO connector.

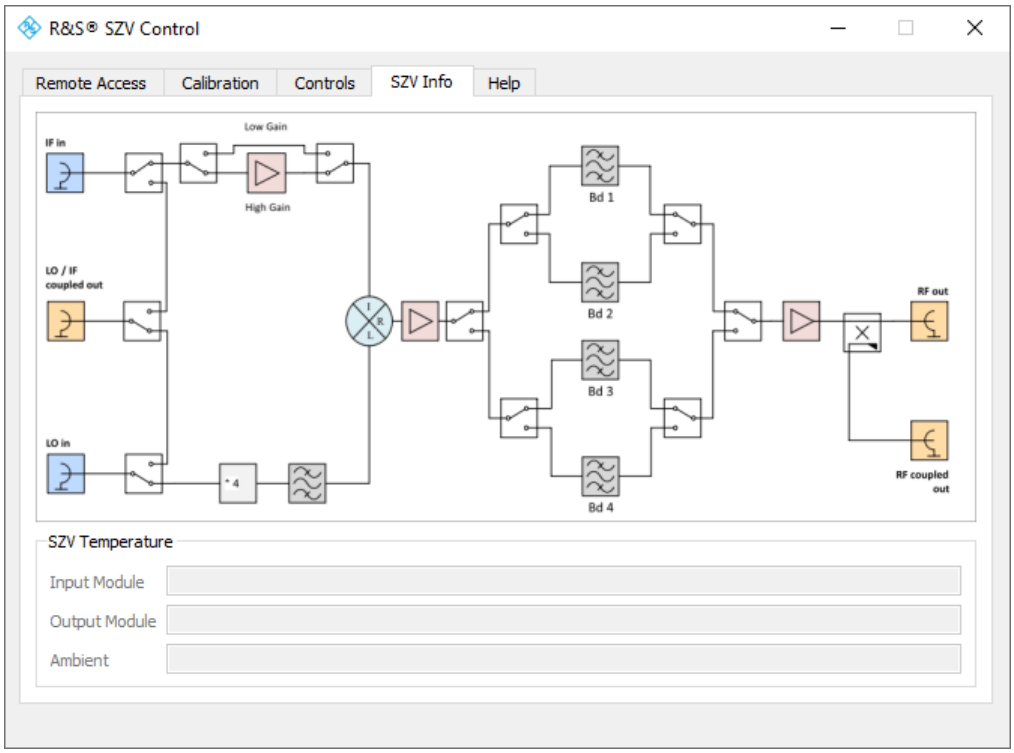
Remote command:
:SOURce:POWer:LEVel:IMM:AMPLitude on page 45

6.2.4 SZV Info Settings

Access:

► Select "R&S SZV Control > SZV Info".

This tab shows information on the test setup and temperature values of the input module, output module and ambience.



Settings

SZV Temperature
Displays temperature values of the input module, output module and ambience.

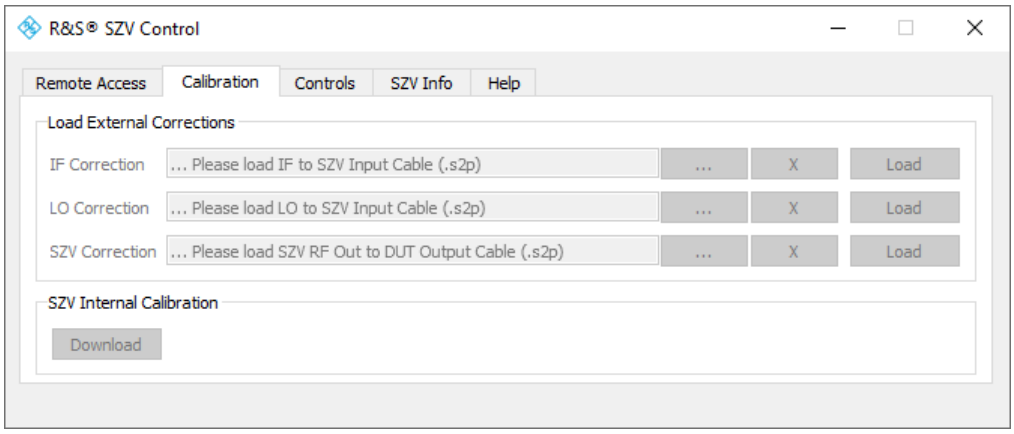
Remote command:
:MEAS:TEMP<N> on page 40

6.2.5 Help Settings

Access:

► Select "R&S SZV Control > Help".

In this tab, you can set the version of your R&S SZV Control software. Also, this tab displays the internal firmware version and the hardware assembly of the R&S SZV100A.



Settings

R&S®SZV Control GUI
Sets the "Version" of your R&S SZV Control software.

SZV Firmware
Displays the "Version" of the internal R&S SZV firmware.

If the version is not correct, click "Update". The "Version" field diplays the latest version installed on the instrument connected via the "SZV IP Address".

SZV

Displays information on the assembly of the R&S SZV100A.

The panel diplays the part number ("Part No"), serial number ("Serial No") and revision number for assembly components. The components are the input module, output module, interface board and motherboard.

7 Remote-Control Commands

In the following, all remote-control commands are presented in detail with their parameters and the ranges of numerical values.

A knowledge about remote control operation and SCPI command syntax is assumed.

Conventions used in SCPI command descriptions

For a description of the conventions used in the remote command descriptions, see section "Remote Control Commands" in the user manual.

We assume that the R&S SZV100A has already been set up for remote operation in a network as described in Chapter 4.7, "Connecting to LAN", on page 19.

Programming examples

This description provides simple programming examples. The purpose of the examples is to present **all** commands for a given task. In real applications, one would rather reduce the examples to an appropriate subset of commands.

The programming examples have been tested with a software tool which provides an environment for the development and execution of remote tests. To keep the example as simple as possible, only the "clean" SCPI syntax elements are reported. Non-executable command lines (e.g. comments) start with two // characters.

At the beginning of the most remote control program, an instrument preset/reset is recommended to set the instrument to a definite state. The commands `*RST` and `SYSTem:PRESet` are equivalent for this purpose. `*CLS` also resets the status registers and clears the output buffer.

7.1 Common Commands

Common commands are described in the IEEE 488.2 (IEC 625-2) standard. These commands have the same effect and are employed in the same way on

different devices. The headers of these commands consist of "*" followed by three letters. Many common commands are related to the Status Reporting System.

Available common commands:

***CLS**

Clear status

Sets the status byte (STB), the standard event register (ESR) and the `EVENt` part of the `QUEStionable` and the `OPERation` registers to zero. The command does not alter the mask and transition parts of the registers. It clears the output buffer.

Usage: Setting only

***ESE** <Value>

Event status enable

Sets the event status enable register to the specified value. The query returns the contents of the event status enable register in decimal form.

Parameters:
<Value> Range: 0 to 255

***ESR?**

Event status read

Returns the contents of the event status register in decimal form and then sets the register to zero.

Return values:
<Contents> Range: 0 to 255

Usage: Query only

***IDN?**

Identification

Returns the instrument identification.

Return values:

<ID> "Rohde&Schwarz,<device type>,<part number>/<serial number>,<firmware version>"

Example: `Rohde&Schwarz,SZV100A,`
`1431.0002.02/102030,0.10.1`

Usage: Query only

***OPC**

Operation complete

Sets bit 0 in the event status register when all preceding commands have been executed. This bit can be used to initiate a service request. The query writes a "1" into the output buffer when all preceding commands have been executed, which is useful for command synchronization.

***RST**

Reset

Sets the instrument to a defined default status. The default settings are indicated in the description of commands.

The command is equivalent to `SYSTem:PRESet`.

Usage: Setting only

***SRE** <Contents>

Service request enable

Sets the service request enable register to the indicated value. This command determines under which conditions a service request is triggered.

Parameters:

<Contents> Contents of the service request enable register in decimal form. Bit 6 (MSS mask bit) is always 0.

Range: 0 to 255

***STB?**

Status byte query

Reads the contents of the status byte in decimal form.

Usage: Query only

***TST?**

Self-test query

Initiates self-tests of the instrument and returns an error code.

Return values:

<ErrorCode> **integer > 0 (in decimal format)**
An error occurred.
For details, see the Service Manual supplied with the instrument.

0
No errors occurred.

Usage: Query only

***WAI**

Wait to continue

Prevents servicing of the subsequent commands until all preceding commands have been executed and all signals have settled (see also command synchronization and *OPC).

Usage: Event

7.2 R&S SZV Control Commands

The R&S SZV Control commands are used to control the R&S SZV100A, IF and LO signal generators.

The common signal generator commands (power on/off, center frequency, power level) are shared between the IF and LO. Most IF and LO commands are different.

In particular, the modulation commands are specific to the IF signal generator. The IF and LO also use different correction methods and, therefore, different correction SCPI commands.

7.2.1 Common Commands

:MEAS:TEMP<N>

Queries the temperature of the R&S SZV100A.

Suffix:

<N> 1 to 3
Temperature sensor: Sensor 1 = Filter module, Sensor 2 = LO module, Sensor 3 = Instrument sensor

Parameters:

<Temperature> float
Default unit: °C

Manual operation: See "SZV Temperature" on page 34

:SOURce:FREQuency:CHANnel <Channel>

Sets the operation band of the R&S SZV100A.

Parameters:
<Channel> BAND1 | BAND2 | BAND3HIGHLO | BAND3LOWLO | BAND4 | LOPOWER | IFPOWER

Manual operation: See "Band" on page 32

:INPut:GAIN:STATe <GainState>

Activates the input gain.

Parameters:
<GainState> 0 | 1 | OFF | ON
*RST: OFF

Manual operation: See "Gain Mode" on page 31

:CALibration:DATA:FACTory

Queries the factory calibration data sourceof the R&S SZV100A.

Parameters:
<FactoryCalibration> string

Manual operation: See "SZV Internal Calibration" on page 29

:CALibration:DATA:USER <UserCalibration>

Sets a user-defined calibration data source of the R&S SZV100A.

Parameters:
<UserCalibration> string

Manual operation: See "Load External Corrections" on page 29

7.2.2 IF Commands

:OUTPut:STATe <PowerState>

Activates the output power.

Parameters:

<PowerState> 0 | 1 | OFF | ON
*RST: OFF

Manual operation: See "RF On" on page 31

:SOURce:IQ:STATe <IQState>

Activates the modulation.

Parameters:

<IQState> 0 | 1 | OFF | ON
*RST: OFF

Manual operation: See "MOD On" on page 31

:SOURce:FREQuency:CW <Frequency>

Sets the center frequency of the IF signal.

Parameters:

<Frequency> float

*RST: 0
Default unit: Hz

Manual operation: See "Frequency" on page 31

:SOURce:POWer:LEVel:IMM:AMPLitude

Queries the peak power level of the IF signal.

Parameters:

<Level> float

*RST: 0
Default unit: dB

Manual operation: See "Power" on page 31

:SOURce:POWer:PEP

Queries the PEP of the IF signal.

Parameters:

<Level> float

*RST: 0
Default unit: dB

Manual operation: See "PEP" on page 32

:SOURce:CORRection:FRES:RF:USER <User>

Activates applying of user-defined corrections to the IF signal data.

Parameters:

<User> 0 | 1 | OFF | ON

*RST: OFF

:SOURce:CORRection:FRES:RF:USER:APPLy

Applies user-defined corrections to the IF signal data.

:SOURce:CORRection:FRES:RF:USER:SLIS:SELect <Filename>

Selects the specified list file for user correction from the default directory or in the directory specified with the absolute file path.

You can select files with extension `*.s2p`.

Parameters:

<Filename> string

:SOURce:CORRection:FRES:RF:OPTimization:MODE <Mode>

Defines the optimization mode.

Parameters:

<Mode> OCONtrol

Output control mode

:SOURce:CORRection:FRES:RF:OPTimization:LOC

Triggers applying of optimization data.

:SOURce:CORRection:FRES:USER:ALEVel:STATe <State>

Activates absolute level compensation.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: OFF

:SOURce:CORRection:FRES:USER:ALEVel:VALue

Queries the absolute level compensation value.

Parameters:

<Level> float

Default unit: dB

7.2.3 LO Commands

:OUTP:STAT <PowerState>

Activates the output power.

Parameters:

<PowerState> 0 | 1 | OFF | ON
*RST: OFF

Manual operation: See "RF On" on page 33

:SOURce:FREQuency:CW <Frequency>

Sets the center frequency of the IF signal.

Parameters:

<Frequency> float
*RST: 0
Default unit: Hz

:SOURce:POWer:LEVel:IMM:AMPLitude

Queries the peak power level of the LO signal.

Parameters:

<Level> float
*RST: 0
Default unit: dB

Manual operation: See "Power" on page 33

:SOURce:CORRcetion:CSET <Value>

Sets the power correction value.

Parameters:

<Value> float

*RST: 0

Default unit: dB

:SOURce:CORRection <CorrectionState>

Activates power correction.

The LO power is corrected by the value, set via `:SOURce:CORRcetion:CSET`.

Parameters:

<CorrectionState> 0 | 1 | OFF | ON

*RST: OFF

8 Transporting

Lifting and carrying

See "Lifting and carrying the product" on page 11.

Packing

Use the original packaging material. It consists of antistatic wrap for electrostatic protection and packing material designed for the product.

If you do not have the original packaging, use similar materials that provide the same level of protection.

Securing

When moving the product in a vehicle or using transporting equipment, make sure that the product is properly secured. Only use items intended for securing objects.

Transport altitude

Unless otherwise specified in the data sheet, the maximum transport altitude without pressure compensation is 4500 m above sea level.

9 Maintenance, Storage and Disposal

The product does not require regular maintenance. It only requires occasional cleaning. It is however advisable to check the nominal data from time to time.

9.1 Cleaning

How to clean the product is described in "Cleaning the product" on page 12.

Do not use any liquids for cleaning. Cleaning agents, solvents (thinners, acetone), acids and bases can damage the front panel labeling, plastic parts and display.

9.2 Storage

Protect the product against dust. Ensure that the environmental conditions, e.g. temperature range and climatic load, meet the values specified in the data sheet.

9.3 Disposal

Rohde & Schwarz is committed to making careful, ecologically sound use of natural resources and minimizing the environmental footprint of our products. Help us by disposing of waste in a way that causes minimum environmental impact.

Electrical and electronic equipment

A product that is labeled as follows cannot be disposed of in normal household waste after it has come to the end of its service life. Even disposal via the municipal collection points for waste electrical and electronic equipment is not permitted.

Figure 9-1: Labeling in line with EN 50419

Disposal

Rohde & Schwarz has developed a disposal concept for the ecofriendly disposal or recycling of waste material. As a manufacturer, Rohde & Schwarz completely fulfills its obligation to take back and dispose of electrical and electronic waste. Contact your local service representative to dispose of the product.

10 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 10-1: QR code to the Rohde & Schwarz support page

Glossary: Abbreviations and definitions

D

DUT: Device Under Test

I

IF: Intermediate Frequency

L

LO: Local Oscillator

P

PEP: Peak Envelope Power

Q

Q/V: Q and V bands covering a range of 36 GHz to 56 GHz

T

TVAC: Thermal Vacuum Chamber

List of remote commands (base unit)

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