

# R&S® SMBV100B Vector Signal Generator Getting Started



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1423104902

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# 1 Preface

The R&S SMBV100B is a new signal generator developed to meet demanding customer requirements. Offering excellent signal characteristic and straightforward and intuitive operation, the signal generator makes signal generation fast and easy.

## 1.1 Key Features

The R&S SMBV100B is a new high-performance signal generator developed to meet demanding customer requirements. Offering excellent signal characteristic and straightforward and intuitive operation, the signal generator makes signal generation fast and easy.

Outstanding key features of the R&S SMBV100B are:

- Frequency range from 8 kHz to 6 GHz
- Up to 500 MHz I/Q modulation bandwidth (in RF) with internal baseband
- Support of all important digital standards such as LTE incl eMTC/NB-IoT, 5G NR, WLAN IEEE 802.11a/b/g/n/j/p/ac/ax, 3GPP FDD/HSPA/HSPA+
- Excellent signal quality for high accuracy in spectral and modulation measurements
- Intuitive operation via touchscreen with block diagram as key element
- Graphical signal monitoring at practically every point in the signal flow
- SCPI macro recorder and code generator for generating executable remote control code from manual operating steps (for MATLAB®, CVI, etc.)

For more information, see data sheet.

## 2 Safety and Regulatory Information

The product documentation helps you use the R&S SMBV100B safely and efficiently. Follow the instructions provided here and in the [Chapter 2.1, "Safety Instructions"](#), on page 9.

### Intended use

The R&S SMBV100B is intended for the development, production and verification of electronic components and devices in industrial, administrative, and laboratory environments. Use the R&S SMBV100B 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 9. The same information is provided in many languages as printed "Safety Instructions". The printed "Safety Instructions" are delivered with the R&S SMBV100B.
- 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**

Some products are heavy. A safety label on the casing indicates if a product weighs more than 18 kg. To safely move the product, you can use lifting or transporting equipment such as lift trucks, cranes, forklifts and hand trucks. Secure the product, but not by its handles. Excessive force can break the handles.

### **Choosing the operating site**

Only use the product indoors. The product casing is not waterproof and water that enters can electrically connect the casing with live parts. This can lead to electric shock, serious personal injury or death if you touch the casing.

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 instrument**

Always place the instrument on a stable, flat and level surface with the bottom of the instrument facing down.

To save space, you can mount several instruments in a rack. If you stack instruments, keep in mind that a stack of instruments can tilt over and cause injury.

If the instrument 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 instrument is moved without lifting it. The foldable feet are designed to carry the weight of the instrument, but not an extra load.

### **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 approved grounded outlet.
- 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.


	<p>Potential hazard</p> <p>Read the product documentation to avoid personal injury or product damage.</p>
	<p>Heavy product</p> <p>Be careful when lifting, moving or carrying the product. Carrying the product requires at least two people or transport equipment.</p>
	<p>Electrical hazard</p> <p>Indicates live parts. Risk of electric shock, fire, personal injury or even death.</p>
	<p>Hot surface</p> <p>Do not touch. Risk of skin burns. Risk of fire.</p>
	<p>Protective conductor terminal</p> <p>Connect this terminal to a grounded external conductor or to protective ground. This protects you against electric shock should an electric problem occur.</p>

## 2.2 Labels on R&S SMBV100B

Labels on the casing inform about:

- Personal safety, see "[Connecting to power](#)" on page 10.
- Product and environment safety, see [Table 2-1](#).
- Identification of the product, see the serial number on the [rear panel](#).

**Table 2-1: Labels regarding R&S SMBV100B and environment safety**

	<p>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 the product user manual, chapter "Disposal".</p>
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## 2.3 Korea Certification Class A



이 기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

## 3 Documentation Overview

This section provides an overview of the R&S SMBV100B user documentation. Unless specified otherwise, you find the documents on the R&S SMBV100B product page at:

[www.rohde-schwarz.com/manual/smbv100b](http://www.rohde-schwarz.com/manual/smbv100b)

### 3.1 Getting Started Manual

Introduces the R&S SMBV100B 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.

### 3.2 User Manuals and Help

Separate manuals for the base unit and the software options are provided for download:

- **Base unit 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.
- **Software option manual**  
Contains the description of the specific functions of an option. Basic information on operating the R&S SMBV100B is not included.

All user manuals are also available for download or for immediate display on the Internet.

### 3.3 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>).

### 3.4 Instrument Security Procedures

Deals with security issues when working with the R&S SMBV100B in secure areas. It is available for download on the Internet.

### 3.5 Basic Safety Instructions

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

### 3.6 Data Sheets and Brochures

The data sheet contains the technical specifications of the R&S SMBV100B. It also lists the options and their order numbers and optional accessories.

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

See [www.rohde-schwarz.com/brochure-datasheet/smbv100b](http://www.rohde-schwarz.com/brochure-datasheet/smbv100b)

Application Notes, Application Cards, White Papers, etc.

### **3.7 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 [www.rohde-schwarz.com/firmware/smbv100b](http://www.rohde-schwarz.com/firmware/smbv100b)

### **3.8 Application Notes, Application Cards, White Papers, etc.**

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

See [www.rohde-schwarz.com/application/smbv100b](http://www.rohde-schwarz.com/application/smbv100b)

## 4 Preparing for Use

This chapter describes the basic steps to be taken when setting up the R&S SMBV100B for the first time.

### 4.1 Lifting and Carrying

See also "[Lifting and carrying the product](#)" on page 10.

- ▶ Use the carrying handle at the side for lifting and carrying the R&S SMBV100B.

For mounting the R&S SMBV100B in a rack, see [Chapter 4.4.2, "Mounting the R&S SMBV100B in a Rack"](#), on page 19.

### 4.2 Unpacking and Checking

1. Unpack the R&S SMBV100B carefully.
2. Retain the original packing material. Use it to protect the control elements and connectors when transporting or shipping the R&S SMBV100B later. See also chapter "Transporting" in the user manual.
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 R&S SMBV100B 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 10.

### Electromagnetic compatibility classes

The electromagnetic compatibility (EMC) class indicates where you can operate the R&S SMBV100B. The EMC class of the R&S SMBV100B 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 SMBV100B

See also:

- "[Setting up the instrument](#)" on page 10.
- "[Intended use](#)" on page 9.

### 4.4.1 Placing the R&S SMBV100B on a Bench Top

#### To place the R&S SMBV100B on a bench top

1. Place the R&S SMBV100B on a stable, flat and level surface. Ensure that the surface can support the weight of the R&S SMBV100B. For information on the weight, see the data sheet.

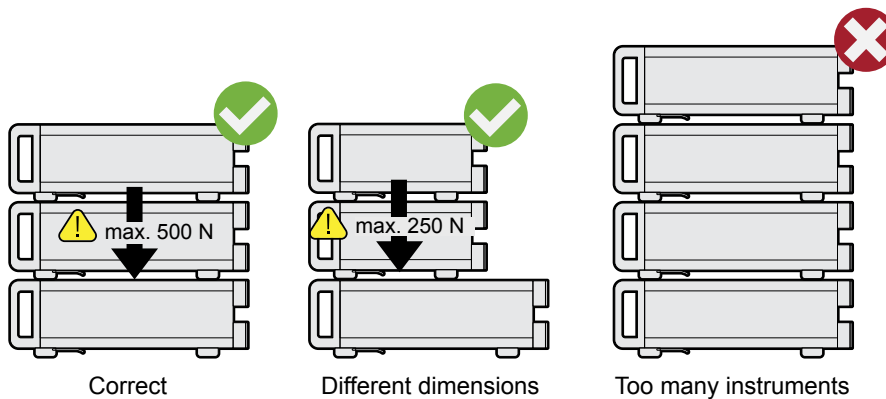
2. **CAUTION!** Foldable feet can collapse. See "[Setting up the instrument](#)" on page 10.

Always fold the feet completely in or out. With folded-out feet, do not place anything on top or underneath the instrument.

3. **WARNING!** A stack of instruments can fall over and cause injury. Never stack more than three instruments on top of each other. Instead, mount them in a rack.

Stack as follows:

- It is best if all instruments have the same dimensions (width and length).
- The overall load on the lowest instrument must not exceed 500 N.
- With smaller instruments on top of the lowest instrument, the overall load on the lowest instrument must not exceed 250 N.



4. **NOTICE!** Overheating can damage the R&S SMBV100B.

Prevent overheating as follows:

- Keep a minimum distance of 10 cm between the fan openings of the R&S SMBV100B and any object in the vicinity.
- Do not place the R&S SMBV100B next to heat-generating equipment such as radiators or other instruments.

#### 4.4.2 Mounting the R&S SMBV100B in a Rack

##### To prepare the rack

1. Observe the requirements and instructions in "[Setting up the instrument](#)" on page 10.
2. **NOTICE!** Insufficient airflow can cause overheating and damage the R&S SMBV100B.



Design and implement an efficient ventilation concept for the rack.

### To mount the R&S SMBV100B in a rack

1. Use an adapter kit that fits the dimensions of the R&S SMBV100B to prepare the instrument for rack mounting. For information on the dimensions, see data sheet.
  - a) Order the rack adapter kit designed for the R&S SMBV100B. For the order number, see data sheet.
  - b) Mount the adapter kit. Follow the assembly instructions provided with the adapter kit.
2. Lift the R&S SMBV100B to shelf height.
3. Grab the handles and push the R&S SMBV100B onto the shelf until the rack brackets fit closely to the rack.
4. Tighten all screws at the rack brackets with a tightening torque of 1.2 Nm to secure the R&S SMBV100B at the rack.

### To unmount the R&S SMBV100B from a rack

1. Loosen the screws at the rack brackets.
2. Bring the lifting equipment to shelf height.
3. Remove the R&S SMBV100B from the rack.
4. If placing the R&S SMBV100B on a bench top again, unmount the adapter kit from the R&S SMBV100B. Follow the instructions provided with the adapter kit.

## 4.5 Important Aspects 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:
  - BNC  
Double-shielded BNC cables.

- USB  
Double-shielded USB cables.  
How to: [Chapter 4.8, "Connecting USB Devices"](#), on page 23.  
See also chapter "Troubleshooting and Error Messages" in the user manual.
- LAN  
At least CAT6 STP cables.  
How to: [Chapter 4.7, "Connecting to LAN"](#), on page 22
- Always terminate open cable ends.
- Ensure that connected external devices comply with EMC regulations.
- Use cables of the same type and equal length for connection to the I/Q and I/Q Bar interfaces of the instrument.
- Use the cable R&S SMU-Z6 for connection to the Dig I/Q interfaces of the instrument. The cable is available under material number 1415.0201.02.
- Use the cable R&S DIGIQ-HS for connection to the HS Dig I/Q interfaces of the instrument. The cable is available under material number 3641.2948.03.  
How to: [Chapter 4.12, "Connecting to HS Dig I/Q"](#), on page 26

### 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 R&S SMBV100B 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 R&S SMBV100B 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 10.

1. Plug the AC power cable into the AC power connector on the rear panel of the instrument. Only use the AC power cable delivered with the R&S SMBV100B.
2. Plug the AC power cable into a power outlet with ground contact.  
The required ratings are listed next to the AC power connector and in the data sheet.

## 4.7 Connecting to LAN

You can operate the R&S SMBV100B via LAN (local area network) or you can operate it locally. 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 located on the [rear panel](#).

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

By default, the R&S SMBV100B 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 SMBV100B displays the address information on the screen.



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

See also the chapter "Connecting the Instrument to the Network (LAN)" in the user manual.

## 4.8 Connecting USB Devices

USB connectors are located on the [front panel](#) and [rear panel](#). You can connect or disconnect all USB devices from the R&S SMBV100B during operation.

### To connect USB storage devices

USB storage devices, such as memory sticks, allow easy data transfer from/to the R&S SMBV100B. You can also use them for firmware updates.

- ▶ Connect the USB storage device to the USB type A connector.  
If you use the front panel connectors, connect the USB storage device directly, without connecting cable. Connecting cables can cause electromagnetic radiation and impair the measurement result.

### To connect USB devices with external power supply

1. **NOTICE!** Connected devices with external power supply can feed back current into the 5 V power supply of the USB interface and thus damage the R&S SMBV100B.

Ensure that there is no connection between the positive pole of the power supply and the +5 V power pin of the USB interface (VBUS).

2. Connect the USB storage device to the USB connector on the rear panel.

### To connect a keyboard

- ▶ Connect the keyboard to the USB connector on the rear panel.

When connected, the R&S SMBV100B detects the keyboard automatically. A detected keyboard has the default layout English – US.

### To connect a mouse

- ▶ Connect the mouse to the USB connector on the rear panel.

When connected, the R&S SMBV100B detects the mouse automatically.

### To connect power sensors

Connect power sensors of the R&S NRP families to the USB connector on the rear panel.

See chapter "Using Power Sensors" in the user manual.

## 4.9 Connecting to RF

The connector is located on the [front panel](#).

If you have the instrument equipped with an option for rear panel connectors, the RF output connector is located on the rear panel.

### To prepare for connecting to "RF"

1. If the R&S SMBV100B is switched on, deactivate the RF output, before connecting an RF cable to the RF connector.  
In the block diagram, select the block "RF" > "RF Level" > "RF ON > Off".
2. Use a high-quality RF cable that matches the RF connector type.  
See "[Cable selection and electromagnetic interference \(EMI\)](#)" on page 20.

### To connect to non-screwable connectors (BNC)

- ▶ To connect the RF cable with the "RF" connector, proceed as follows:
  - a) Carefully align the connector of the cable and the "RF" connector along a common axis.
  - b) Mate the connectors along the common axis until the male pin of the connector of the cable engages with the female socket of the "RF" connector.

### 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 SMBV100B 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.

## 4.10 Connecting to LO In/Out

"LO In/Out" connectors are Subminiature Version A (SMA) connectors.

The connector is located on the [rear panel](#).

1. Use a high-quality cable that matches the connector type.  
See "[Cable selection and electromagnetic interference \(EMI\)](#)" on page 20.
2. **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 firmly coupled.
  - 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](#).
3. 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
N	13.3	1.5	3/4	20
SMA	5	0.56	5/16	8
3.5 mm	8	0.9	5/16	8
2.92 mm	8	0.9	5/16	8
2.4 mm	8	0.9	5/16	8
1.85 mm	8	0.9	5/16	8
1.0 mm	3	0.34	0.236	6

See also chapter "Local Oscillator Coupling" in the user manual.

## 4.11 Connecting to Ref In/Ref Out

The connector is located on the [rear panel](#).

**To connect to "Ref In"/"Ref Out" (reference < 1 GHz)**

For connection, the R&S SMBV100B provides BNC connectors.

- ▶ Follow the instructions in ["To connect to non-screwable connectors \(BNC\)"](#) on page 24.

**To connect to "Ref In"/"Ref Out" (reference = 1 GHz)**

For connection, the R&S SMBV100B provides SMA connectors.

- ▶ Follow the instructions in [Chapter 4.10, "Connecting to LO In/Out"](#), on page 24.

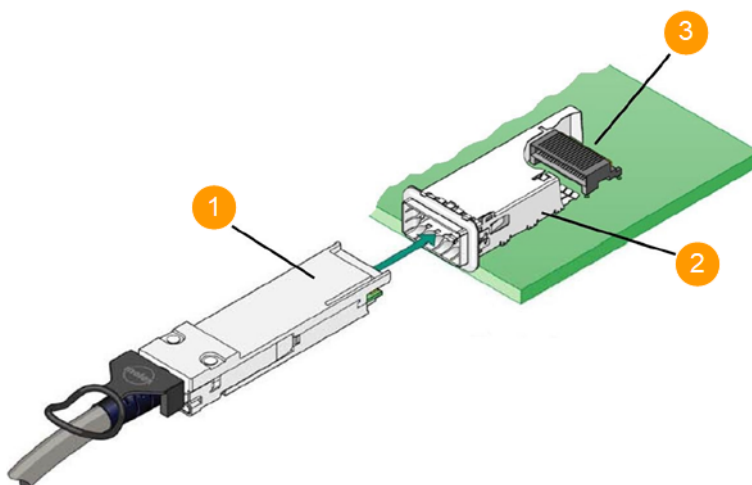
**To connect to Ref In/Ref Out (reference = 1 GHz)**

For connection, the R&S SMBV100B provides SMA connectors.

- ▶ Follow the instructions in [Chapter 4.10, "Connecting to LO In/Out"](#), on page 24.

## 4.12 Connecting to HS Dig I/Q

The HS Dig I/Q connector comprises a QSFP+ (Quad Small Form-factor Pluggable) socket, that has two components: a QSFP+ connector and a QSFP+ cage. The QSFP+ cable is equipped with the QSFP+ plug.



- 1 = QSFP+ plug
- 2 = QSFP+ cage
- 3 = QSFP+ connector

The connector is located on the [rear panel](#).

### To connect to HS Dig I/Q interface

1. For connection, use the QSFP+ cable R&S DIGIQ-HS.  
See "[Cable selection and electromagnetic interference \(EMI\)](#)" on page 20.
2. Hold the QSFP+ plug of the cable by its panes.
3. Turn the QSFP+ cable, so that the release tab shows upwards.
4. Insert and push the QSFP+ plug into the QSFP+ cage.

### To disconnect from HS Dig I/Q interface




1. **NOTICE!** If you pull the cable, you can damage the cable and the HS Dig I/Q connector.  
Pull the release tab.
2. Pull the QSFP+ plug out of the QSFP+ cage.

See also "Digital Baseband Input Settings" in the user manual.

## 4.13 Switching On or Off

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

**Table 4-2: Overview of power states**

State	LED	Position of power switch
Off	 gray	[0]
Standby	 orange	[I]
Ready	 green	[I]



### To switch on the R&S SMBV100B

The R&S SMBV100B is off but connected to power. See [Chapter 4.6, "Connecting to Power"](#), on page 22.

1. Set the switch on the power supply to position [I].  
The switch is located on the [rear panel](#).  
The LED of the [On/Standby] key is orange.
2. Wait until the oven-controlled oscillator (OCXO) warms up. For the warm-up time, see data sheet.
3. Press the [On/Standby] key.  
Key and LED are located on the [front panel](#).  
The LED changes to green. The R&S SMBV100B boots.

When starting for the first time, the R&S SMBV100B starts with the default settings. When restarting the instrument, the settings depend on the instrument configuration before shut-down.

See the chapter "Saving and Recalling Instrument Settings" in the user manual.

When the instrument is switched on, it automatically monitors main functions. You can query erroneous functions. In addition to automatic monitoring, you can perform maintenance tasks.

See:

- Chapter "Querying Error Messages" in the user manual.
- Chapter "Performing Maintenance Tasks" in the user manual.

### To shut down the R&S SMBV100B

The R&S SMBV100B is in the ready state.

- ▶ Press the On/Standby key.  
The operating system shuts down. The LED changes to orange.

In the standby state, the power switch circuits and the OCXO are active. To deactivate them, disconnect the instrument from the power supply.

**To disconnect from power**

The R&S SMBV100B is in the standby state.

1. **NOTICE!** Risk of data loss. If you disconnect the R&S SMBV100B from power when it is in the ready state, you can lose settings and data. Shut it down first. Set the toggle switch on the power supply to position [0]. The LED of the [On/Standby] key is switched off.
2. Disconnect the R&S SMBV100B from the power source.



## 5 Instrument Tour

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

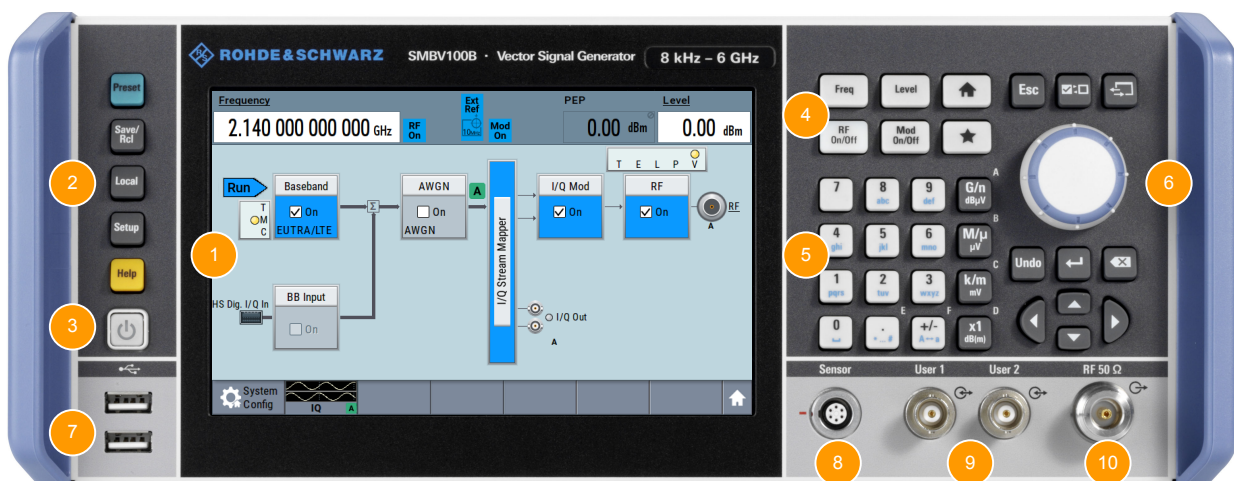
- [Front Panel Tour](#)
- [Rear Panel Tour](#)

This section explains the control elements and the connectors of the R&S SMBV100B 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 SMBV100B are described in [Chapter 2.2, "Labels on R&S SMBV100B"](#), on page 12.

### 5.1 Front Panel Tour

This section provides an overview of the control elements and connectors on the front panel of the R&S SMBV100B. On the rear panel, you find all further connectors of the unit, see [Chapter 5.2, "Rear Panel Tour"](#), on page 38. The user interface can be displayed on a remote PC station used to manually remote control the instrument.



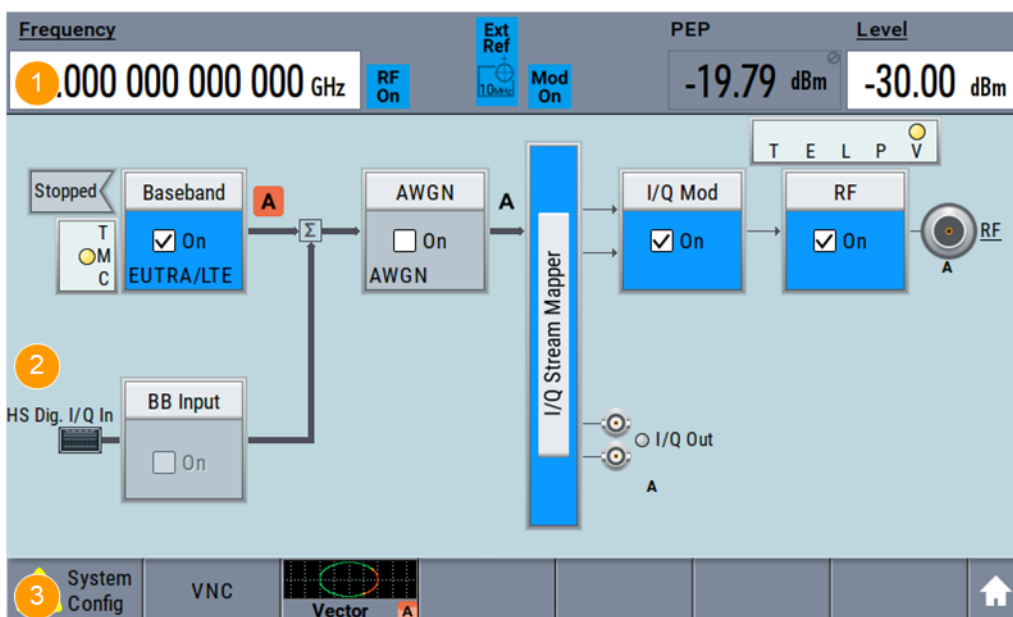
**Figure 5-1: Front panel view**

- 1 = Touchscreen, see [Chapter 5.1.1, "Touchscreen"](#), on page 32
- 2 = Utility keys, see [Chapter 5.1.2.1, "Utility Keys"](#), on page 33
- 3 = [On/Standby], see [Chapter 5.1.2.2, "On/Standby"](#), on page 33

- 4 = Function keys, see [Chapter 5.1.2.3, "Function Keys"](#), on page 34
- 5 = Keypad, see [Chapter 5.1.2.4, "Keypad"](#), on page 34
- 6 = Navigation controls, see [Chapter 5.1.2.6, "Navigation Controls"](#), on page 35
- 7 = USB connectors, see [Chapter 5.1.3, "Connectors"](#), on page 37
- 8 = Sensor connector, see [Chapter 5.1.3, "Connectors"](#), on page 37
- 9 = User x input/output connectors, see [Chapter 5.1.3, "Connectors"](#), on page 37
- 10 = RF output connectors, see [Chapter 5.1.3, "Connectors"](#), on page 37

## 5.1.1 Touchscreen

The block diagram and the most important settings are displayed on the screen on the front panel. Additionally, the screen display provides status and setting information and allows you to quickly reconfigure the signal flow. The screen is touch-sensitive, offering an alternative means of user interaction for quick and easy handling of the instrument.



**Figure 5-2: Touchscreen elements**

- 1 = Status bar (frequency and level display)
- 2 = Block diagram
- 3 = Taskbar/softkey bar

A touchscreen is a screen that is touch-sensitive. It reacts in a specified way when a particular element on the screen is tapped by a finger. Any user interface element that can be clicked by a mouse pointer can also be tapped on the screen to trigger the same behavior.

Using the touchscreen, the following tasks (among others) can be performed by the tap of your finger:

- Changing a setting
- Selecting new settings
- Scrolling through the list of parameters
- Saving or recalling settings
- Opening and closing dialogs

See also:

- [Chapter 8, "Instrument Control"](#), on page 73, for operating the touchscreen.
- "Maintenance" in the user manual, for instructions on cleaning the screen.

## 5.1.2 Keys

### 5.1.2.1 Utility Keys

The utility keys cause the R&S SMBV100B to return to a defined instrument state and provide information on the instrument and assistance.

For more information, refer to chapter "General Instrument Functions" in the user manual.

**Table 5-1: Utility keys**

Utility Key	Assigned functions
[Preset]	Sets the instrument to a defined state
[Save/Rcl]	Saves and loads instrument setting Accesses the file manager
[Local]	Switches from remote control to local (manual) control
[Setup]	Accesses the general instrument settings
[Help]	Displays context-sensitive help text

### 5.1.2.2 On/Standby

The [On/Standby] key switches the instrument from the standby to the ready state or vice versa.

The LED above the [On/Standby] key indicates the instrument state, see [Chapter 4.13, "Switching On or Off"](#), on page 27.

### 5.1.2.3 Function Keys

Function keys provide access to most common generator settings and functions. A detailed description of the corresponding functions is provided in the user manual.

**Table 5-2: Function keys**

Function key	Assigned functions
[Freq]	Activates frequency entry.
[Level]	Activates level entry.
[Home]	Brings the block diagram to the foreground. Active dialogs are minimized.
[RF on/off]	Switches the RF output on and off. Press the key again to restore the last active status. Status is displayed in the "Status bar".
[Mod on/off]	Switches the modulations on and off. Press the key again to restore the last active status. Status is displayed in the "Status bar".
[★ (User)]	Key with a customizable function.

### 5.1.2.4 Keypad

The keypad is used to enter alphanumeric parameters, including the corresponding units. It contains the following keys:

**Table 5-3: Keys on the keypad**

Type of key	Description
Alphanumeric keys	Enter numbers and (special) characters in edit dialog boxes.
Decimal point	Inserts a decimal point "." at the cursor position.

Type of key	Description
Sign key	Changes the sign of a numeric parameter. In the case of an alphanumeric parameter, inserts a "-" at the cursor position.
Unit keys (G/n dB $\mu$ V, M/ $\mu$ $\mu$ V, k/m mV and x1 dB(m))	These keys add the selected unit to the entered numeric value and complete the entry.  In the case of level entries (e.g. in dB) or dimensionless values, all units have the value "1" as multiplying factor. Thus, they have the same function as an [Enter] key.

### 5.1.2.5 Editing Keys

Editing keys enable you to confirm an entry, delete individual characters, or exit the current operation.

**Table 5-4: Editing keys**

Type of key	Description
[Esc] key	Closes all kinds of dialog boxes, if the edit mode is not active. Quits the edit mode, if the edit mode is active. In dialog boxes that contain a "Cancel" button it activates that button.  For "Edit" dialog boxes the following mechanism is used: <ul style="list-style-type: none"> <li>• If data entry has been started, it retains the original value and closes the dialog box.</li> <li>• If data entry has not been started or has been completed, it closes the dialog box.</li> </ul>
[Enter] key	Has the same effect as pressing the rotary knob <ul style="list-style-type: none"> <li>• Concludes the entry of dimensionless entries. The new value is accepted.</li> <li>• With other entries, this key can be used instead of the default unit key.</li> <li>• In a dialog box, selects the default or focused element.</li> <li>• Calls the next dialog level.</li> <li>• Confirms and closes open input windows.</li> </ul>
[Backspace] key	Deletes the character to the left of the cursor in editing mode.

### 5.1.2.6 Navigation Controls

The navigation controls include a rotary knob, navigation keys, and the display keys. They allow you to navigate within the display or within dialog boxes.

#### Rotary Knob

The rotary knob has several functions:



- Increments (clockwise direction) or decrements (counterclockwise direction) the instrument parameter at a defined step width in the case of a numeric entry.
- Moves the selection, e.g. to a function block in the block diagram
- Shifts the selection bar within focused areas (e.g. lists).
- Acts like the [Enter] key, when it is pressed.
- Opens a context-sensitive menu, when it is pressed and held.

## Navigation Keys

The navigation keys can be used alternatively to the rotary knob to navigate through dialog boxes, diagrams, or tables.

**Table 5-5: Navigation keys**

Type of key	Description
[Up/Down] Key	The [Up] and the [Down] key does the following: <ul style="list-style-type: none"> <li>• In a numeric edit dialog box, increase or decrease the instrument parameter.</li> <li>• In a list, scroll forward and backward through the list entries.</li> <li>• In a table, move the selection bar vertically.</li> <li>• In windows or dialog boxes with vertical scrollbar, move the scrollbar.</li> </ul>
[Left/Right] Key	The [Left] and the [Right] key does the following: <ul style="list-style-type: none"> <li>• In an alphanumeric edit dialog box, move the cursor.</li> <li>• In a list, scroll forward and backward through the list entries.</li> <li>• In a table, move the selection bar horizontally.</li> <li>• In windows or dialog boxes with horizontal scrollbar, move the scrollbar.</li> </ul>

## Display Keys

The display keys arrange different windows on the display.

**Table 5-6: Display keys**

Display key	Assigned functions
[Next window]	Toggles between the active dialogs
[Home]	Shows the block diagram.
[Next window]	Toggles between the open dialogs.
[On/Off Toggle]	<ul style="list-style-type: none"> <li>• Switches highlighted elements or a function block on and off.</li> <li>• Switches between two or more settings, e.g. items of selection lists. At the end of a list, the cursor is set on the first entry again.</li> </ul>

Display key	Assigned functions
[Undo]	Reverts the last operation.
[★ (User)]	Key with a customizable function.

### 5.1.3 Connectors

The RF connector and various other interface connectors are on the front panel.

#### USB

There are two female USB (universal serial bus) connectors of type A (host USB) on the front panel. These connectors are intended for service and file transfer purposes only. You can connect, for example, a USB memory stick.

Further USB connectors of type A (host USB) and USB type B (USB In) are available on the rear panel.

How to: [Chapter 4.8, "Connecting USB Devices"](#), on page 23.

#### Sensor

Connector for R&S NRP sensors.

A power sensor is connected to the R&S SMBV100B by inserting the male connector. To disconnect, pull the connector by its sleeve. You cannot disconnect the sensor simply by pulling at the cable or the rear part of the connector.

The R&S SMBV100B supports the use of R&S NRP power sensors in various ways including the use as a power viewer.

How to: Chapter "Using Power Sensors" in the user manual

#### User x

BNC multipurpose connectors for defining input signals and output signals.

The [Table 5-7](#) lists the signals assigned to the User x connectors in the default instrument state.

**Table 5-7: Default configuration of the User x connectors**

User connector	Direction	Default assigned signal
1	Output	Baseband Marker 1
2	Output	Baseband Marker 2

A dedicated LED indicates the connector status:

- ● green: an input connector

- yellow: an output connector
- gray: no light / gray: the connector is not active

See also chapter "Global Connector Settings" in the user manual.

## RF

Output for RF signal.

The connector type depends on the installed frequency option.

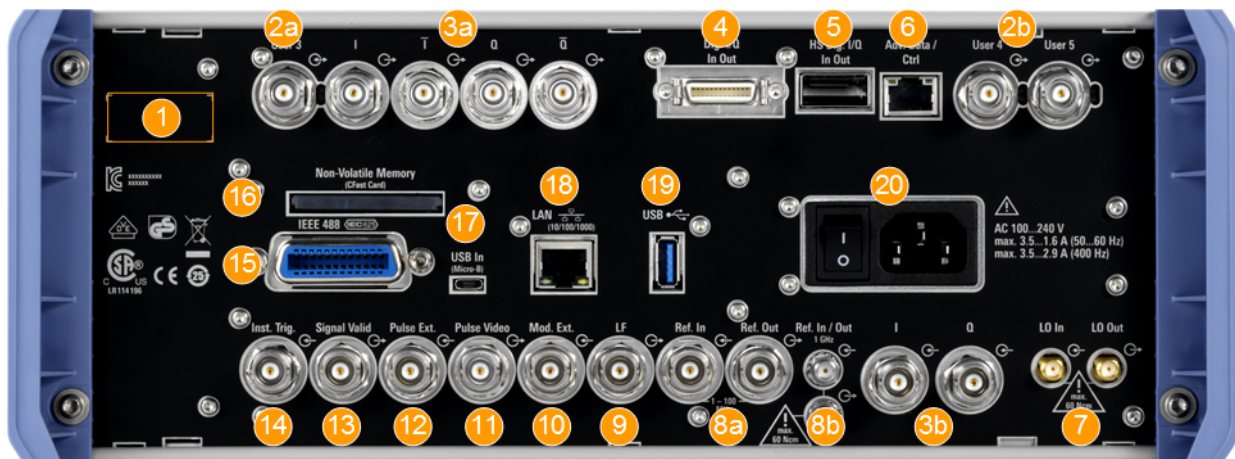
**Table 5-8: Overview of RF connector types depending on the frequency range**

Required option	Connector type
R&S SMBVB-B103/-KB106	N female

How to: [Chapter 4.9, "Connecting to RF"](#), on page 24

## 5.2 Rear Panel Tour

This section provides an overview of the connectors on the rear panel of the instrument. For technical data of the connectors, refer to the data sheet.



**Figure 5-3: Rear panel**

- 1 = Serial number (six digits in the string 1423.1003.02-<serial number>-<checksum>)
- 2a, 2b = User x connectors
- 3a = I/Q, I/Q Bar connectors (output)
- 3b = I/Q connectors (input)
- 4 = Dig I/Q connector
- 5 = HS Dig I/Q connector
- 6 = Adv Data/Ctrl connector (provided for future use)
- 7 = LO In/LO Out connectors

- 8a = Ref In/Ref Out connectors
- 8b = Ref In/Ref Out 1GHz connectors
- 9 = LF connector
- 10 = Mod Ext connector
- 11 = Pulse Video connector
- 12 = Pulse Ext connector
- 13 = Signal Valid connector
- 14 = Inst Trig connectors
- 15 = IEC 625/IEEE 488 connector
- 16 = Non-Volatile Memory
- 17, 19 = USB/USB In connectors
- 18 = LAN connector
- 20 = AC power supply connection and main power switch

## 5.2.1 Connectors

### User x

BNC multipurpose connectors for defining input signals and output signals.

[Table 5-9](#) lists the signals assigned to the User x connectors in the default instrument state.

**Table 5-9: Default configuration of the User x connectors**

User connector	Direction	Default assigned signal
3	Input	Global Trigger
4	Input	Global Next Segment
5	Output	Baseband Sync Out

A dedicated LED indicates the connector status:

- ● green: an input connector
- ● yellow: an output connector
- ● no light / gray: the connector is not active

See also chapter "Global Connector Settings" in the user manual.

### I/Q, I/Q Bar

BNC connector for output of direct (single-ended) or differential analog I/Q signals.

Use the connectors for connections as follows:

- I/Q connectors: Direct (single-ended) or positive differential output of analog I/Q signals
- I/Q Bar connectors: Negative differential output of analog I/Q signals

**Dig I/Q**

Connectors for the input of a digital I/Q signal from a Rohde & Schwarz instrument, like a signal generator.

**HS Dig I/Q**

Connectors for the input of high-speed digital I/Q signals, for example, from Rohde & Schwarz instruments.

For more information, see data sheet.

The interface is a QSFP+ (Quad Small Form-factor Pluggable) module. It supports max. bandwidth of up to 50 Gsample/s with optical active cables.

How to: [Chapter 4.12, "Connecting to HS Dig I/Q"](#), on page 26

**Adv Data/Ctrl**

Interface for exchanging of external data and control signals.

**LO In/LO Out**

Option: R&S SMBVB-K90

SMA connector for local oscillator input and output for phase-coherent RF signal:

- LO In: Input of phase coherence signal
- LO Out: Output of phase coherence signal

How to: [Chapter 4.10, "Connecting to LO In/Out"](#), on page 24

**I/Q**

BNC connector for input of external I/Q signals for analog modulation. The signals are fed directly into the I/Q modulator.

Use the I/Q connector for direct (single-ended) or positive differential input of analog I/Q signals.

See also chapter "Overview of the Input and Output Signals and Connectors" in the user manual.

**Ref In/Ref Out**

Input/output for external reference signal.

BNC connectors for reference signals from 1 MHz to 100 MHz.

SMA connectors for 1 GHz reference signals.

How to: [Chapter 4.11, "Connecting to Ref In/Ref Out"](#), on page 25

**LF**

Output for internal LF generator signal.

See also data sheet and user manual, section "Analog Modulation".

**Mod Ext**

Input for external analog modulation signals.

**Pulse Video**

Output of the internal pulse generator signal or the looped through pulse signal from Pulse Ext connector (video signal).

**Pulse Ext**

Input for an external pulse modulation signal or an external trigger/gate signal for the pulse generator.

**Signal Valid**

Output signal that marks the valid signal times (valid level and frequency) for all analog modulations.

**Inst Trig**

BNC connector for input of external trigger signals. The signals trigger sweeps and list mode.

See chapter "Signal Generation and Triggering in the Sweep and List Modes" in the user manual.

**IEC 625/IEEE 488**

General purpose interface bus (GPIB) interface for remote control of the instrument. The interface is in compliance with the standards IEC 625, IEEE 488 and SCPI.

Use this interface to connect a computer for remote control of the R&S SMBV100B. To set up the connection, use high-quality shielded cables. See ["Cable selection and electromagnetic interference \(EMI\)"](#) on page 20.

See also "Annex: Hardware Interfaces" and chapter "Network and Remote Control" in the user manual.

**Non-Volatile Memory**

Option: R&S SMBVB-B80

Slot for removable mass storage.

**USB/USB In**

- Female USB type A connector, to connect devices like a keyboard, a mouse, a memory stick, or the R&S NRP-Z3/Z4 cable for the R&S NRP power sensors
- Female USB In connector (USB type B), for example for remote control.

How to: [Chapter 4.8, "Connecting USB Devices"](#), on page 23

**LAN**

RJ-45 connector to connect the R&S SMBV100B to a LAN for remote control, remote operation, and data transfer.

How to: [Chapter 4.7, "Connecting to LAN"](#), on page 22

**AC power supply connector and switch**

Mains power switch for performing the following tasks:

- Connecting the internal power supply to the power source
- Disconnecting the internal power supply from the power source

How to: [Chapter 4.6, "Connecting to Power"](#), on page 22.

## 6 Trying Out the Instrument

This chapter introduces the most important functions and settings of the R&S SMBV100B step by step. The complete description of the functionality and its usage is given in the R&S SMBV100B user manual. Basic instrument operation is described in [Chapter 8, "Instrument Control"](#), on page 73.

### Prerequisites

- The instrument is set up, connected to the power supply, and started up as described in [Chapter 4, "Preparing for Use"](#), on page 17.

For the first signal generation tasks, you use the internal baseband and reference signal, so you do not need any additional signal source. More complex signal generation tasks, however, require an instrument equipped with additional options and/or external signals. Each task description lists its prerequisites.



The screenshots in this description show a fully equipped instrument. Consider that, the block diagram displayed on your particular instrument can differ from the one used in the example.

The instrument is manually operated via the touchscreen. Try out the following:

- [Generating an Unmodulated Carrier](#)..... 43
- [Generating a Digitally Modulated Signal](#)..... 46
- [Triggering the Instrument with an External Signal](#)..... 48
- [Enabling and Configuring a Marker Signal](#)..... 54
- [Verifying the Generated Signal with the Graphics Display](#)..... 55
- [Saving and Recalling Settings](#)..... 58
- [Generating an EUTRA/LTE Signal](#)..... 61

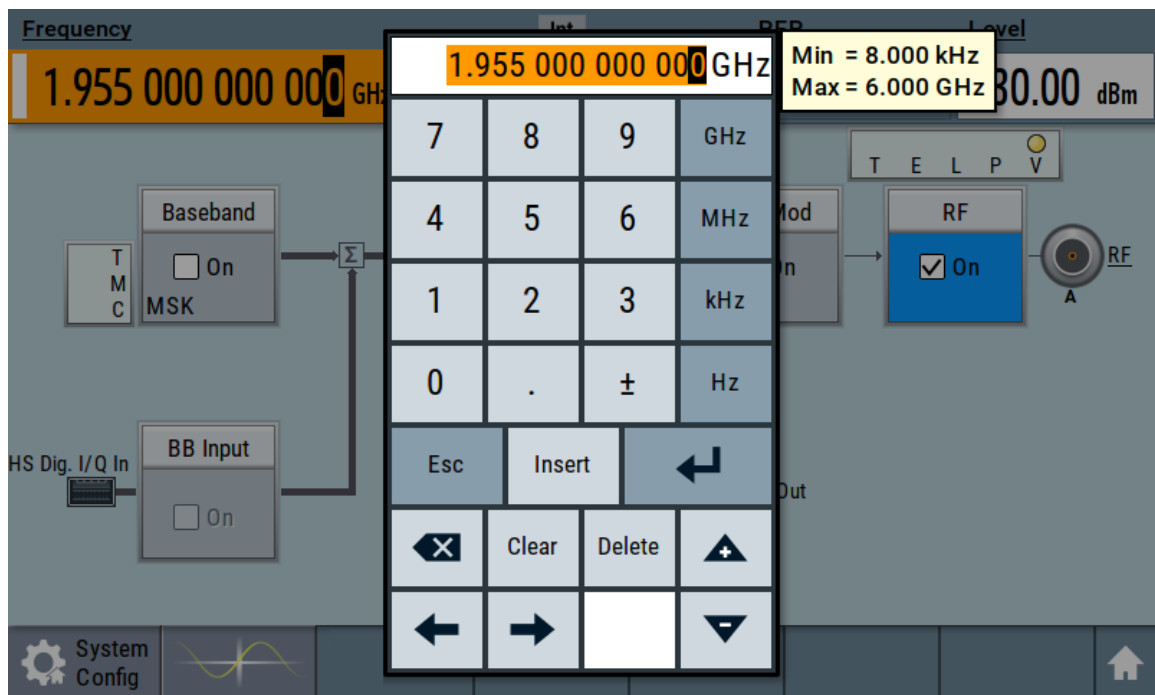
### 6.1 Generating an Unmodulated Carrier

We start out by generating a simple unmodulated signal. The R&S SMBV100B in this example can be a base unit in its minimal configuration (i.e. with installed R&S SMBVB-B103).



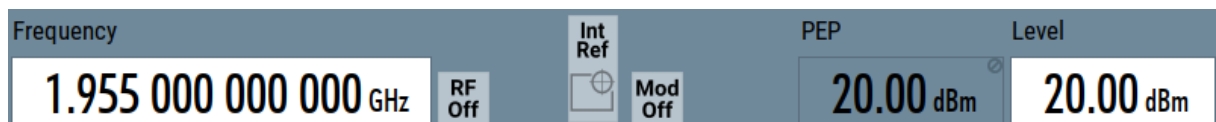
## Generating an Unmodulated Carrier

1. On the R&S SMBV100B front panel, press the Preset key to start out in a defined instrument configuration.
2. Set the frequency:
  - a) On the "Status Bar", tap the "Frequency" field.
  - b) On the on-screen keypad, enter 1.955 and press the "GHz" key.



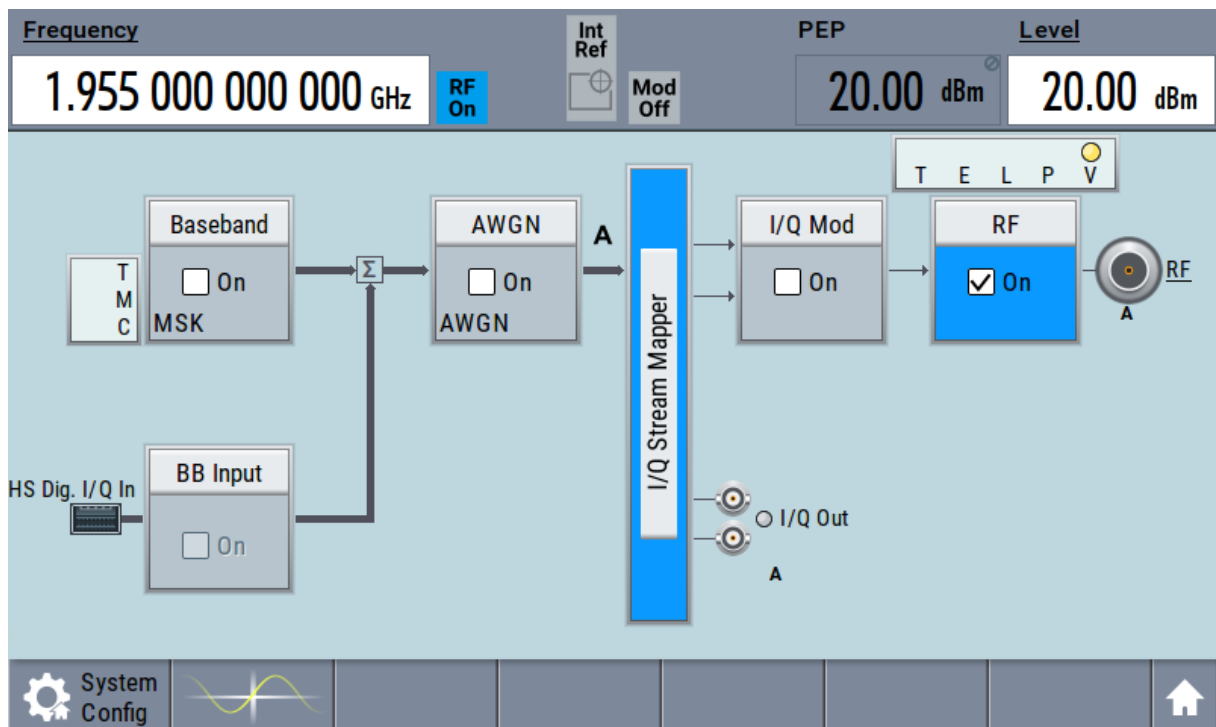
The on-screen keypad closes and the frequency value is displayed.

3. On the "Status Bar", tap the "Level" field and enter the level in the same way.



4. Select "Block Diagram > RF Block > On" to enable the output of the generated unmodulated signal.

## Generating an Unmodulated Carrier

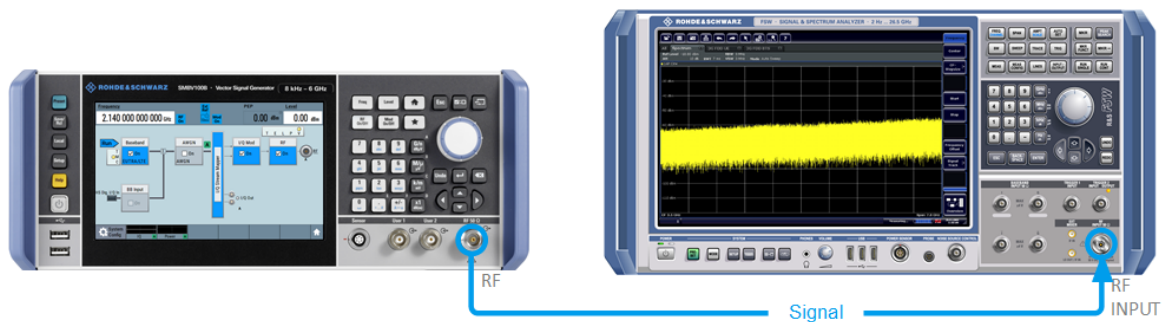


**Figure 6-1: Block diagram: Generating an unmodulated signal**

The 1.95 GHz signal is output at the RF connector at the front panel of the R&S SMBV100B.



Connect RF of the R&S SMBV100B to a signal analyzer, for example R&S®FSW, to display the generated signal.



**Figure 6-2: Simplified test setup**

For the required settings of the signal analyzer, refer to its user manual or its online help.

## 6.2 Generating a Digitally Modulated Signal

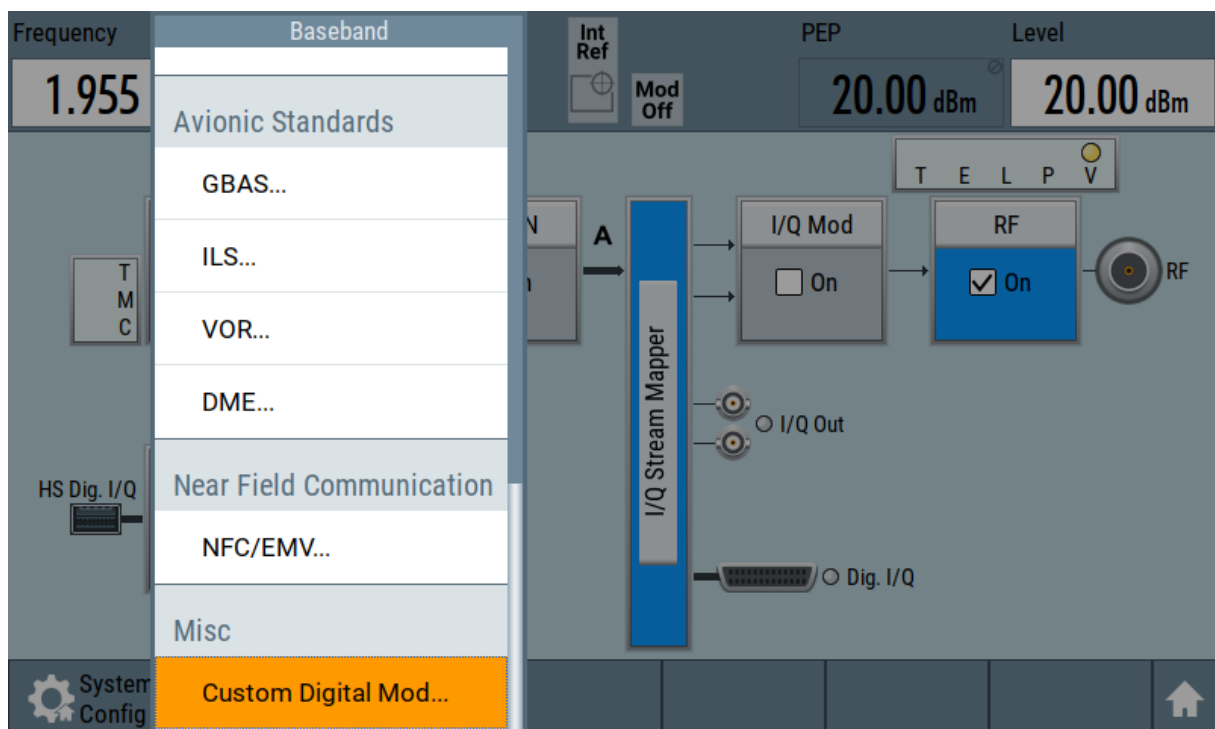
This example shows you how to generate a simple WCDMA-3GPP (QPSK 45° offset) signal with the help of the "Custom Digital Modulation" functionality.

The minimum requirement for R&S SMBV100B in this example is a base unit equipped with:

- Option custom digital modulation R&S SMBVB-K520
- Option frequency R&S SMBVB-B103.

The initial situation is not the instrument's preset state but rather the configuration described in [Chapter 6.1, "Generating an Unmodulated Carrier"](#), on page 43.

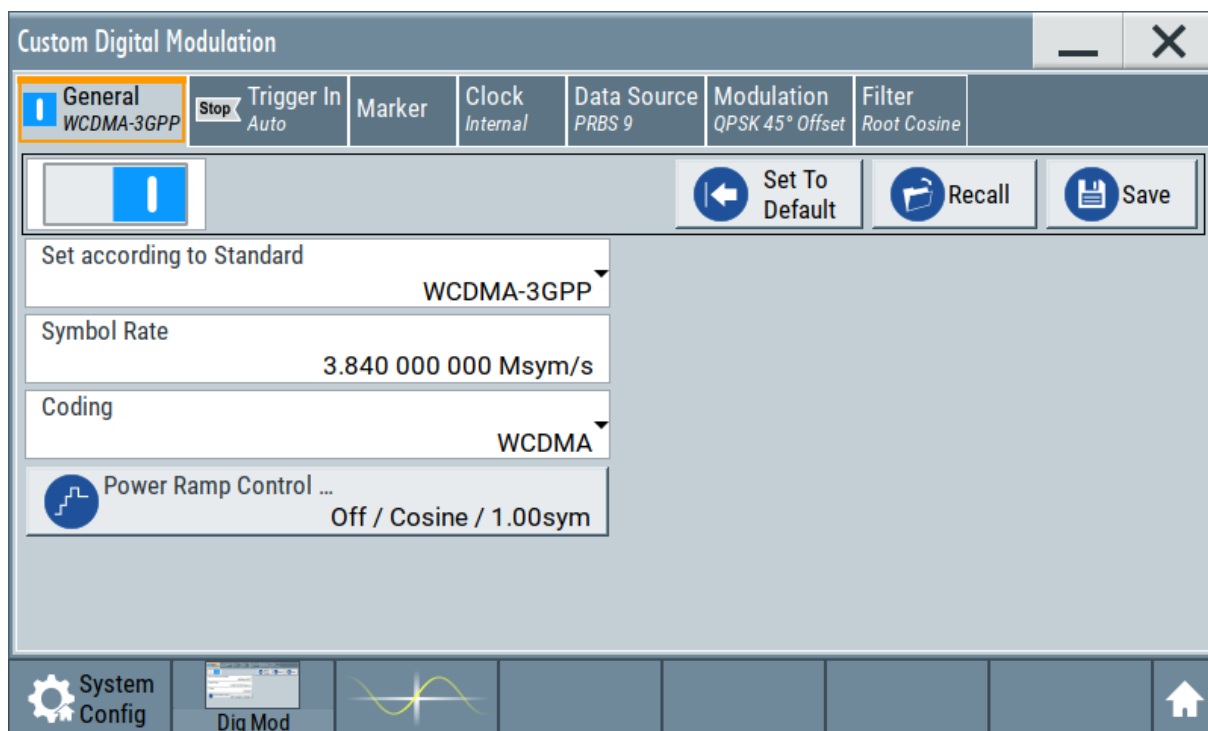
1. In the block diagram, select "Baseband" and navigate to the section "Misc > Custom Digital Mod...".



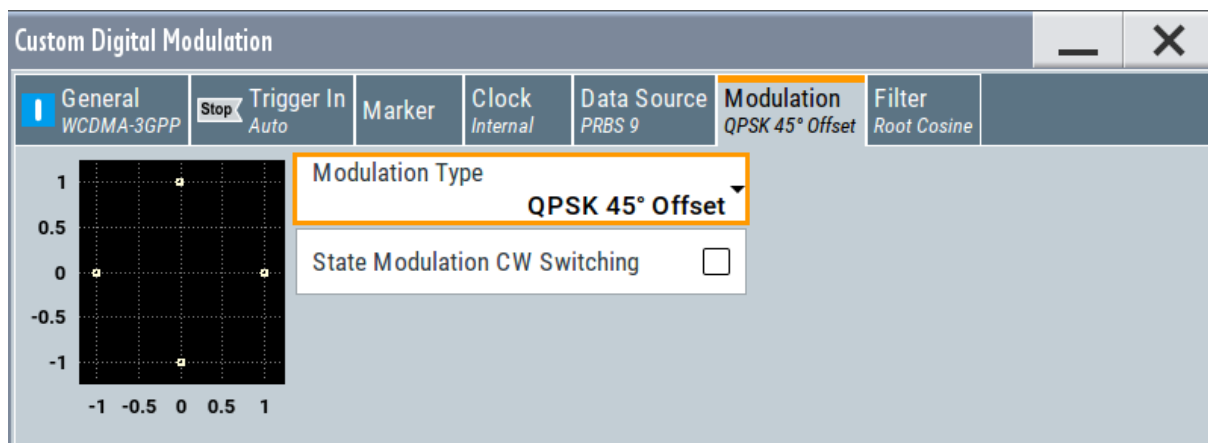
The "Custom Digital Modulation" dialog opens.

2. In the "Custom Digital Modulation" dialog, select "General > Set according to Standard > WCDMA-3GPP".
3. Select "General > State > On" to enable signal generation.

## Generating a Digitally Modulated Signal



- Select the "Modulation" tab and observe the used "Modulation Type".



**Figure 6-3: Display of the used modulation type**

The instrument activates automatically "I/Q Mod", uses the internal trigger and clock signals, and generates a WCDMA-3GPP signal, modulated with a QPSK 45° offset modulation.

## Triggering the Instrument with an External Signal

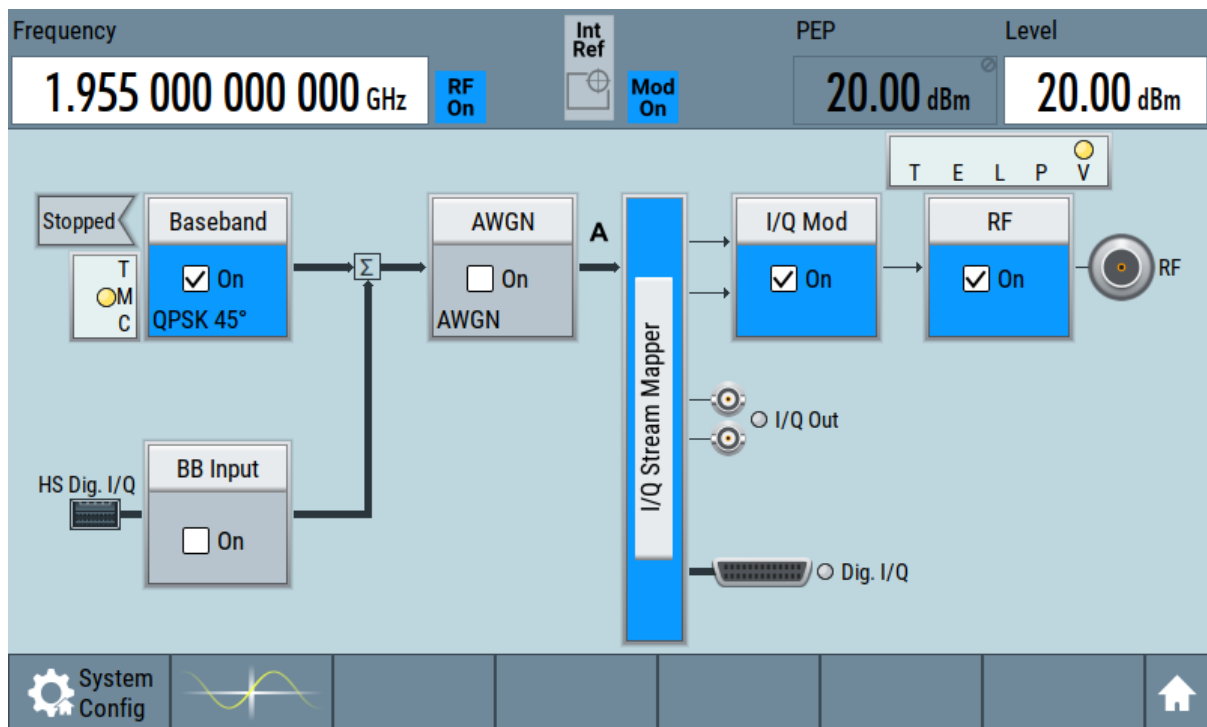


Figure 6-4: Block diagram: Generating a digitally modulated signal

### 6.3 Triggering the Instrument with an External Signal

The example configurations are rather theoretical cases, because you rarely use the R&S SMBV100B as a standalone instrument. Usually, the instrument would be connected to a device under test (DUT) and/or other measurement equipment. As a rule, whenever a test setup requires two or more devices, provide them with a common reference frequency. Some test setups require control of the signal generation start and an exact generation start time, determined by a defined trigger event. For example, by triggering the instrument internally or externally from the DUT.

This example illustrates the general principle of external triggering and extends the configuration performed in [Chapter 6.2, "Generating a Digitally Modulated Signal"](#), on page 46 by the configuration of the required trigger signal and connector settings.

This test setup requires one signal analyzer, like the R&S®FSW, as additional equipment.

## To start the signal generation synchronous to an external global trigger signal

The configuration requires three main steps with the following goals:

1. Observe the current connector configuration. Define an input connector for the external global trigger signal.  
See ["To verify the current connector configuration"](#) on page 49
2. Configure the baseband to use this external global trigger signal as trigger source.  
See ["To reconfigure the trigger settings"](#) on page 51
3. Connect the instrument and the external trigger source.  
See ["To connect the instrument and the external trigger source"](#) on page 53

## To verify the current connector configuration

The R&S SMBV100B is equipped with multipurpose bi-directional User connectors. Because the signal direction, input or output, and the signal mapping are configurable, we recommend that you check the current configuration before cabling or further instrument's configurations.

1. To display *an overview* of the current mapping of the logical signals to the connectors, perform one of the following:
  - In the block diagram, select the Trigger/Marker/Clock status LEDs on the left side of the "Baseband" block.



- Select "Baseband > Trigger Marker Clock".

## Triggering the Instrument with an External Signal

Trigger Marker Clock

Baseband A







	Logical Signal	Connector	Show
Trigger Source	Internal		
Clock Source	Internal		
Clock Output			
Marker 1	Radio Frame	User 1	 ...
Marker 2	Radio Frame	User 2	 ...
Marker 3	Radio Frame		

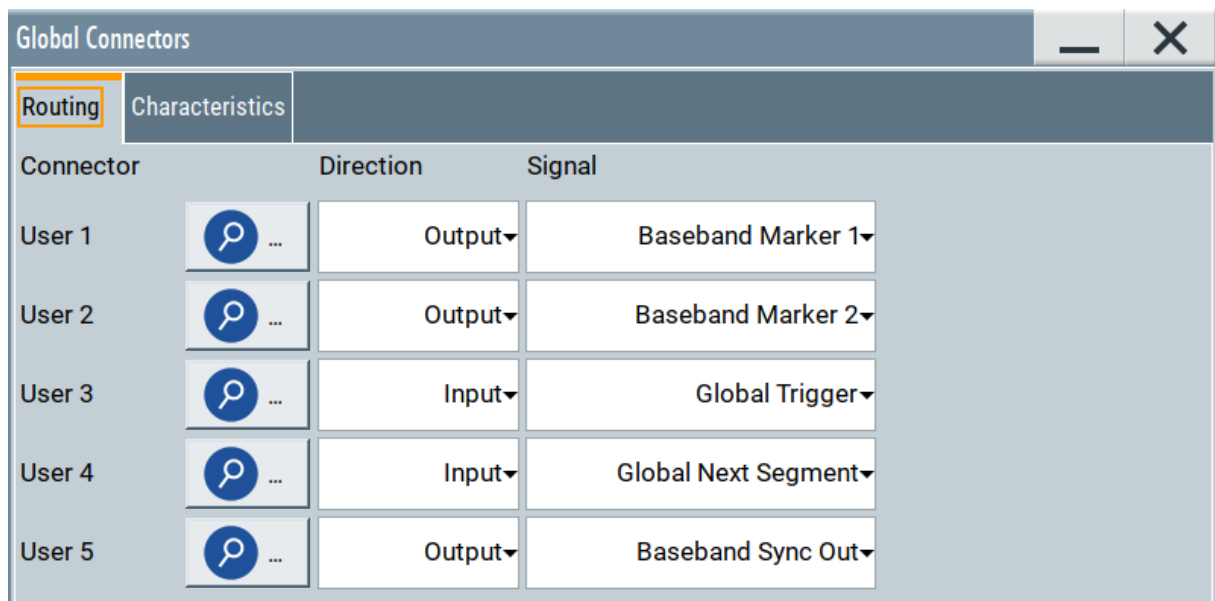
Diagram Legend

- T = Trigger  = Common to all Basebands
- M = Marker
- C = Clock
-  = Signal is available at Output Connector
-  = Signal Source is external

 Global Connectors ...

The instrument uses its internal trigger and clock signals, and the default mapping of the marker signals to the connectors.

2. To access the related connector settings, perform one of the following:
  - Select "Global Connector Settings"
  - Tap the connector name, for example select the connector "User 1"



**Figure 6-5: Signal mapping to the global connectors**

The "Global Connectors" dialog displays the current connectors configuration. The settings are configurable, but in this example we use the default mapping.

- Alternatively, select "Block Diagram > Baseband > Misc > Custom Digital Mod", select the "Trigger In" tab and select "Global Connector Settings".

In the current mapping, the two global connectors **User x** on the front panel are configured as follows:

- "Marker 1/2" are output at the User 1/2 connectors
- The User 3 connector is an input for the "Global Trigger" signal.



### Find the physical location of each connector

Use the built-in "Trigger Marker Clock > Show" function to display the location of the selected connector. A blinking marker on the front/rear panel view also indicates the selected connector.

### To reconfigure the trigger settings

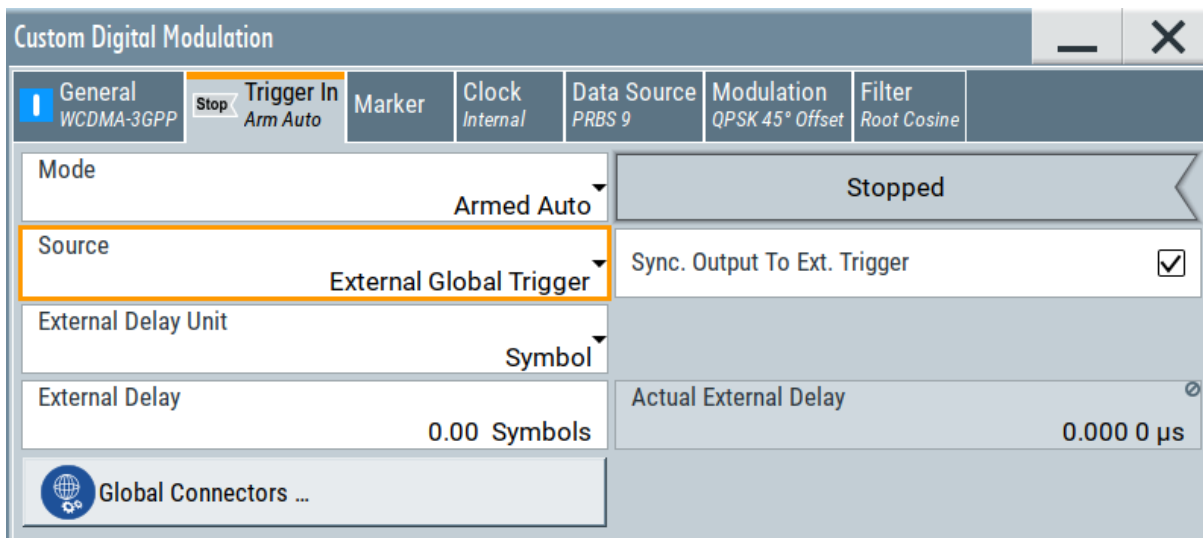
We assume that the instrument is configured as described in [Chapter 6.2, "Generating a Digitally Modulated Signal"](#), on page 46 and the default connector mapping is maintained (see [Figure 6-5](#)).

- In the block diagram, select "Baseband > Misc > Custom Digital Mod > Trigger In".
- Select the following settings:

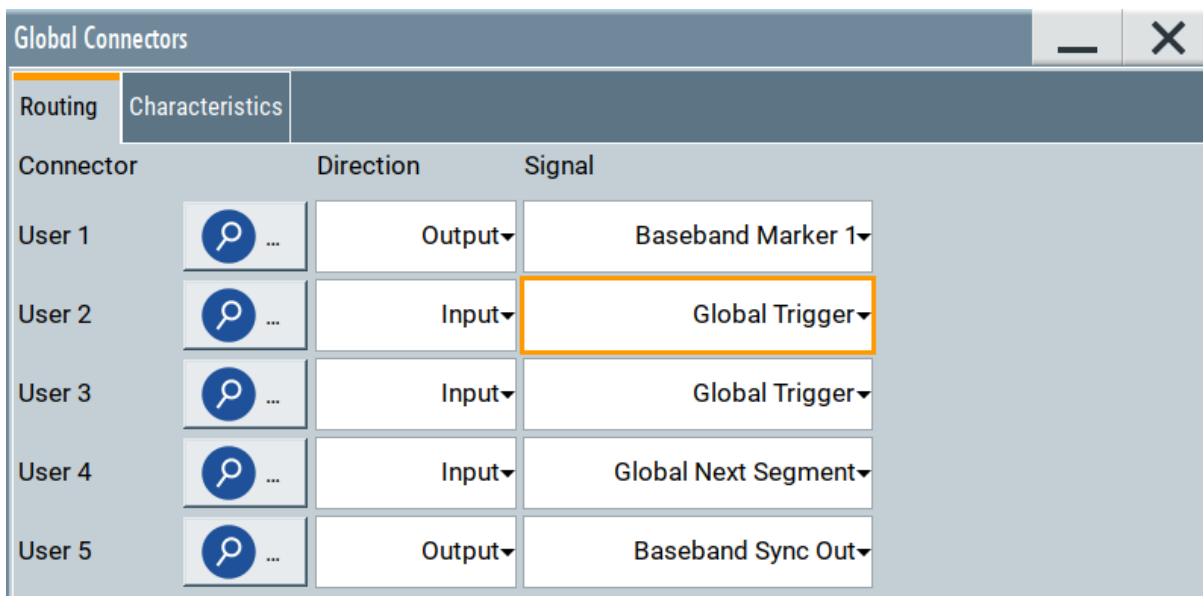


## Triggering the Instrument with an External Signal

- a) "Mode > Armed Auto"
- b) "Source > External Global Trigger".



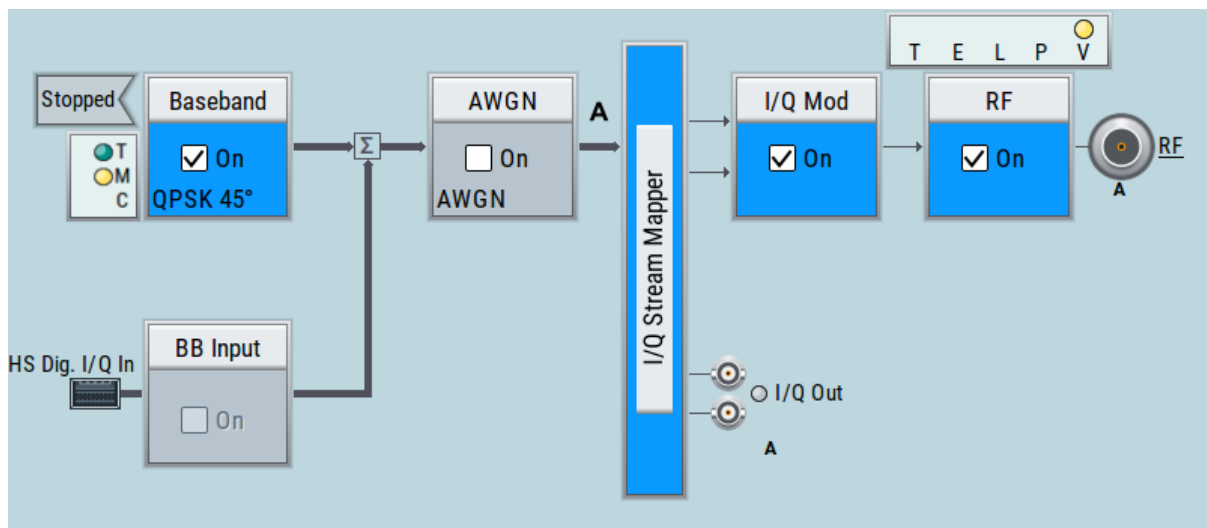
3. Select "Global Connector Settings > Routing".
4. For "User 2", select "Direction > Input" and "Signal > Global Trigger".



The instrument expects an external global trigger event. In the current configuration, the "Global Trigger" signal has to be supplied at the input connector User 2.

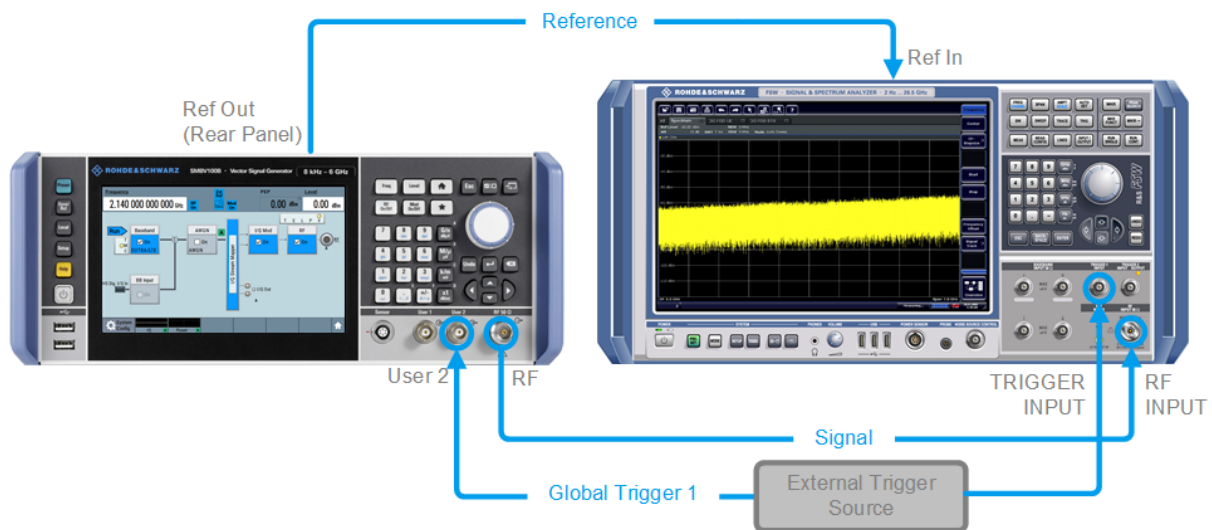
The Trigger/Marker/Clock status LEDs in the block diagram confirm that an external trigger signal is selected; the signal generation is however stopped.

## Triggering the Instrument with an External Signal



### To connect the instrument and the external trigger source

1. Use a suitable cable to connect the external trigger source to the User 2 connector of the R&S SMBV100B. See [Figure 6-6](#).



**Figure 6-6: Simplified representation of a test setup\*\***

\*\* = The figure depicts the cabling as a general principle; particular test setups do not require all connections at the same time

The [Figure 6-6](#) depicts the location of the connectors and explains the connection as principle. In practice, you would rather "substitute" the analyzer by a DUT, like a base station (BS). Other than in the example, the DUT can be the source for the reference signal. Instead of using an external trigger source, the DUT can also send, for example, a frame trigger signal to the R&S SMBV100B. The R&S SMBV100B acts still as the signal source.

2. Use suitable cables to connect the **RF** and **REF OUT** connectors of the R&S SMBV100B to the signal analyzer or the DUT.

Upon the receiving of an external trigger event, the R&S SMBV100B starts the signal generation and then generates a continuous signal. An "Arm" stops the signal generation. A subsequent trigger event causes a restart of the signal generation.



To learn more about this topic, refer to:

- Chapter "Baseband Trigger Signals" in the user manual
  - Chapter "Global Connectors" in the user manual
- 

## 6.4 Enabling and Configuring a Marker Signal

Test setups often require that an external device is synchronized to the generated data stream. For this purpose, the R&S SMBV100B can output marker signals (or markers) also to the generated signal. The R&S SMBV100B provides several regular marker signals and marker signals specific to the firmware option. With suitable marker settings for instance, you can mark slot or frame boundaries or mark the start of a particular modulation symbol.

This example extends further the configurations performed in [Chapter 6.2, "Generating a Digitally Modulated Signal"](#), on page 46. We assume a default connector mapping (see [Figure 6-5](#)).

This test setup requires one oscilloscope, like the R&S®RTO, as additional equipment.

1. In the block diagram, select "Block Diagram > Baseband > Misc > Custom Digital Mod > Marker" tab.

2. Select "Marker Mode > Marker 1 > Pulse" and "Divider = 32".

Generated is a periodic marker with marker frequency of 120 KHz. The signal is output at the User 1 connector of the R&S SMBV100B (see [Figure 6-5](#)).

3. Use a suitable cable to connect the User 1 connector of the R&S SMBV100B to the monitoring instrument, for example oscilloscope like R&S®RTO. See [Figure 6-7](#).

## Verifying the Generated Signal with the Graphics Display



**Figure 6-7: Simplified representation of a test setup for signal monitoring\*\***

\*\* = The figure depicts the cabling as a general principle

4. Use a suitable cable to connect the **I OUT** connector of the R&S SMBV100B to the monitoring instrument.



To learn more about this topic, refer to chapter "Regular Marker Output Signals" in the user manual.

## 6.5 Verifying the Generated Signal with the Graphics Display

It is often useful to check the spectra of the configured signals, before you enable the RF output of the instrument.

The R&S SMBV100B provides a build-in function to represent the generated signal on a graphical signal display. We demonstrate this feature by showing the characteristics at one particular point of the signal processing chain. You can, however, display the signal characteristics at other different stages.

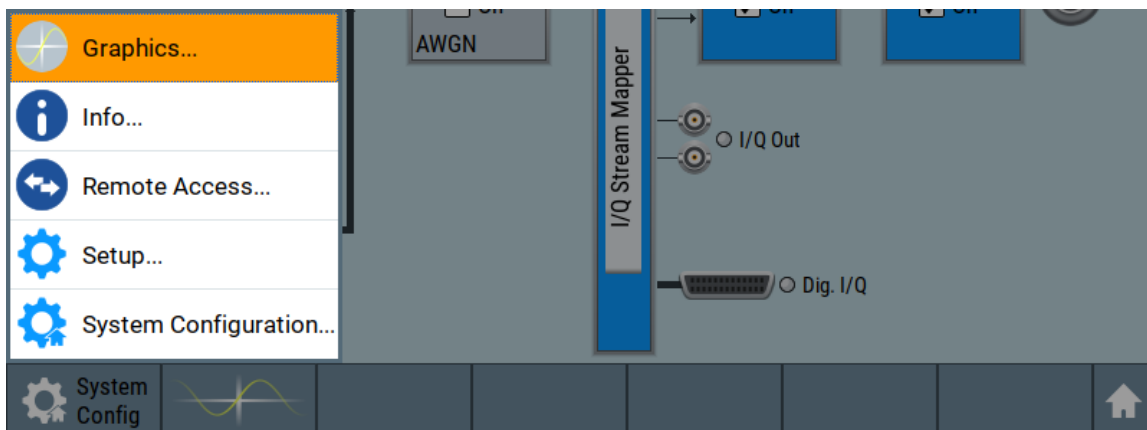
This example shows you how to use this graphical display to verify the generated signal. Use the signal generated in [Chapter 6.4, "Enabling and Configuring a Marker Signal"](#), on page 54.

### To access the graphical signal display functionality

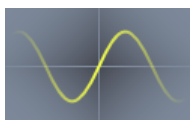
- Perform one of the following:

## Verifying the Generated Signal with the Graphics Display

- a) Select "Taskbar > System Configuration > Graphics"



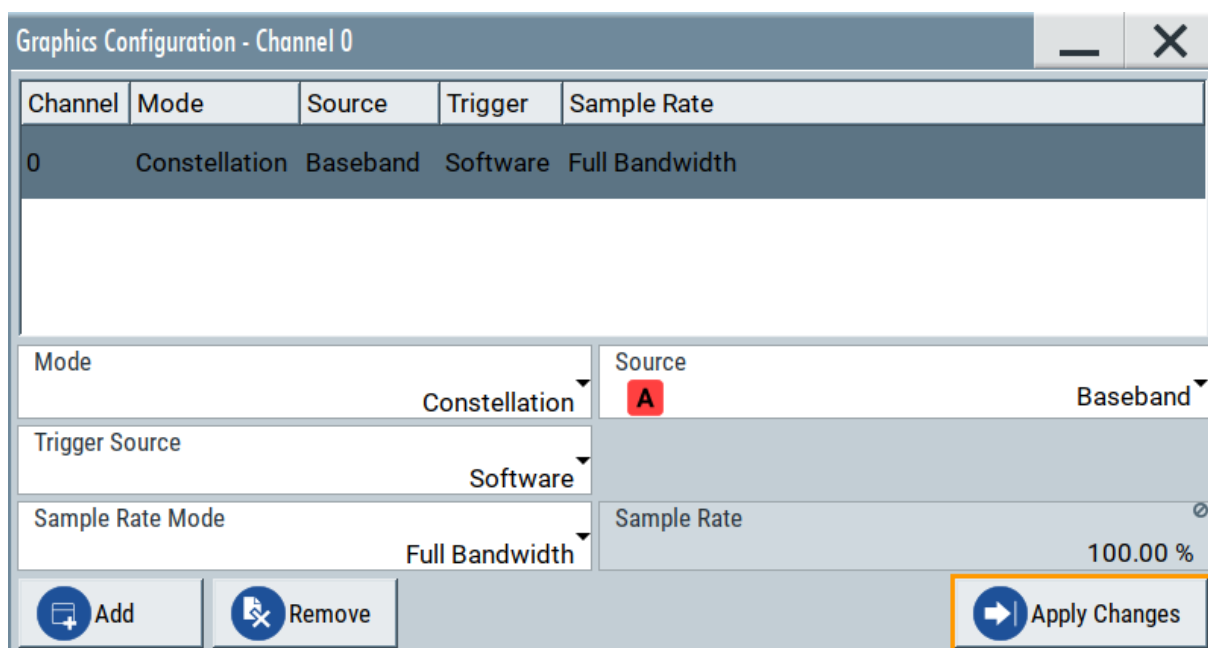
- b) On the "Taskbar", tap the wave icon.



The "Graphics Configuration" dialog opens.

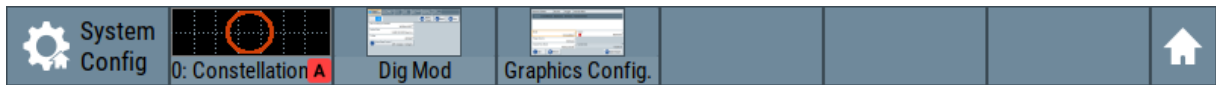
### To visualize the signal

1. In the "Graphics Configuration" dialog, select "Mode > Constellation".
2. Select "Source > Baseband".
3. Select "Add" to enable signal display.



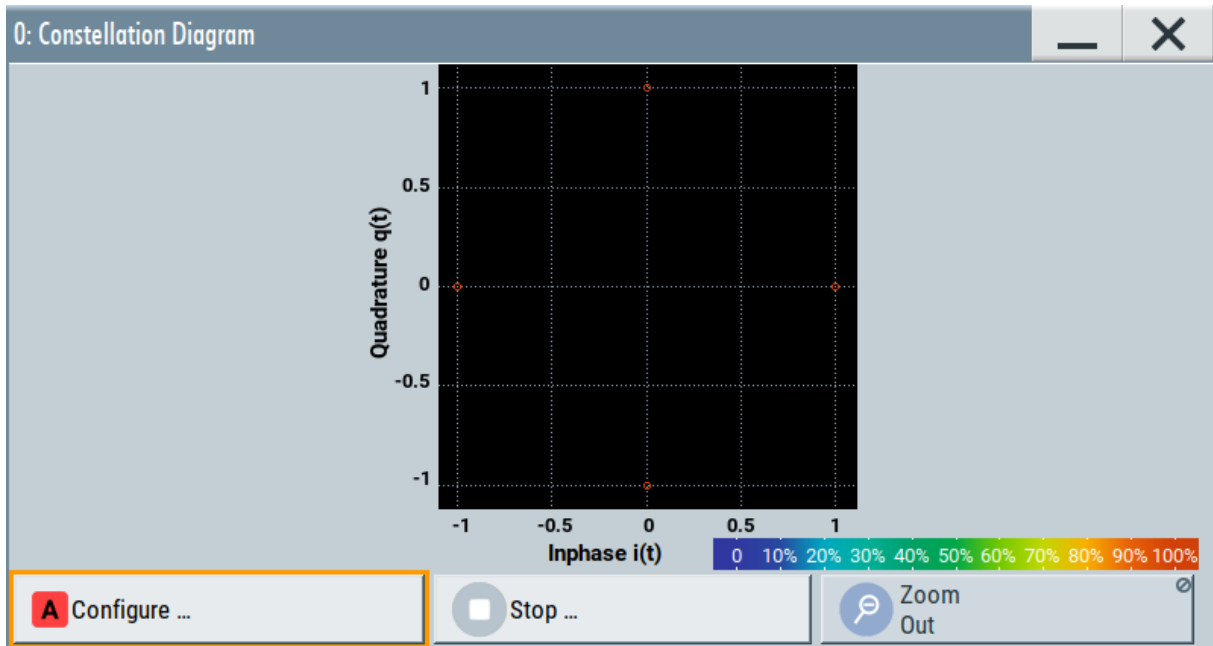
## Verifying the Generated Signal with the Graphics Display

A new thumbnail (minimized view) indicating the active diagram appears in the "Taskbar".



4. Press the thumbnail graphic.

The graphic enlarges and the diagram is displayed in a normal size.

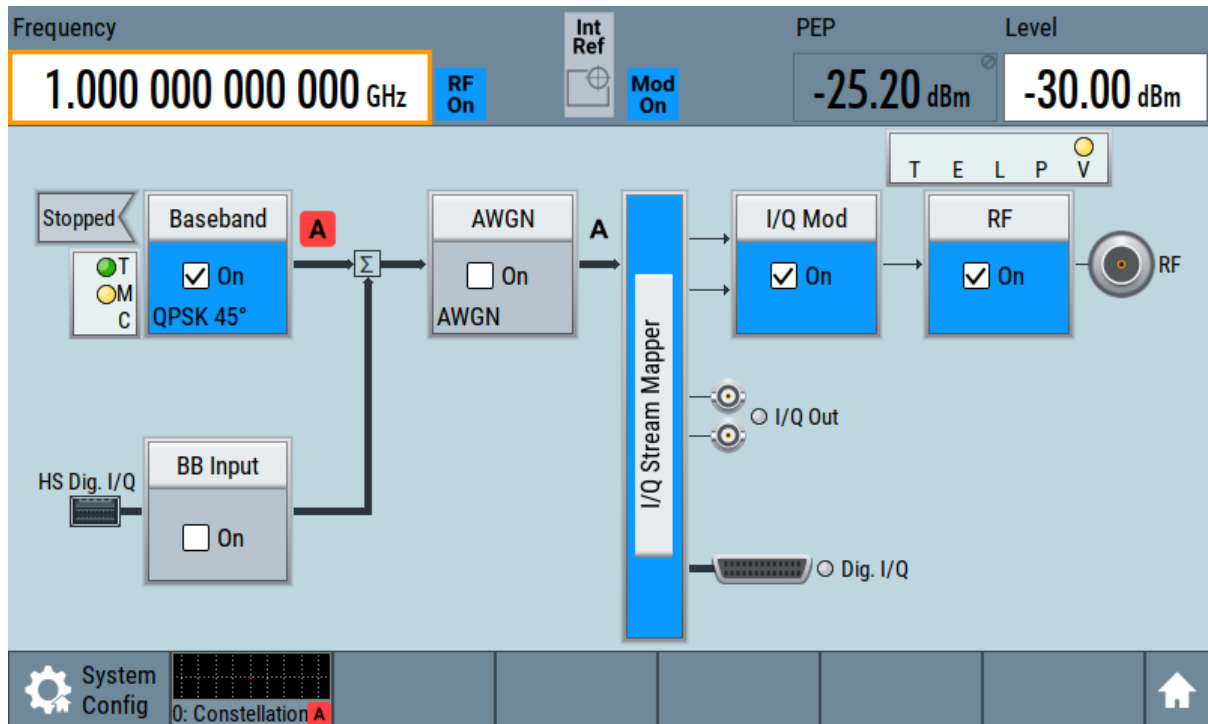


The "Constellation Diagram" displays the 3GPP FDD signal.

5. To retrieve more information, zoom in. In some diagrams you can select "Show Marker" to measure the distance, for example, between two signals. In principle, the zoom in function works like the two-finger pinching for magnifying images on your cellphone.
6. In the "Constellation Diagram" dialog, select "Configure" to return to the "Graphics Configuration" dialog.  
Close the "Graphics Configuration" dialog.

This action has no effect on the configured graphics but on the dialog itself.

The block diagram displays the current signal routing. It indicates that frequency and power offsets are enabled and displays the acquisition points for the real-time diagrams minimized in the "Taskbar".



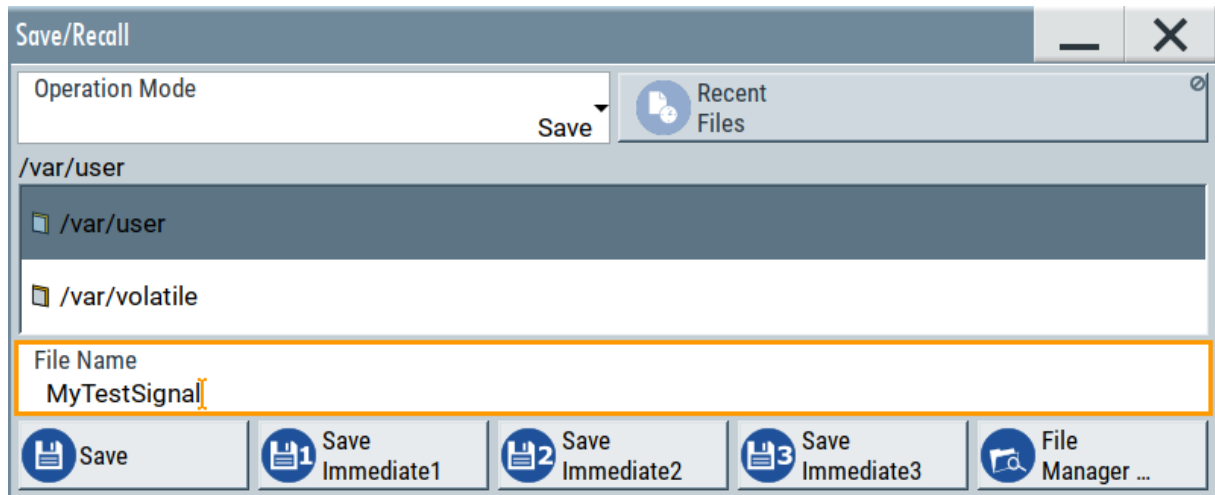
## 6.6 Saving and Recalling Settings

To restore the results of our measurements later, we save the instrument settings to a file.

### To save the instrument settings to a file

We assume, a test configuration as described in [Chapter 6.4, "Enabling and Configuring a Marker Signal"](#), on page 54.

1. Press the Save/Rcl key on the front panel.
2. In the "Save/Recall" dialog box, select "Operation Mode > Save".  
Tap the "Filename", use the on-screen keyboard, and enter *MyTestSignal*.



3. Tap the "Save" button.

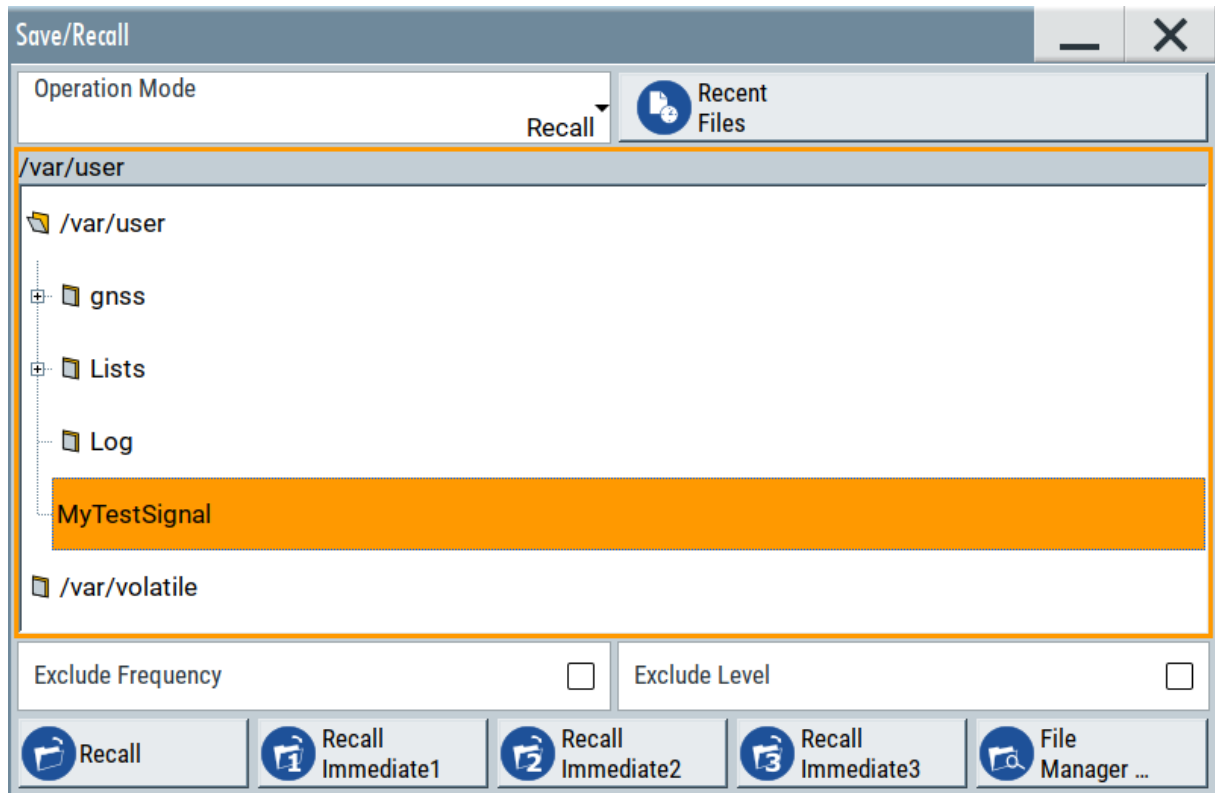
The file `MyTestSignal.savrc1.txt` is saved in the default directory `/var/user`.

### To load saved instrument settings

You can restore the settings to the instrument at any time using the settings file.

1. Press the Preset button to restore the default instrument settings so you can check that the saved user settings are restored afterwards.
2. Press the Save/Rcl key.
3. In the "Save/Recall" dialog, select "Recall" operation. Navigate to the directory of the saved file. Select the `MyTestSignal` file.





4. Tap the "Recall" button.

All instrument settings are restored and the display resembles the instrument display right before the settings were saved.

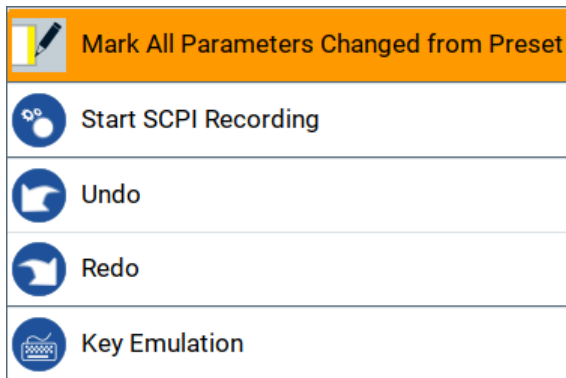


### How to display all parameters with values different to their preset values

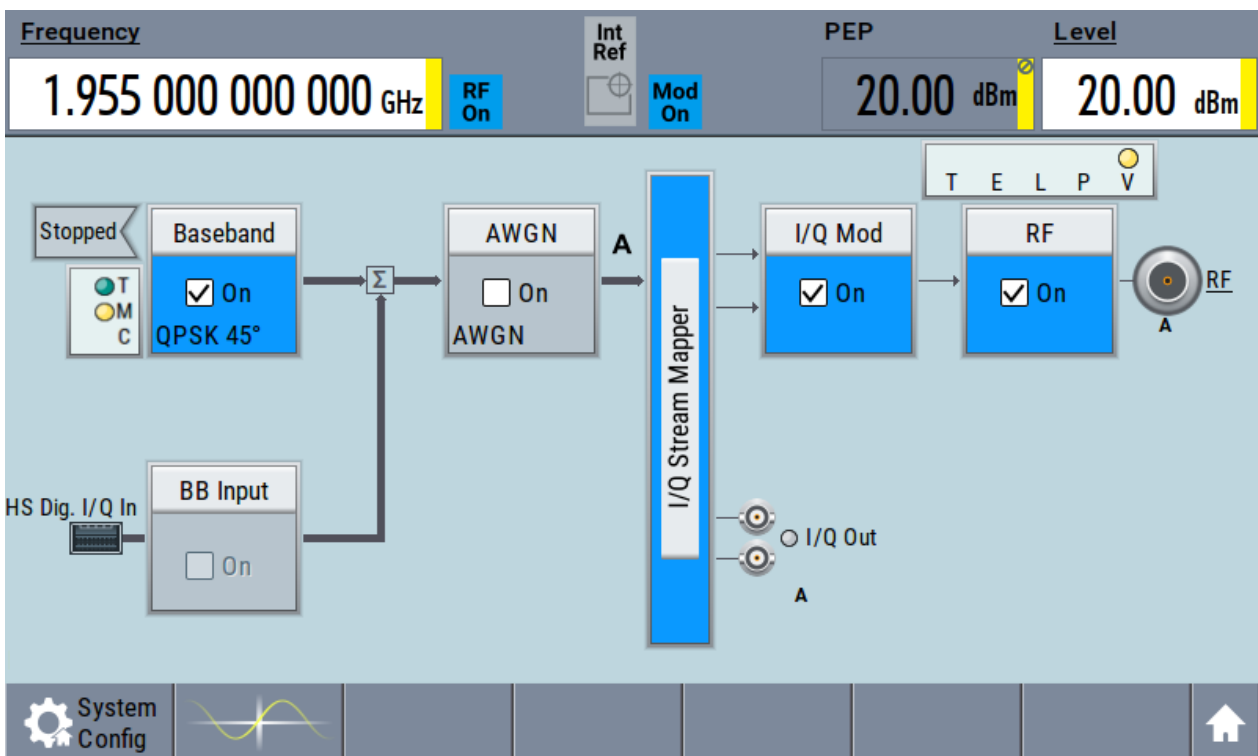
When you load a file to your instrument and do not have enough information on the changed settings, visualize all parameters that have been changed from their default state.

Try out the following:

- Tap and hold on an empty space in the block diagram to access the context-sensitive menu.
- Select "Mark All Parameters Changed from Preset".



- All changed parameters are highlighted.



## 6.7 Generating an EUTRA/LTE Signal

The main application field of the R&S SMBV100B is the generation of digital signals in accordance with several telecommunication and wireless standards, like WCDMA, EUTRA/LTE or WLAN, to name a few. This example uses the digital standard EUTRA/LTE to introduce the way you can access and interact with the instrument and experience the advantages provided by the additional options.

The minimum requirement for R&S SMBV100B in this example is a base unit equipped with:

- Option EUTRA/LTE R&S SMBVB-K55
- Option frequency R&S SMBVB-B103

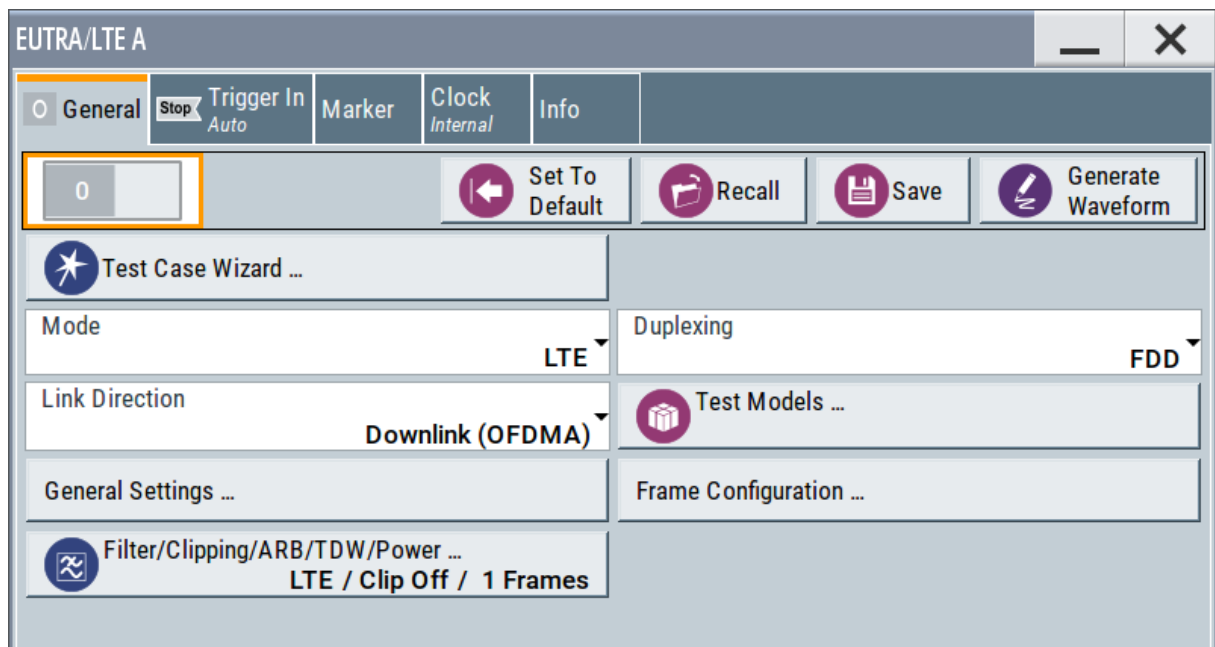
### To generate a downlink test signal

The main focus of the following example is not on the R&S SMBV100B capabilities and the features provided by the firmware option. The example aims rather to help you get familiar with the settings and configuration principle common for the digital standards.

We use one of the provided EUTRA test models (E-TM) to show how to generate a test signal upon a quick selection.

1. On the R&S SMBV100B front panel, press the Preset key to start out in a defined instrument configuration.
2. In the block diagram, select "Baseband > Beyond 3G Standards > EUTRA/LTE".

The EUTRA/LTE dialog appears and displays the general settings provided for the digital standard.



As in the user interfaces of all digital standards, the "EUTRA/LTE" dialog is divided into several tabs. The "General" tab comprises the primary settings of the standard, the functions for storing and recalling settings and provides access to further functions and dialogs, like the "Filter" settings. The "Trigger In", "Marker" and "Clock" tabs comprise the settings related to the corresponding function.

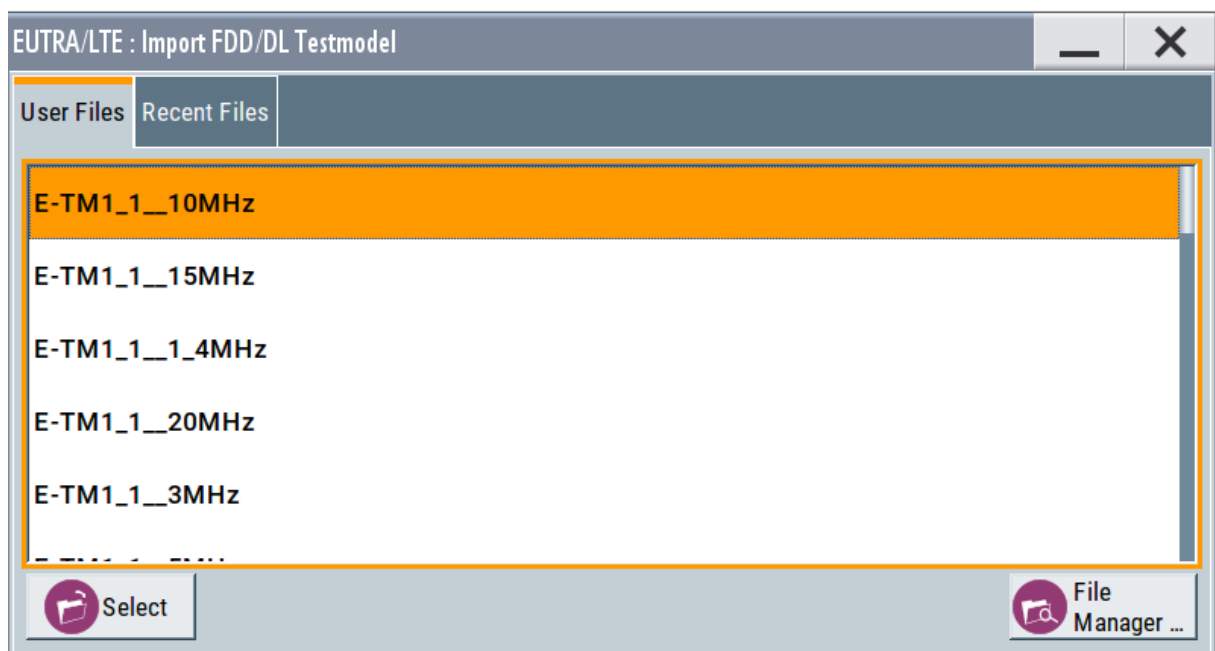
The more complex the digital standard itself is, the more comprehensive the further dialog and tab structure. The start dialog of each digital standard, however, follows a repeating dialog structure that comprises the tabs "General", "Trigger In", "Marker" and "Clock". (See also [Chapter 8.3.4, "Additional Display Characteristics"](#), on page 78).

**Tip:** To display the dialog in its maximal height, press the Resize window key on the front panel.

3. In the "EUTRA/LTE General" tab, select "Test Models".

The test models is a function for quick selection and settings adjustment according to one of the various EUTRA test models (E-TM).

A standard "File Select" function enables you to select from files with predefined settings.



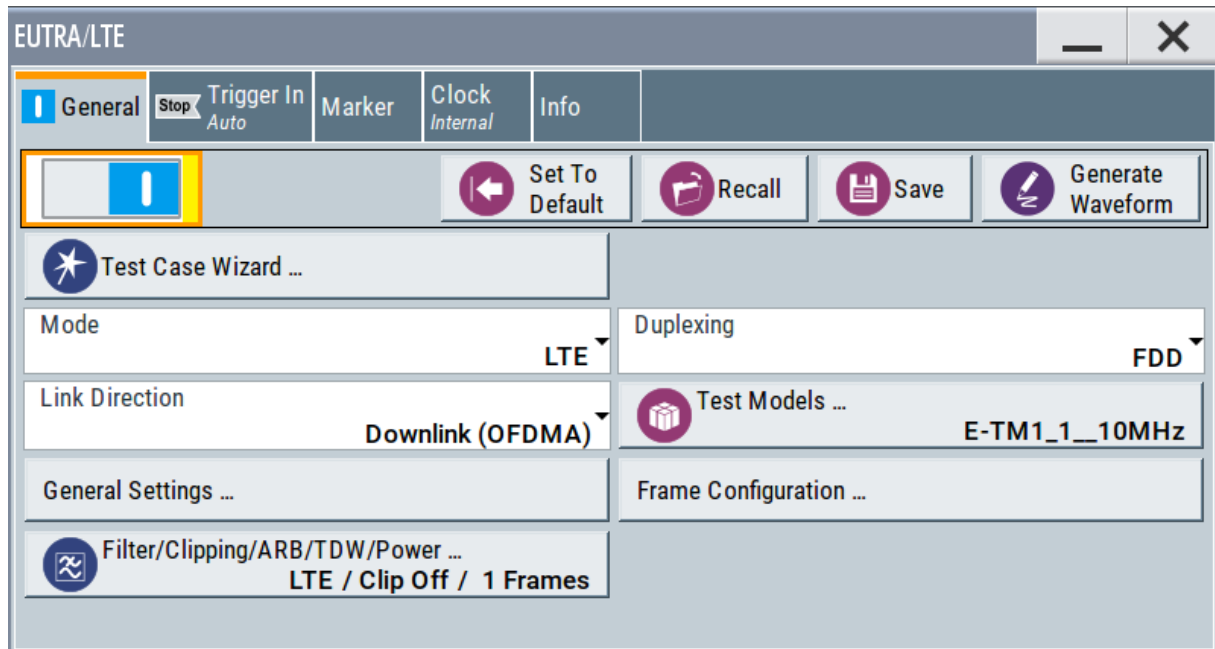
**Tip:** On the front panel, press the Help key to retrieve detailed information on the current settings and on the contents of the predefined files.

4. Navigate to a file, for example to the E-TM1\_1\_10MHz (an E-TM1.1 test model with 10 MHz channel bandwidth) and confirm with "Select".

## Generating an EUTRA/LTE Signal

The dialog closes automatically and the user interface confirms the name of the selected file.

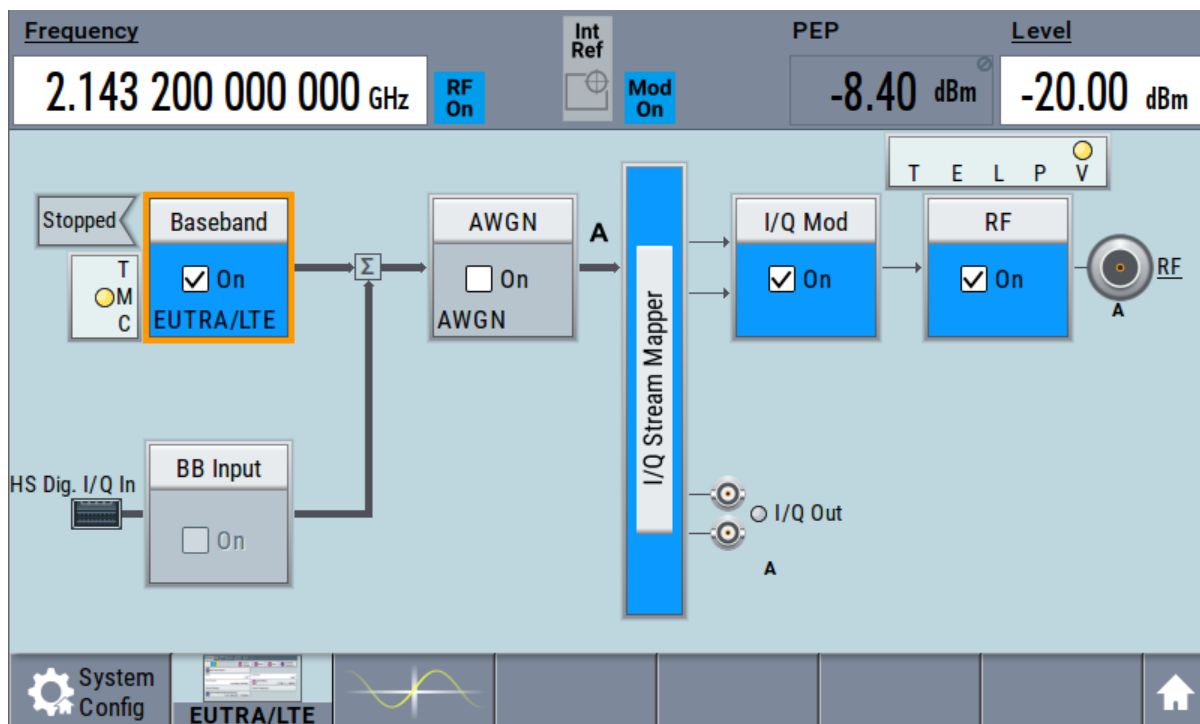
5. In the "EUTRA/LTE > General" tab, select "State > On".



Close the dialog.

6. On the "Status Bar", tap the "Frequency" and "Level" fields and enter new values, for example *2.1432 GHz* and *-20 dBm*.

Select "RF > On".



The instrument generates an EUTRA/LTE test signal with the selected channel bandwidth, frequency, and level.



With these first steps, you have gained an impression of the provided functionality.

For a comprehensive description of the full range of capabilities, refer to the user manual "EUTRA/LTE Digital Standard for R&S SMBV100B".

# 7 System Overview

This section helps you to get familiar with the R&S SMBV100B. It provides an introduction to the general concept of the instrument. This section also introduces the main blocks in the signal generation flow.

For information on how to access functions and interact with the R&S SMBV100B, refer to [Chapter 8, "Instrument Control"](#), on page 73.

## 7.1 Brief Introduction to the Instrument's Concept

The R&S SMBV100B offers excellent RF and baseband characteristics. The baseband section of the R&S SMBV100B is fully digital. It contains the hardware for generating and processing I/Q signals in realtime or generating signals with an arbitrary waveform generator.

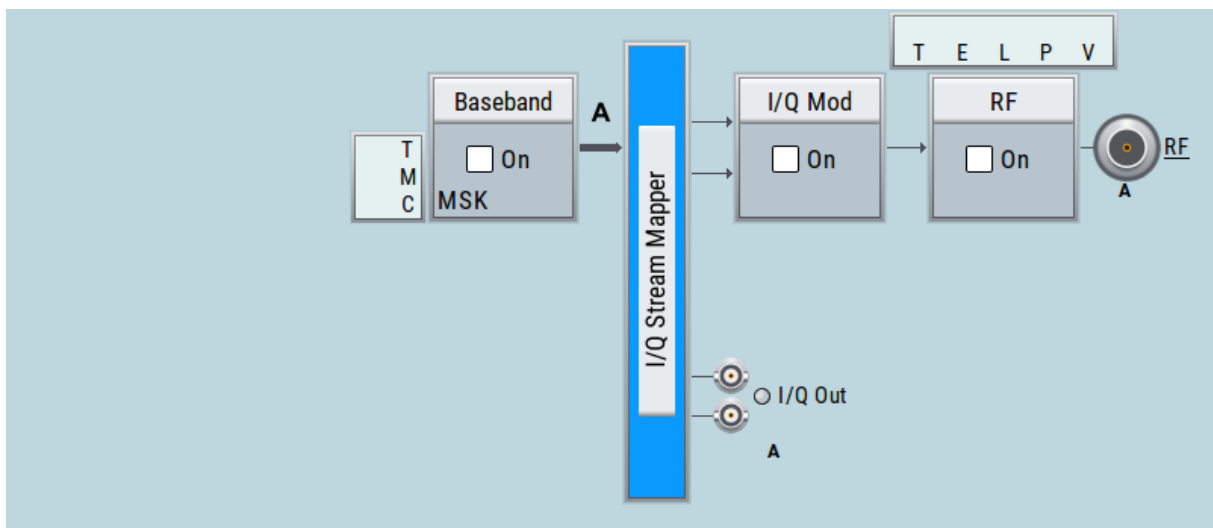
## 7.2 Signal Flow at a Glance

The R&S SMBV100B is equipped with a large touchscreen, that displays a block diagram. The block diagram represents the signal flow and the general stages the signal generation goes through. Depending on the options the R&S SMBV100B is equipped with, the appearance of the block diagram changes.

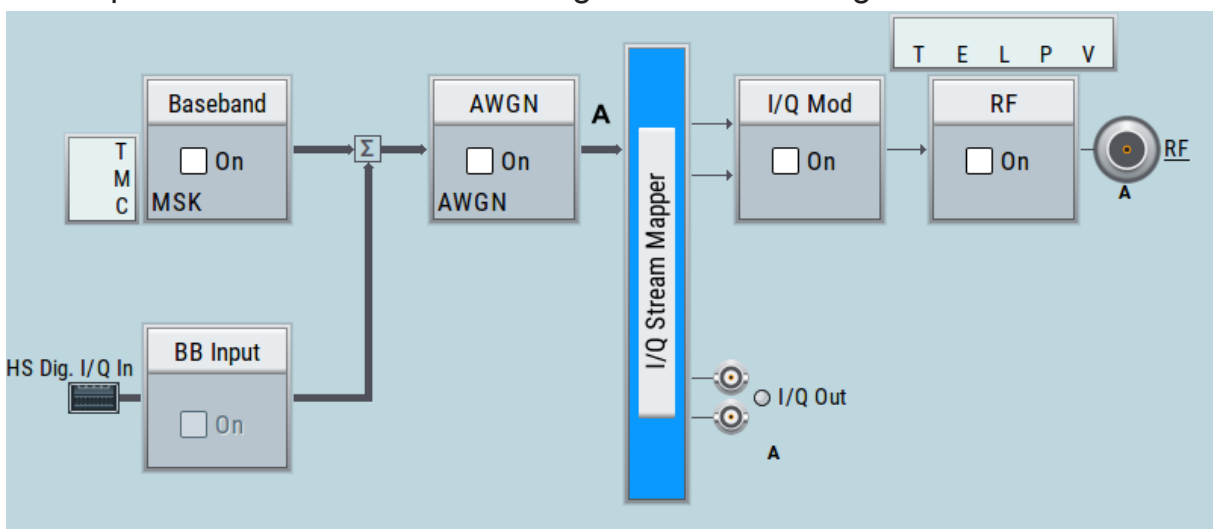
The following examples do not cover all possible cases but aim to introduce the way the block diagram depicts the installed options.

- An example of a base unit, equipped with R&S SMBVB-B103.

## Signal Flow at a Glance



- An example of a fully equipped instrument. The block diagram displays all blocks for that the required hardware and software options are fitted. The block diagram shows the signal flow as it is.



### The cross-reference between the installed options and the displayed settings

The [Table 7-1](#) is an excerpt of the available options and lists only the options required *to display* a functional block in the block diagram. The information assumes R&S SMBV100B base unit.

For exact information on the available options, and on the minimum requirements and the interdependencies between the provided options, refer to the R&S SMBV100B data sheet.



**Table 7-1: Required options per functional block (excerpt)**

Functional block	Required option
"Baseband"	-
"BB Input"	
"AWGN"	R&S SMBVB-K62
"I/Q Stream Mapper"	-
"I/Q Mod"	-
"I/Q Analog"	-
"RF"	R&S SMBVB-B103/-KB106

### 7.3 Internal Baseband Source ("Baseband" Block)

The "Baseband" block represents the source of the baseband signals (basebands).

This functional block is the access point to:

- *The internal baseband generator*  
The baseband generator contains modules for real time signal generation (Custom Digital Modulation) and an arbitrary waveform generator (ARB).
- *The available digital standards*  
Generation of digital signals in accordance with the supported standards requires additional software options. For example, option R&S SMBVB-K55 generates signals according to the EUTRA/LTE standard.
- *The baseband offsets function*  
Signals from the baseband generator can be shifted in frequency and phase, or boosted in power.

### 7.4 Digital Baseband Input ("BB Input"Block)

The "BB Input" block is the access point to the settings of the digital interfaces.

The R&S SMBV100B is able to receive and process digital baseband signals. The digital baseband input can be used together with other Rohde & Schwarz instruments, like signal generators. Note, however, that the internal and the exter-

nal digital signals cannot be used simultaneously. The two blocks "Baseband" and "BB Input" deactivate each other.

The "BB Input" block is the access point to the settings of:

- *The external digital I/Q signals*  
The external digital I/Q signals are further processed in the baseband section
- *The baseband offsets function*  
The external and internal baseband signals can be shifted in frequency and phase, or boosted in power.

## 7.5 Additional White Gaussian Noise ("AWGN" Block)

The "AWGN" block is displayed only in instruments equipped with the option R&S SMBVB-K62. This block controls the additional white Gaussian noise generator (AWGN). An additive white noise is required for measurements of mobile radio base stations.

## 7.6 "I/Q Stream Mapper" Block

As one of the access points to the system configuration settings, the "I/Q Stream Mapper" provides direct access for mapping the generated I/Q streams to the available output connectors. That is, to the analog RF and I/Q output connectors.

## 7.7 I/Q Modulator ("I/Q Mod" Block)

The "I/Q Mod" block represent the I/Q modulator.

This functional block is the access point to:

- The I/Q modulation of the internal baseband signal
- The I/Q modulation of an external single-ended analog wideband signal
- The analog I/Q impairments

## 7.8 Analog I/Q Output ("I/Q Analog" Block)

The "I/Q Analog" block represents the analog I/Q output connectors.

This block is the access point to the settings of:

- The analog I/Q output signals  
The generated signal can be output as single-ended or differential analog signal.
- The analog I/Q impairments

## 7.9 RF and Analog Modulations ("RF" Block)

The "RF" block represents the RF settings of the instrument.

This block is the access point to:

- RF frequency and level settings, as well as the reference frequency, local oscillator, user correction, etc.
- The analog modulations
- The list and sweep modes

## 7.10 Applications Examples of the R&S SMBV100B

The R&S SMBV100B can be optimally adapted to the requirements of different applications:

- Generation of digitally modulated signal  
The main field of application of the R&S SMBV100B is the generation of digitally modulated signals. The R&S SMBV100B generates a digitally modulated signal in several ways: using the internal baseband generator, using the externally applied digital baseband signals or in an analog wideband I/Q operation.
- Generation of a wanted signal or an interfering signal for receiver tests
- Generation of signals with up to 500 MHz signal bandwidth

## 8 Instrument Control

This chapter provides an overview on how to work with the R&S SMBV100B.

It covers the following topics:

• Possible Ways to Operate the Instrument.....	73
• Means of Manual Interaction.....	74
• Understanding the Display Information.....	75
• Accessing the Functionality.....	80
• Entering Data.....	82
• Getting Information and Help.....	83
• Remote Control.....	85
• Remote Operation over VNC.....	86

### 8.1 Possible Ways to Operate the Instrument

There are three ways to operate the R&S SMBV100B:

- Manual operation:  
Use the touchscreen, hard keys and rotary knob, or an optional mouse and/or keyboard.  
The following description shows how to operate the instrument manually.
- Remote control:  
Create programs to automatize repeating settings, tests and measurements.  
The instrument is connected to a computer running the program.  
This way of operation is described in the user manual, chapter "Network and Remote Control Operation".
- Remote operation from a computer:  
Remote monitoring and control of the instrument from a connected computer is based on the common cross-platform technology VNC (Virtual Network Computing). On the remote computer, any standard web browser (supporting Java) or a dedicated VNC client (like Ultr@VNC) can be used. See also [Chapter 8.8, "Remote Operation over VNC"](#), on page 86.

## 8.2 Means of Manual Interaction

For the manual interaction with the R&S SMBV100B, you have several methods that you can use as an alternative to perform a task:

- **Touchscreen:**  
Touchscreen operation is the most direct way to interact. Almost all control elements and actions on the screen are based on the standard operating system concept. You can tap any user interface element to set parameters in dialog boxes, enter data, scroll within a dialog etc., as if you work with a mouse pointer.  
Tapping the screen works like clicking mouse buttons:
  - Touch quickly = click: Selects a parameter or provokes an action.
  - Touch and hold = right-click: Opens a context-sensitive menu.
  - Touch and swipe = drag: Scrolls through the contents of a display element larger than the screen, e.g. a list or a table.
  - Spread or pinch two fingers = zoom out, zoom in:  
Increases or decreases the size of an area in a graphical display as it works on your cell phone
- **Function keys and rotary knob:**  
The front panel provides nearly all functions and controls to operate the instrument in the classic way, without touchscreen.
- **Optional mouse and/or keyboard:**  
These devices work like known from PCs. The navigation keys on the front panel correspond to the keys on the keyboard.

This manual describes the manual interaction with the instrument via the touchscreen. It mentions the alternative methods using the keys on the instrument or the on-screen keypads if it deviates from the standard operating procedures. The usage of the touchscreen and navigation keys is described in [Chapter 8.4, "Accessing the Functionality"](#), on page 80.

Throughout the manual, the term "select" refers 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.

### 8.3 Understanding the Display Information

The block diagram of the R&S SMBV100B displays all main settings and generator states, divided into three main operation areas.

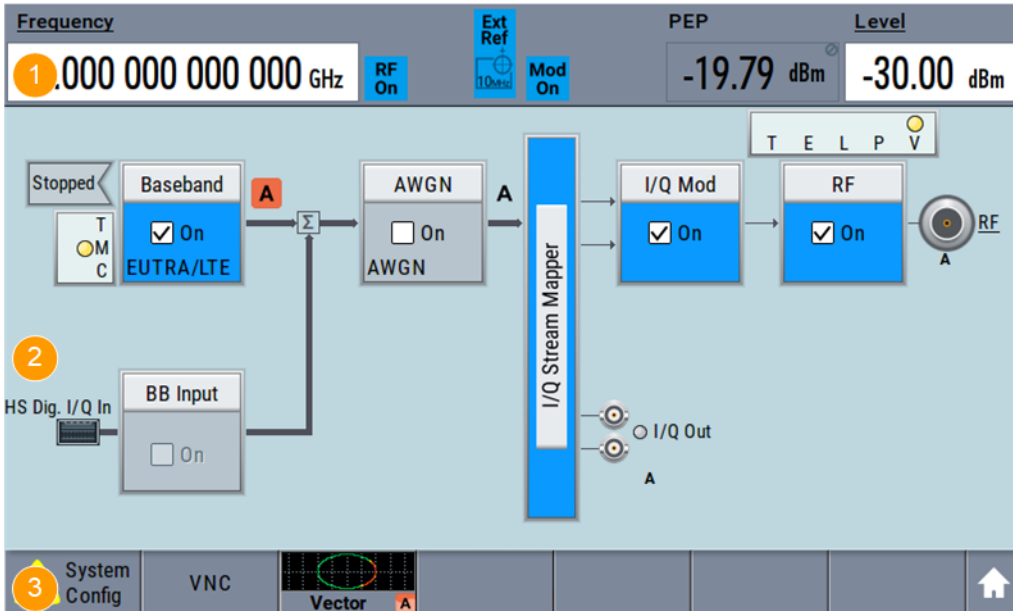


Figure 8-1: Block diagram

- 1 = Status bar (frequency and level display)
- 2 = Block diagram
- 3 = Taskbar/softkey bar

- [Status Bar](#)..... 75
- [Block Diagram](#)..... 76
- [Taskbar](#)..... 77
- [Additional Display Characteristics](#)..... 78

#### 8.3.1 Status Bar

The status bar at the top of the screen indicates the RF frequency and the level of the output signal provided to the DUT. You can set both parameters directly here.



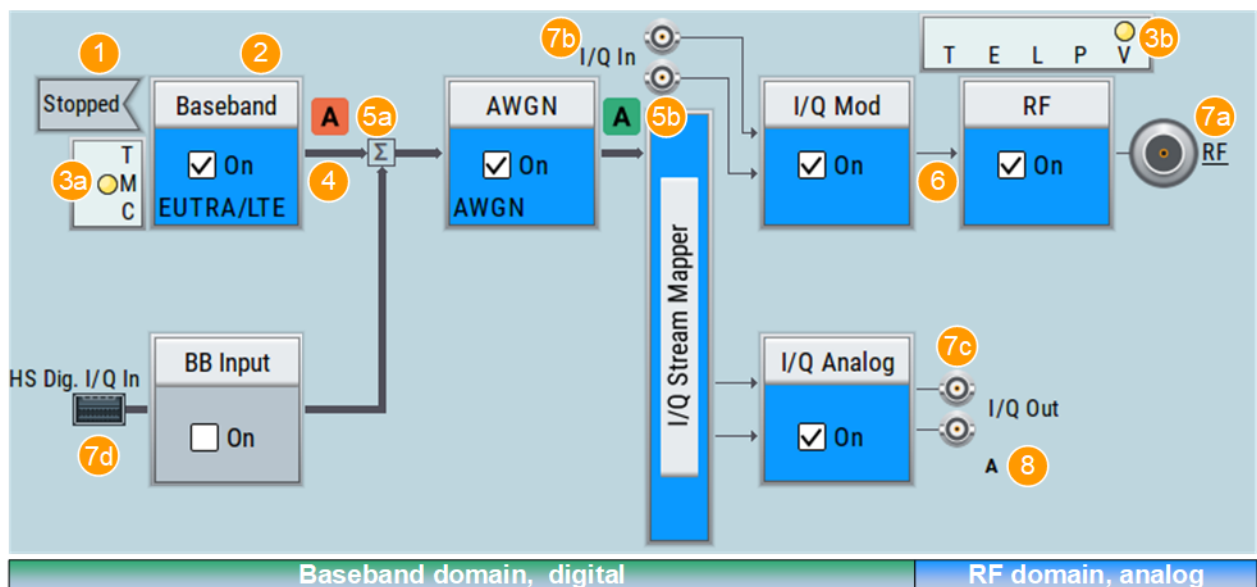
Understanding the Display Information

- 1 = Frequency display
- 2 = Status buttons
- 3 = Level display

The status buttons indicate key parameters that are set for the output signal. Most of the status buttons are virtual keys you can use to open a corresponding menu or dialog.

### 8.3.2 Block Diagram

The block diagram shows the current configuration and the signal flow in the generator with the aid of function blocks, connected by signal lines.



- 1 = Status indicator
- 2 = Functional block
- 3a / 3b = Control signal block
- 4 = Signal line (digital)
- 5a / 5b = Graphics indicator
- 6 = Signal line (analog)
- 7a / 7b / 7c / 7d = Connector icons (RF, analog, digital)
- 8 = Stream indicator

Starting from left up to the "I/Q Stream Mapper", you can see the functional blocks provided in the baseband domain. After the stream mapper, the analog section contains the digital to analog conversion and modulation to RF.

Legend	Item	Description
1	Status indicator	Indicates whether the signal is running or waiting for a trigger.
2	Functional block	Represents a basic task in signal generation. The push button provides access to any number of associated actions to accomplish the task. The On/Off (checkbox) and the block label quickly activates the basic task.
3	Control signal block	Indicates information on the control signals like signal content, input or output and provides quick access to the corresponding configuration dialog. A dedicated control block is displayed for the baseband block (3a) and RF block (3b).
4, 6	Signal lines (digital, analog)	Show the currently configured signal flow. <ul style="list-style-type: none"> <li>Thick lines represent the digital I/Q streams, see (4) in the figure above</li> <li>Thin lines represent the analog signals (6)</li> </ul>
5	Graphics indicator	Denotes that the signal is displayed graphically (5a/5b).
7	Connector icons	Represent the interfaces for signal input and output. <ul style="list-style-type: none"> <li>RF signal connector output (7a); (icons vary depending on the frequency)</li> <li>Analog I/Q signal connector input (7b)</li> <li>Analog I/Q signal connector output (7c)</li> <li>Digital I/Q signal connector input (7d)</li> <li>Digital I/Q HS signal connector input and output (7b, 7c)</li> </ul>
8	Stream indicators	Show the input streams at the I/Q stream mapper.

### 8.3.3 Taskbar

The "Taskbar" contains labeled softkeys and minimized views (thumbnails) of active graphics and dialogs.

Initially, it shows the permanently assigned softkeys. The softkey with the sine wave denotes that no signal is activated for graphical representation.



**Figure 8-2: Taskbar in default state**



## Understanding the Display Information

Whenever you open a settings or graphics dialog, it is automatically assigned to the "Taskbar". The softkeys shown in the following figure represent the variants.



**Figure 8-3: Taskbar fully assigned**

- 1 = System configuration
- 2 = Remote control connections
- 3 = Graphics
- 4 = Dialogs
- 5 = Diagram / more

1	SystemConfig	Provides access to general system configurations like setup, display, or remote.
2	Remote	Shows the established remote connections when the instrument is remotely controlled. <b>Tip:</b> An indicator in the status bar shows the current remote control status.
3	Graphics	Shows that a signal is represented graphically.
4	Dialogs	Shows a dialog as a thumbnail, the dialog name, and the name of signal channel.
5	Diagram / more	The diagram icon as shown in <a href="#">Figure 8-2</a> minimizes all dialogs indicated on the screen. The block diagram is in the foreground. The "More" softkey indicates that more dialogs are open than can be displayed in the taskbar. Use this softkey to open a selection list with the remaining active dialogs, and the "Diagram" function.

### 8.3.4 Additional Display Characteristics

The following section provides a short insight on the indication of the screen in general, and significant elements that you see under specific operating modes, in dialogs or settings.

- **Appearance of active elements**
  - *Active* elements like On/Off switches, state buttons have a **blue** background.
  - *Selected* elements are framed or highlighted **orange**.
  - *Inactive* elements are **gray**.

- **On-Screen keypads**

As additional means of interacting with the instrument without having to connect an external keyboard, either a numerical or alphanumerical on-screen keypad appears when you activate an entry field (see [Chapter 8.5, "Entering Data"](#), on page 82).

- **Info line**

The "Info line" shows brief status information and error messages. It appears when an event generates a message.



- **Key parameters indicated in tab labels**

Most dialogs are divided into tabs with logically grouped parameters. The tab label expresses the content and can also contain status indicators or the set value of a key parameter.



1 = Status indicators

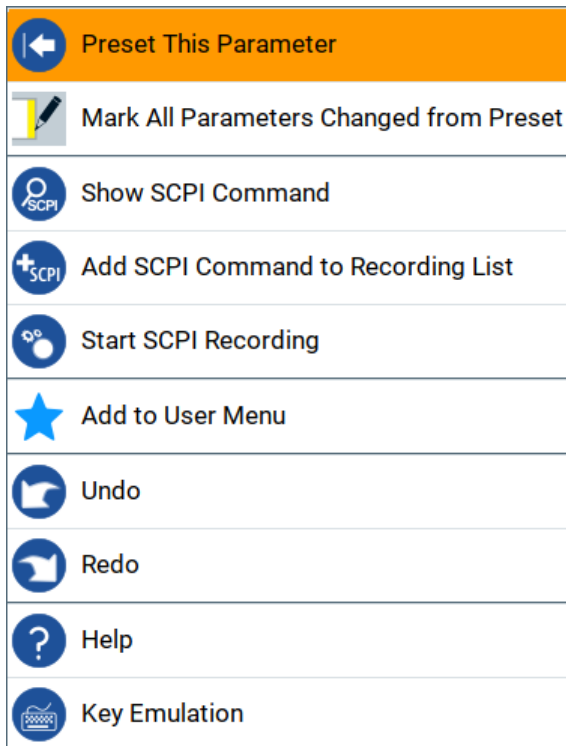
2 = Key parameter values

- **Scroll bar handle**

An arrow icon that appears when you touch a scroll bar helps you to scroll in a dialog or list.

- **Context-sensitive menus**

Within the entire screen display, including single parameters, you can access context-sensitive menus that provide some additional functions.



## 8.4 Accessing the Functionality

All functionalities are provided in dialog boxes as known from computer programs. You can control the instrument intuitively with the touchscreen. This section provides an overview of the accessing methods.

The instrument's functions and settings can be accessed by selecting one of the following elements:

- System and function keys on the front panel of the instrument
- Taskbar/softkeys on the touchscreen
- Context-sensitive menus for specific elements on the touchscreen, or with the rotary knob (press and hold).
- Elements on the status bar in the touchscreen
- Displayed setting on the touchscreen, that means block diagram and all settings available in dialogs.

### To open a dialog box

- ▶ Perform one of the following actions:

- Tap the required block, and then the menu entry.
- Tap the minimized view (thumbnail) on the taskbar.

Some of the utility keys access a dedicated dialog, too.

### To minimize a dialog box

- ▶ Tap the "Minimize" icon in the upper right corner.

### To close a dialog box

To close a dialog box, you have the same controls as you know from computers or devices with touchscreen.

- ▶ Perform one of the following actions:
  - Tap the "Close" icon in the upper right corner.
  - Press the [Esc] key on the front panel.
  - Drag and drop a minimized dialog from the taskbar to the block diagram.

### To select an option in a dialog box

- ▶ Tap the required option.

### To select an option in a list

If many options are available - for example, for the trigger mode - the options are provided in a list. The current selection is shown on the list button.

1. Tap in the list.
2. To navigate through the list, try out the following:
  - Using a mouse, scroll in the list, tap the required option.
  - Use the rotary knob.
  - Use [On/Off Toggle] key to select the succeeding option
  - Use the front panel keys:
    - a) Press the [Left/Right] arrow keys to navigate to the list button.
    - b) Press the [Enter] key to open the list.
    - c) Press the [Up/Down] keys to navigate to the required option in the list.
    - d) Press the [Enter] key to select the marked option.

## 8.5 Entering Data

Some parameters have their own key on the front panel.

For data input in dialog boxes, the instrument provides on-screen keypads for entering numeric and alphanumeric values. Thus, you can always set the parameters via the touchscreen, the front panel, or an external keyboard.

### Correcting an entry

1. Using the arrow keys, move the cursor to the right of the entry you want to delete.
2. Press the [Backspace] key.
3. Deletes the entry to the left of the cursor.
4. Enter your correction.

### Completing the entry

- ▶ Press the [Enter] key or the rotary knob.

### Aborting the entry

- ▶ Press the [Esc] key.  
The dialog box closes without changing the settings.

## 8.5.1 Entering Numeric Parameters

### To enter values with the on-screen keypad

For numeric settings, the instrument displays the numeric keypad. The units specified correspond to the units of the parameter.

1. Enter the numeric value.
2. Tap the unit button to complete the entry.  
The unit is added to the entry.
3. If the parameter does not require a unit, confirm the entered value by pressing "Enter".

### To enter values by using the front panel controls

1. Change the currently used parameter value by using the rotary knob or the [Up/Down] keys.
2. If the parameter does not require a unit, confirm the entered value by pressing the [Enter] key or any of the unit keys.  
The instrument highlights the editing line to confirm the entry.

If you edit numeric data in tables, the entry field must be in edit mode: Press [Enter], or the rotary knob to activate the edit mode.

## 8.5.2 Entering Alphanumeric Parameters

If a field requires alphanumeric input, you can use the on-screen keyboard to enter letters and (special) characters.

## 8.5.3 Undo and Redo Actions

Accessed via the context-sensitive menus, "Undo" allows you to restore one or more actions on the instrument. Depending on the available memory, the "Undo" steps can restore all actions.



"Redo" restores a previously undone action.

## 8.6 Getting Information and Help

In some dialog boxes, graphics are included to explain the way a setting works.

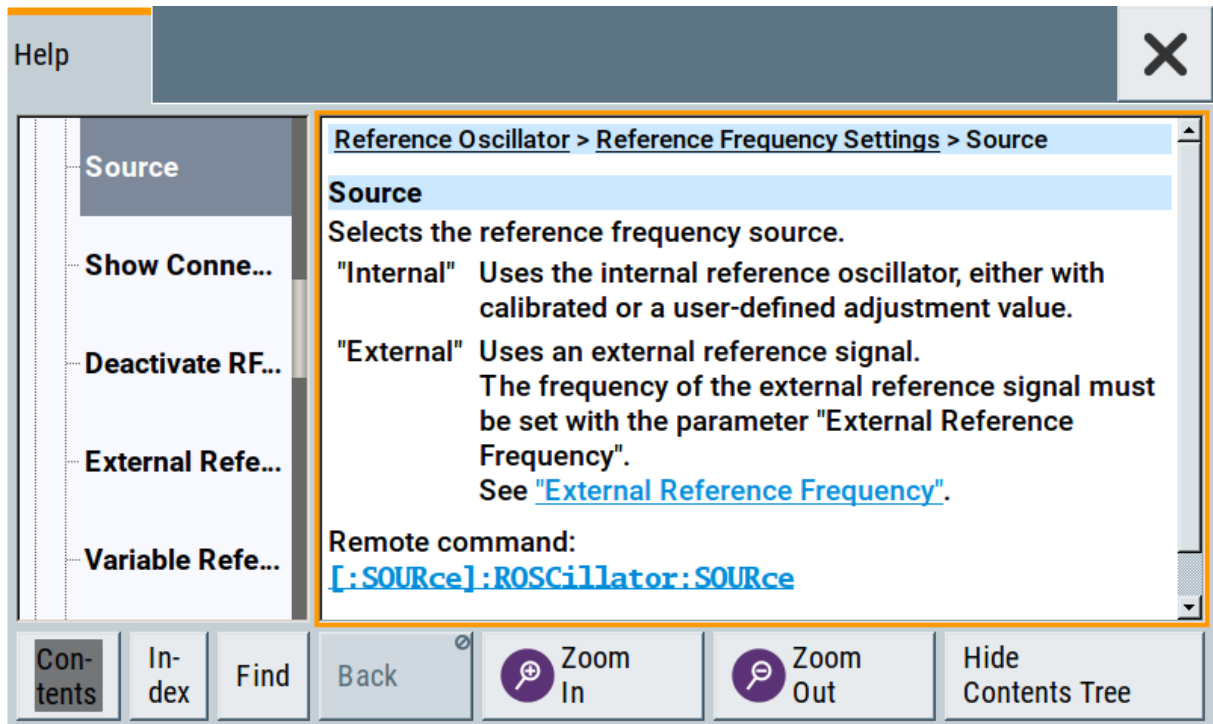
For further information, you can use the following sources:

- Tooltips give the value range of the parameter.
- The context help provides functional description on a setting.
- The general help explains a dialog box, provides instructions, and general information.

### To display context help

- ▶ To access a help topic, perform one of the following:
  - a) Tap and hold the parameter for which you need information and tap "Help" in the context menu.
  - b) Tap the parameter and press the [Help] key.

The "Help" dialog opens. You can browse the help for further information.



### Contents of the help dialog box

The help dialog box covers two main areas:

- "Contents" - contains a table of help contents
- "Topic" - contains a specific help topic

The help system also provides an "Index" and a "Find" area, and "Zoom" functions that are accessed via the corresponding buttons.

### To open general help

- ▶ Press the yellow [Help] key on the front panel.

If a dialog box is opened, the help topic for the current tab is shown. Otherwise the "Contents" page appears.

### Navigating in the table of contents and in the help topics

1. To move through the displayed contents entries, tap on an entry and scroll or use a connected mouse or the [Up/Down] keys.  
Entries with a plus sign contain further entries.
2. To display a help topic, tap on the topic name or double click on the topic name or press the [Enter] key.
3. To follow a cross-reference, tap on the link text.
4. To return to the previous page, select "Back".  
This function scrolls back all steps you have performed before.
5. Use the "scroll bars" to shift the visible section of content shown.
6. To maximize the "Topics" area, tap the "Hide Contents Tree" button to hide the contents tree.

### Using the index

1. Select the "Index" button.
2. Enter the first characters of the topic you are interested in.  
The entries starting with these characters are displayed.
3. Tap on the index entry.  
The corresponding help topic is displayed.

## 8.7 Remote Control

In addition to working with the R&S SMBV100B interactively, located directly at the instrument, it is also possible to operate and control it from a remote PC.

The R&S SMBV100B supports various methods for remote control:

- Connecting the instrument to a LAN (see [Chapter 4.7, "Connecting to LAN"](#), on page 22)
- Using the LXI browser interface in a LAN
- Connecting a PC via the IEC-bus (IEEE 488) interface
- Remote control via the USB interface





For remote control over LAN or USB, you can use the R&S VISA (Virtual Instrument Software Architecture) library provided for download at the Rohde & Schwarz website <http://www.rohde-schwarz.com/rsvisa>.

How to configure the remote control interfaces is described in the user manual, chapter "Network and Remote Control Operation".

## 8.8 Remote Operation over VNC

The VNC is an application which can be used to access and control the instrument from a remote computer through a LAN connection. While the instrument is in operation, the instrument screen contents are displayed on the remote computer, and VNC provides access to all applications, files, and network resources of the instrument. Thus, remote operation of the instrument is possible.



### Instrument control from a remote computer

To access the basic utility functions of the R&S SMBV100B, perform a right mouse click on the block diagram and select "Key Emulation".

A key panel to the right of the block diagram gives access to the utility functions provided by the front panel keys.

The VNC is an add-on program, included in operating system Linux/Unix, and available as a free-of-charge download on the internet.

For more information, refer to the R&S SMBV100B user manual, chapter "How to Set Up Remote Operation via VNC".

## 9 Contacting Customer Support

### Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz equipment, contact one of our Customer Support Centers. A team of highly qualified engineers provides telephone support and works with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz equipment.

### Up-to-date information and upgrades

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish. We will make sure that you get the right information.

#### Europe, Africa, Middle East

Phone +49 89 4129 12345

[customersupport@rohde-schwarz.com](mailto:customersupport@rohde-schwarz.com)

#### North America

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