Quick Start Guide

Microwave Signal Generator

R&S® SMR20
1104.0002.20

R&S® SMR30
1104.0002.30

R&S® SMR27
1104.0002.27

R&S® SMR40
1104.0002.40

Printed in Germany

ROHDE & SCHWARZ

Test and Measurement Division

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Contents

ROHDE&SCHWARZ
EC Certificate of Conformity

CE

Certificate No.: 99042

This is to certify that:

Equipment type	Order No.	Designation
SMR20	1104.0002.20	Signal Generator 1 to 20 GHz
SMR27	1104.0002.27	Signal Generator 1 to 27 GHz
SMR30	1104.0002.30	Signal Generator 1 to 30 GHz
SMR40	1104.0002.40	Signal Generator 1 to 40 GHz
SMR-B1	1104.5485.02	Option: Reference Oscillator OCXO
SMR-B5	1104.3501.02/.03	Option: AM/FM/SCAN Modulator
SMR-B11	1104.4250.02	Option: Frequency Extension
SMR-B15	1104.4989.02	Option: RF Attenuator 20 GHz
SMR-B17	1104.5233.02	Option: RF Attenuator 40 GHz
SMR-B19	1104.6281.02	Option: Rear Connector
SMR-B20	1104.6381.02	Option: Rear Connector
SMR-B23	1104.5804.02	Option: IF Input 20 GHz

complies with the provisions of the Directive of the Council of the European Union on the approximation of the laws of the Member States

- relating to electrical equipment for use within defined voltage limits
  (73/23/EEC revised by 93/68/EEC)

- relating to electromagnetic compatibility
  (89/336/EEC revised by 91/263/EEC, 92/31/EEC, 93/68/EEC)

Conformity is proven by compliance with the following standards:

EN61010-1 : 1993 + A2 : 1995
EN50081-1 : 1992
EN50082-2 : 1995

Affixing the EC conformity mark as from 1999

ROHDE & SCHWARZ GmbH & Co. KG
Mühldorfstr. 15, D-81671 München

Munich, 2000-08-24

Central Quality Management FS-QZ / Becker

Contents of User Documentation for Microwafe Signal Generator R&S SMR

The user documentation describes the Mikrowave-Signal Generator R&S SMR and all options. It includes a printed Quick Start Guide and a CD-ROM with the complete operating and service manual in printable pdf-format.

The R&S SMR is equipped with a context-sensitive online help that offers a help page for each instrument function.

Quick Start Guide

The present quick start guide describes everything that is needed to put the instrument into operation and to get familiar with the generator. The quick start guide gives an introduction to remote control and manual control via external monitor, mouse and keyboard.

The quick start guide is subdivided into the data sheet plus 3 chapters plus index:

The data sheet informs about specifications and characteristics of the instrument.

Chapter 1 Describes the control elements and connectors on the front and rear panel as well as all procedures required for putting the instrument into operation.

Chapter 2 Gives an introduction the operating concept and typical applications of the R&S SMA.

Chapter 3 Describes key operating modes, the structure of the graphical interface and the principles of manual control.
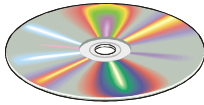
Chapter 4 Contains an index for the quick start guide.

Help System
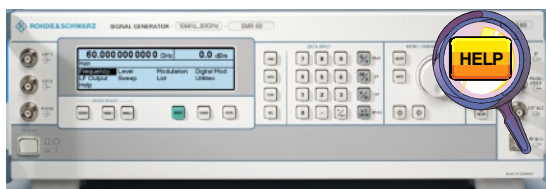
The help system is embedded in the instrument, offering quick, context-sensitive reference to the information needed for operation and programming. The help contains the complete user documentation for the R&S SMR including the contents of the present quick start guide.
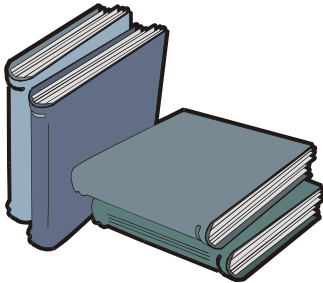
Documentation CD-ROM

The CD-ROM provides the complete user documentation for the Signal Generator:

- The complete operating manual and service manual in printable form (*.pdf).
- The data sheet (brochure and specifications) in printable form.

Links to different useful sites in the R&S internet.

Optional Documentation

Operating Manual

The operating manual contains comprehensive information about the instrument functions and remote control, in addition to the chapters of the quick start guide. It includes information about maintenance of the instrument and about error detection listing the error messages which may be output by the instrument. It is subdivided into 10 chapters:

Chapter 1	describes the control elements and connectors on the front and rear panel as well as all procedures required for putting the instrument into operation.
Chapter 2	gives an introduction to the operating concept and typical applications of the R&S SMR.
Chapter 3	describes key operating modes, the structure of the graphical interface and the principles of manual control.
Chapter 4	forms a reference for manual control of the R&S SMR and contains a detailed description of all instrument functions and their application. The chapter also lists the remote control command corresponding to each instrument function.
Kapitel 5	describes the basics for programming the R&S SMR, command processing and the status reporting system.
Chapter 6	lists all the remote-control commands defined for the instrument.
Chapter 7	contains program examples for a number of typical applications of the R&S SMR.
Chapter 8	describes preventive maintenance and the characteristics of the instrument's interfaces.
Chapter 9	gives the status messages and a list of error messages that the R&S SMR may generate.
Chapter 10	contains an index for the operating manual.

Service Manual Instrument

The service manual - instrument informs on how to check compliance with rated specifications, on instrument function, repair, troubleshooting and fault elimination. It contains all information required for the maintenance of R&S SMR by exchanging modules. In addition it describes how to perform a firmware update and how to install options.

1   Putting into Operation

This chapter contains all information about putting into operation (unpacking, connection to AC supply, switching on and off), functional testing and installation of the instrument, preset settings and views of the front and rear panel showing the controls and connectors needed for operation.

General Instructions

Before putting the SMR into operation, please make sure that

• the covers of the casing are put on and screwed,

• the ventilation openings are free,

• no signal voltage levels exceeding the permissible limits are applied at the inputs,

• the outputs of the instrument are not overloaded or connected incorrectly.

If these points are not observed, the instrument might be damaged.

Unpacking the Instrument
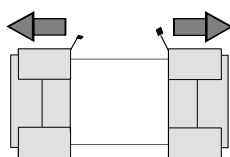
remove protective cabs

➢ Take the instrument out of the shipping box and check whether the items listed in the packing list and in the lists of accessories are all included.

➢ Remove the two protective caps from the front and rear of the SMR and carefully check the instrument for damage.

Should the instrument be damaged, immediately notify the forwarder who shipped the instrument to you and keep the box and packing material.

For further transport or shipment of the SMR the original packing should also be used. It is recommended to keep at least the two protective caps for front and rear side in order to prevent damage to the controls and connectors.

Setting up the Instrument

For applications in the laboratory or on a work bench, it is recommended that the support feet on the bottom of the instrument be extended. For the LCD display, this provides the optimum viewing angle which typically ranges from perpendicular to the display front to approximately 30° below.

Warning

The feet must be fully folded in or out. Only in this way can the stability of SML be guaranteed and reliable operation be ensured. With the feet out, the weight of other units put onto SML must not exceed 30 kg. The units must be secured against slipping (eg by locking the feet of the unit at the top side of the enclosure).

When shifting the unit with the feet out, the feet might collapse and fold in. To avoid injuries, the unit must therefore not be shifted with the feet out.

Supply Voltage

The SMR can be operated at a.c. systems from 100 to 120 V and 200 to 240 V at system frequencies from 50 to 60 Hz. The power supply socket is situated at the rear of the instrument. The instrument automatically sets itself to the voltage applied within the permissible voltage ranges. It is not necessary to set the instrument to a certain supply voltage.

How to Ensure EMC

In order to avoid electromagnetic interference, the instrument may only be operated when it is closed and with all shielding covers fitted. Only appropriate shielded signal and control cables may be used.
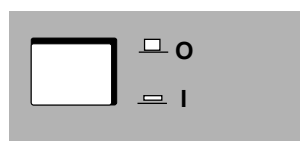
Power Fuses

The SMR is protected against short circuits by means of two fuses according to nameplate of the power supply. The fuses are situated in the draw-out fuse holder which is inserted close to the power supply socket (see below).

——————— Power supply socket

——————— Fuse holder
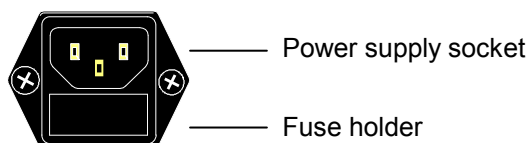
Power supply socket at the rear of the instrument

Switching On/Off the Instrument

Switch on: ➢ Press switch.
                  The instrument is ready for operation.

Switch off: ➢ Release switch.

On/Off switch at the front of the instrument

Initial Status

Upon switching on, the instrument automatically assumes the status which was set when it was switched off.
If the instrument need not to be operated from the initial status any further, a defined default status should be established by pressing the [PRESET] key prior to further settings.

Frequency accuracy after switching on when the oven-controlled reference oscillator is fitted (option SMR-B1)

The reference oscillator needs some minutes of warm-up time to reach its nominal frequency. During this period of time, the output frequency does not yet reach its final value either. In the status line in the header field of the display the message "OVEN COLD" is displayed for this time.

RAM With Battery Back-Up

The SMR has a static read-write memory (CMOS-RAM) with battery back-up, in which 50 different complete settings of the instrument can be stored (cf. Chapter 3, section "Storing and Calling of Instrument Settings"). In addition, all data and/or lists the user enters himself, such as for list mode, memory sequence, and user correction of the level, are stored in the RAM. Further, all data of the calibrations running within the instrument in the SMR are stored in the RAM (cf. Chapter 4, section "Calibration" and Service Manual Instrument). A lithium battery with a service life of approx. 5 years serves to supply the RAM with power. When the battery is discharged, the data stored will be lost. Exchanging the battery is described in the Service Manual Instrument.

Preset Setting

A defined setting status is achieved by pressing the [PRESET] key.

Preset Status:

RF frequency	10 GHz
RF level	-20 dBm
Reference frequency	internal, adjustment off
Offsets	0
Modulations	switched off
Transient-free level setting	switched off, level attenuator mode: Auto
Internal level control	level Alc: On
User correction	level Ucor: Off
LF output	switched off
Sweep	switched off
List mode	switched off
Memory sequence	switched off
Suppression of indications	system security: unaltered
Protection of calibration data	protection lock: unaltered
Settings stored	unaltered
Data, lists etc. stored	unaltered
IEC-bus address	unaltered

All parameters and circuit states, even those of operating modes which are not activated, are preset by means of Preset. The presettings going beyond the above list can be seen from the menu representations as of Chapter 4 which each indicate the Preset setting status.

Functional Test

On switching on the instrument and permanently during operation, the SMR carries out a self test. The ROM contents as well as the battery of the non-volatile RAM are checked. The most important instrument functions are automatically monitored during operation. If an error is detected, the message "Err" is displayed in the status line. For further identification of the error, press the [ERROR] key. Thereupon a description of the error is displayed (cf. Chapter 9, section "Error Messages"). Return to the menu exited by pressing the [BACK] key. If required, internal test points can be polled by the user and the results be read out and displayed. Cf. Service Manual Instrument.
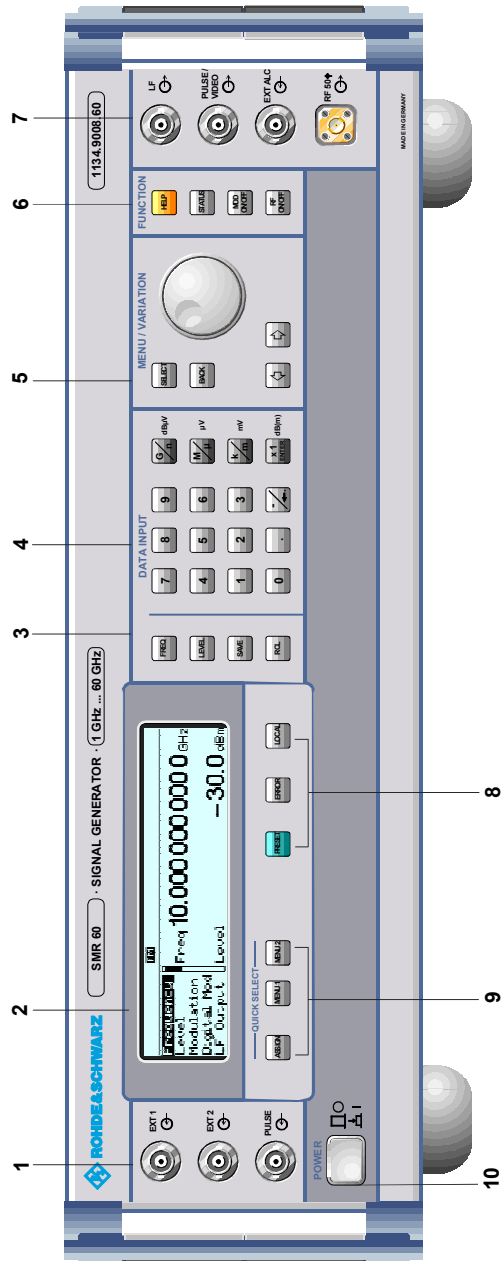
Mounting into a 19" Rack

Caution: *Ensure free air inlet at the perforation of the side walls and air outlet at the rear of the instrument in rack mounting.*

The SMR can be mounted into a 19" rack by means of rack adapter ZZA-94 (stock no. 396.4905.00). The mounting instructions are attached to the adapter.

Explanation of Front and Rear Panel

Elements of the Front Panel

1

EXT1   Input external modulation signal alternatively for AM, FM, ASK and FSK.

EXT2   Input external modulation signal alternatively for AM and FM.

PULSE   Input for triggering the pulse generator or for direct control of the pulse modulation.

2   DISPLAY

Cf. Chapter 3 for the design of the display.

3

Parameter field

Parameters RF frequency and RF level can be entered directly by means of the parameter keys, alternatively to menu operation. Further, complete instrument settings can be stored and called.

FREQ   Opens the setting of the RF frequency via value input or variation by means of a rotary knob. The current menu is maintained. Return to the menu by means of the [BACK] key. (Setting of the RF frequency also in the FREQUENCY menu).

LEVEL   Opens the setting of the RF level via value input or variation by means of a rotary knob. The current menu is maintained. Return to the menu by means of the [BACK] key. (Setting of the RF level also in the LEVEL menu).

SAVE   Opens the storing of the current instrument setting. Memory selection is effected by entering a number (1 to 50) and is finished by means of the [x1/ENTER] key.

RCL   Opens the calling of an instrument setting stored. Memory selection is effected by entering a number (1 to 50) and is finished by means of the [x1/ENTER] key.
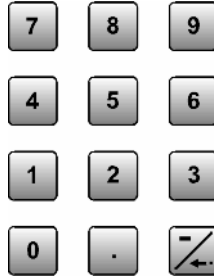
⇒   Cf. Chapter 3, Sections "Use of [FREQ] and [LEVEL] Keys", "RF Frequency", "RF Level" and "Storing and Calling of Instrument Settings".

Fig. 1-1   Front panel view
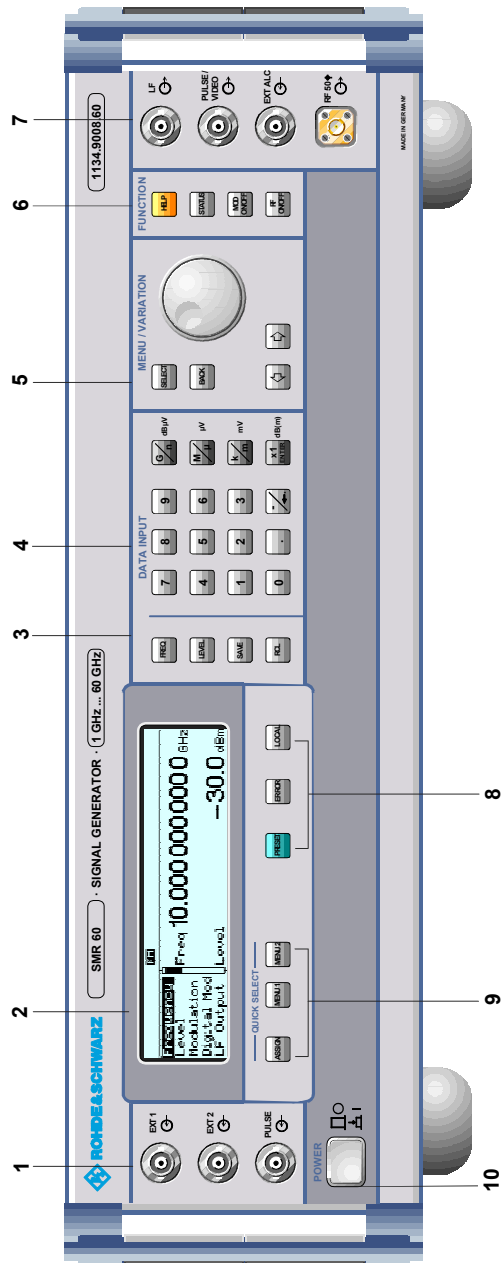
4   DATA INPUT

Numeric input field

Numeric values, decimal point and minus sign can be entered by means of the digital keys.

0...9   Enters the digit.

•   Enters the decimal point

-/←   Enters the minus sign.

              Deletes the last input (digit, sign or decimal point)
              - key [BACKSPACE]

Unit keys with enter function

The unit keys terminate the input of values and specify the multiplication factor for the respective basic unit.

The basic units are displayed next to the input field while numbers are entered. In the case of level settings, the unit keys specify the unit.

G/n   dBμV   Selects giga/nano, with RF level dBμV.

M/μ   μV   Selects mega/micro, with level μV.

k/m   MV   Selects kilo/milli, with level mV.

1x
Enter   dB(m)   Terminates entries in the basic unit and value inputs without unit.

                      Selects with level dBm.

                      Selects with level offset and level step width dB.

In order to change to another level unit, simply press the unit key desired. Parameter LEVEL must be activated, e.g. by pressing the [LEVEL] key.

⇒   Cf. Chapter 3, Section "Change Unit of Level".
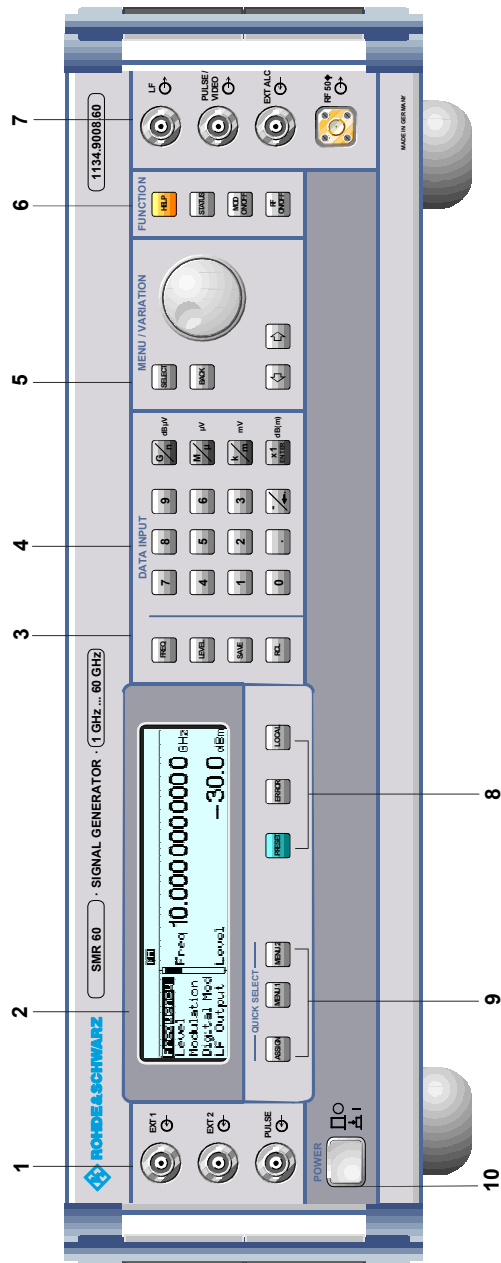
Fig. 1-1   Front panel view

Fig. 1-1   Front panel view

5   *MENU/VARIATION*

Menu keys

The menu keys access the menus and settings within the menus.

SELECT	Acknowledges the choice marked by the menu cursor.
BACK	Returns the menu cursor to the next higher menu level.
⇐	Moves the digit cursor to the left by one position in the marked value indication. Moves the menu cursor to the left by one position in a 1-out-of-n selection.
⇒	Moves the digit cursor to the right by one position in the marked value indication. Moves the menu cursor to the right by one position in a 1-out-of-n selection.

Rotary knob

The rotary knob moves the menu cursor over the positions of a menu level to choose from, or varies the value of a parameter. The variation is either effected in steps of one or in a step width that can be specified at will.

Furthermore, by pressing the rotary knob when the cursor marks a menu position, the lower menu level or the setting menu is displayed (cf. function of [SELECT] key).

⇒   Cf. Chapter 2, Section "Sample Setting for First Users" and Chapter 3, Section "Basic Operating Steps".
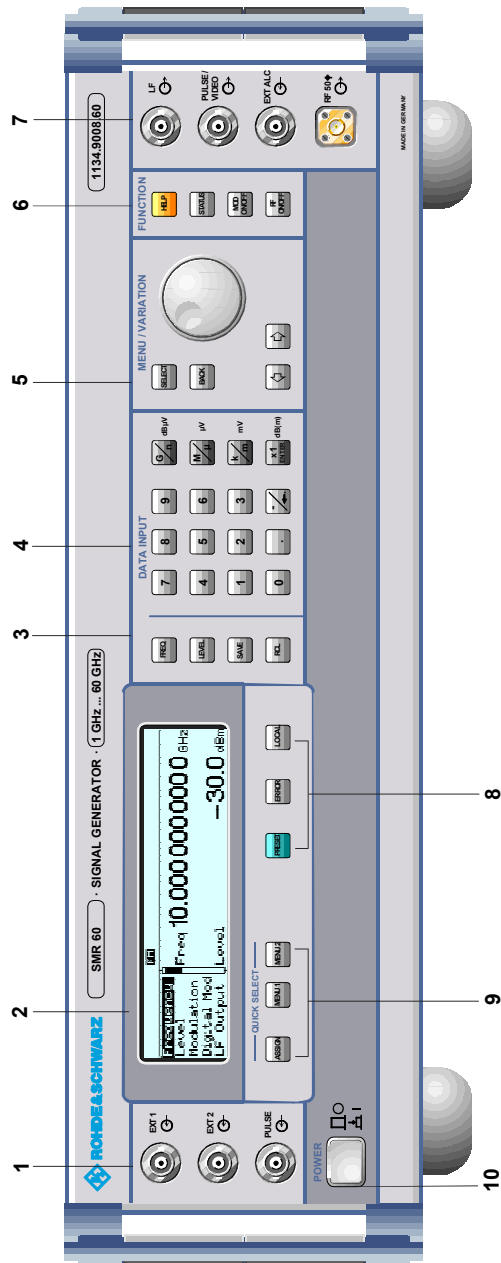
6   FUNCTION

HELP*	Indicates context-sensitive auxiliary text.
STATUS*	Indicates the instrument status.
MOD ON/OFF	Switches on/off the modulation selected in Utilities - ModKey.
RF ON/OFF	Switches on/off the RF signal.

⇒   Cf. Chapter 4, Sections "The Help System", "Status", and Chapter 3, Section "Use of [MOD ON/OFF] and [RF ON/OFF] keys".

* Exit the menus using the [BACK] key.

7

LF	Output LF signal of the internal LF-generator.
PULSE/VIDEO	Output of pulse generator or video output (only with Option SMR-B14).
EXT ALC	Input detection voltage of an external level detector.

⇒   Cf. Chapter 4, Section "Switch On/Off Internal Level Control", Section "Pulse Modulation" and Section "[RF ON/OFF] Key".

8

PRESET	Establishes a defined instrument status.
ERROR*	Indicates error and caution messages.
LOCAL	Switches the instrument from the REMOTE mode (remote control) to the LOCAL mode (manual control).

⇒   Cf. Chapter 1, Section "Preset Settings", Chapter 9, "Error Messages" and Chapter 6, "Remote Control".

* Exit the menus using the [BACK] key.

Fig. 1-1   Front panel view
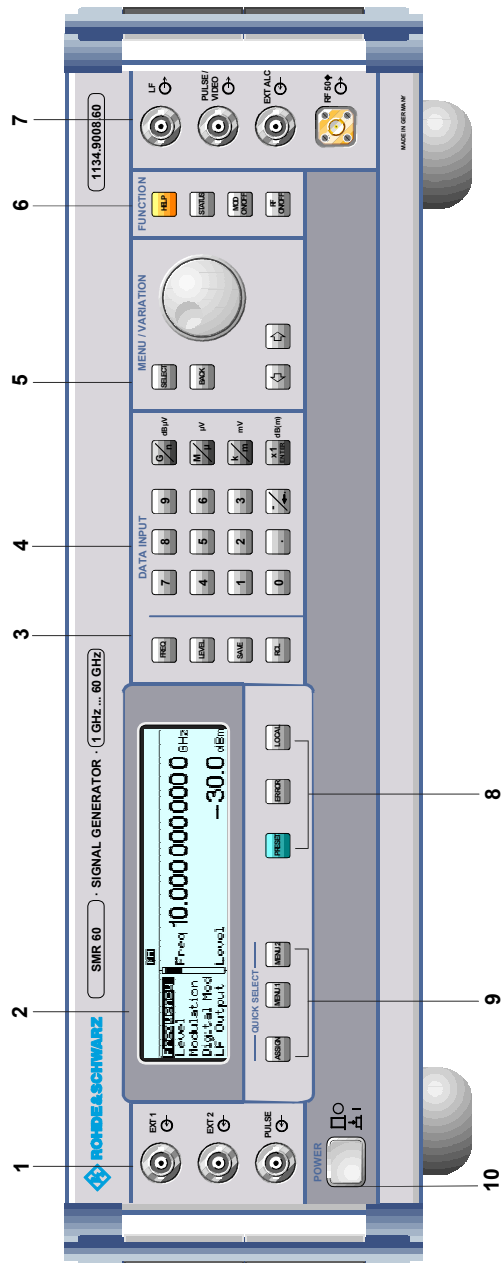
Fig. 1-1   Front panel view

9   QUICK SELECT

The menu-quick-selection keys permit fast access to two menus selected.
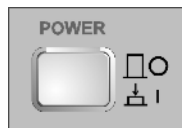
ASSIGN   Stores the current menu as menu1 when the MENU1 key is pressed afterwards or as menu2 when the MENU2 key is pressed afterwards.

MENU1   Activates menu1 stored.

MENU2   Activates menu2 stored.

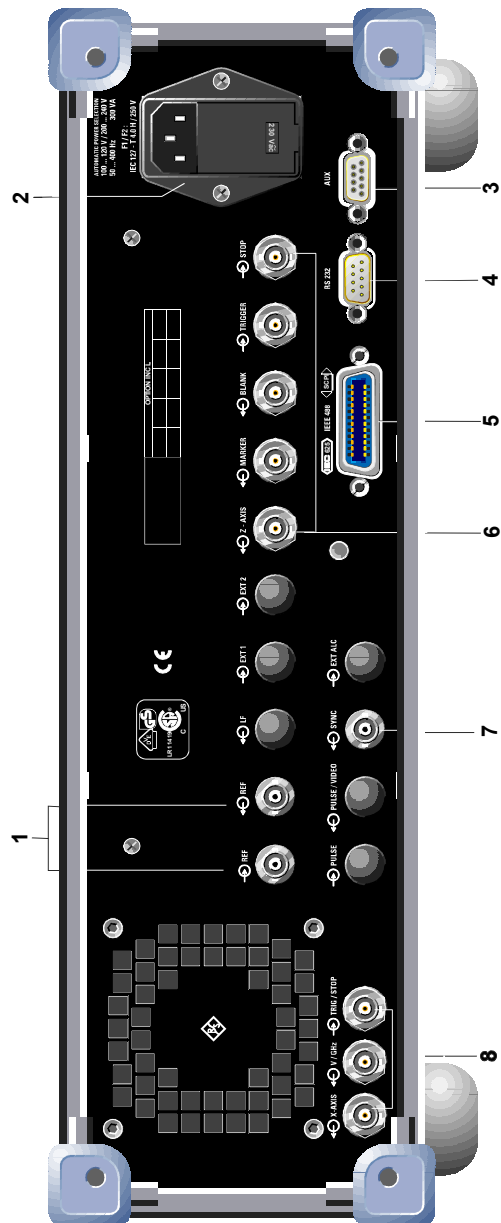⇒   Cf. Chapter 3, Section "Quick Selection of Menu (QUICK SELECT)".

10   ON/OFF SWITCH

The On/Off switch switches the instrument on ("I") or off ("O").

⇒   Cf. Chapter 1, Section "Switching On/Off the Instrument".
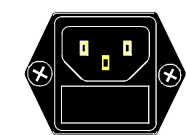
Elements of the Rear Panel

1

REF   Output of the internal 10-MHz-reference signal with reference internal.
Input for external reference frequency 10 MHz with reference external. LF   Output LF signal of the internal LF-generator.LF   Output LF signal of the internal LF-generator.

⇒   Cf. Chapter 4, Sections "LF Output" and "Internal/External Reference Frequency (REF OSC)".

2

Power supply connector and

fuse holder

⇒   Cf. Chapter 1, Section "Power Fuses".

3   AUX

Interface for direct control of additional, external devices.

Pin	Designation	Assignment
1	MARKER	Marker signal output for sweep mode.
2	BLANK	Blanking signal input for sweep mode.
3	TRIGGER	Trigger input for sweep, memory sequence and list modes.
4	STOP	Input for stopping the sweep.
5	Z-AXIS	combined MARKER/BLANK signal.
6 - 9	GROUND	

Fig. 1-2   Rear panel view
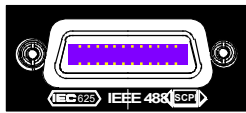
Fig. 1-2   Rear panel view
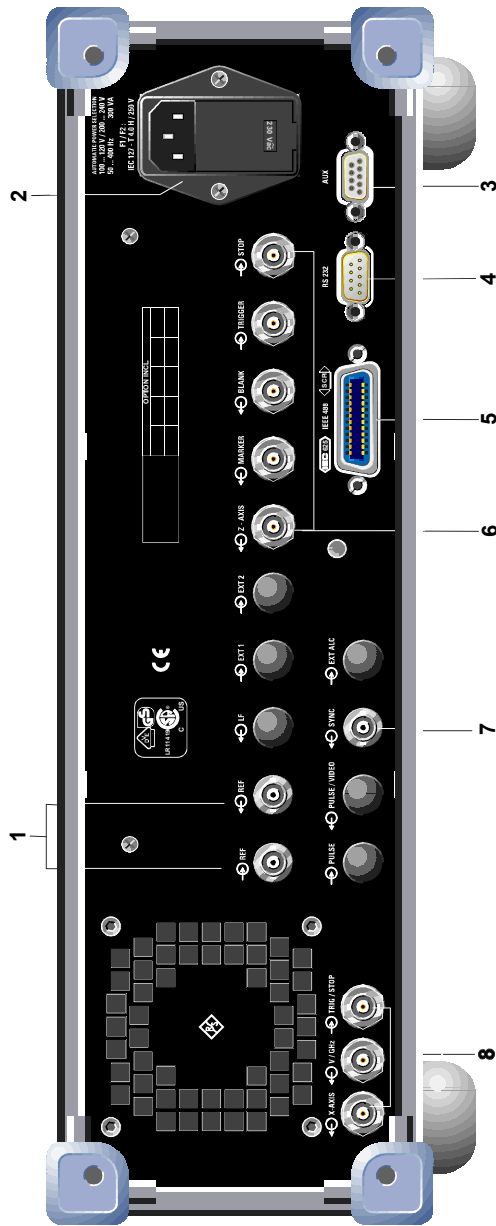
4
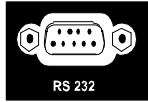
RS-232   RS-232-C interface
used for software update and remote control. The pin assignment corresponds to the pin assignment of a PC.

⇒   Cf. Chapter 5, Section "Interface RS-232-C".

5

IEC 625   IEC-bus (IEEE 488)

IEEE 488   Interface for Remote Control

⇒   Cf. Chapter 5 "Remote Control".

6

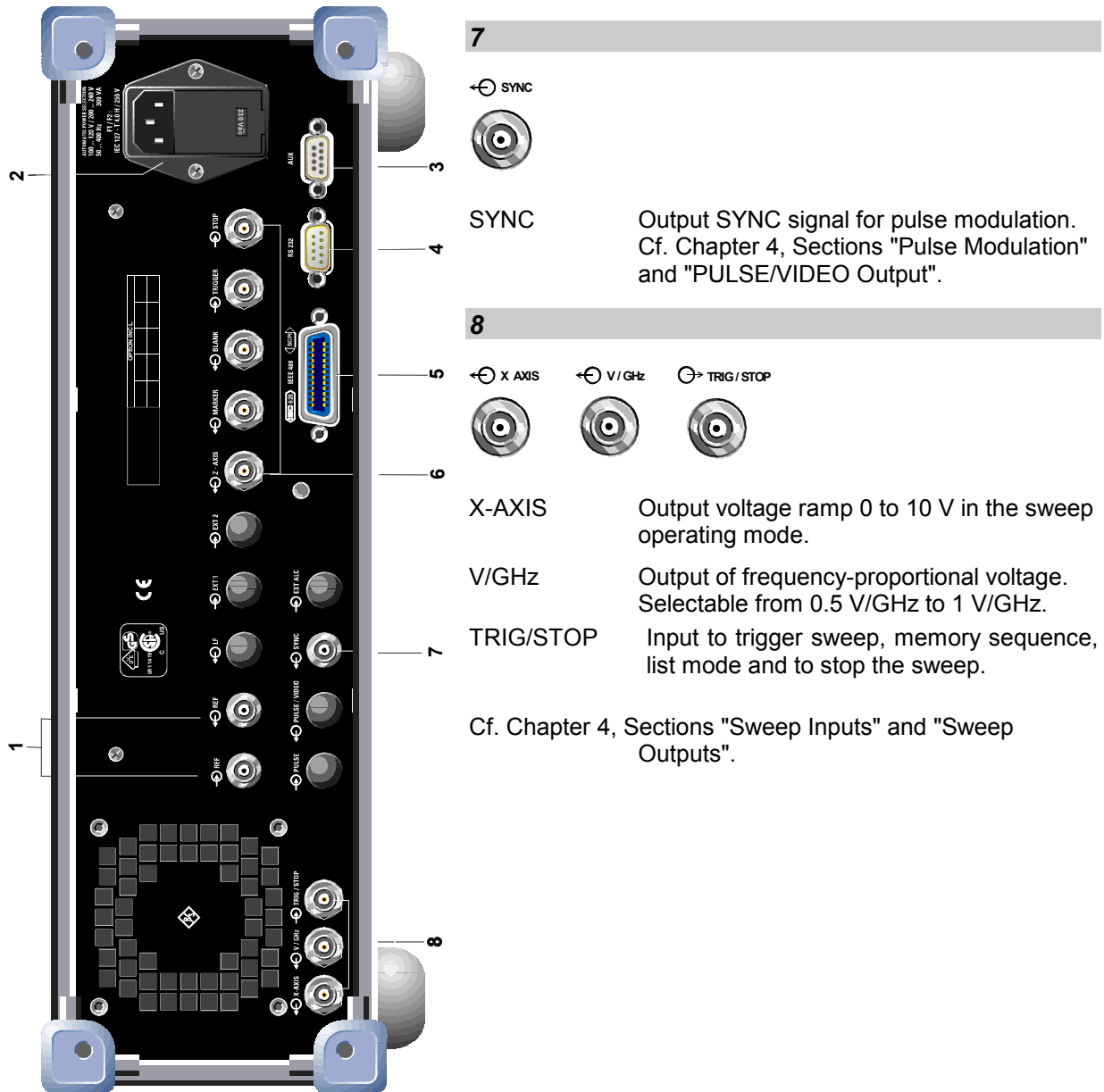|	
MARKER	Marker signal output for sweep mode.
BLANK	Blanking signal input for sweep mode.
TRIGGER	Trigger input for sweep, memory sequence and list modes.
STOP	Input for stopping the sweep.
Z-AXIS	combined MARKER/BLANK signal.

Fig. 1-2   Rear panel view

7

SYNC   Output SYNC signal for pulse modulation.
                    Cf. Chapter 4, Sections "Pulse Modulation"
                    and "PULSE/VIDEO Output".

8

X-AXIS   Output voltage ramp 0 to 10 V in the sweep
                    operating mode.

V/GHz   Output of frequency-proportional voltage.
                    Selectable from 0.5 V/GHz to 1 V/GHz.

TRIG/STOP   Input to trigger sweep, memory sequence,
                     list mode and to stop the sweep.

Cf. Chapter 4, Sections "Sweep Inputs" and "Sweep
                    Outputs".

2   Short Tutorial

The present chapter contains a short tutorial with sample settings allowing the users to operate immediately the instrument.

Sample Setting for First Users

Setting frequency and level of the RF output signal

First frequency and level of the RF output signal are set via keys [FREQ] and [LEVEL] in the DATA INPUT field:
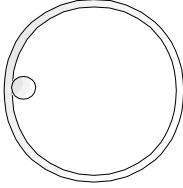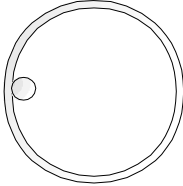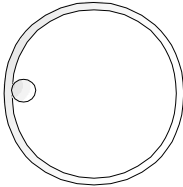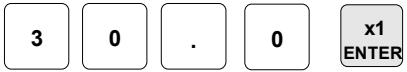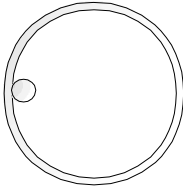
- frequency   2.5 GHz
- level   10 dBm
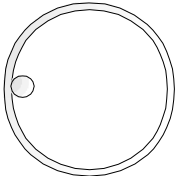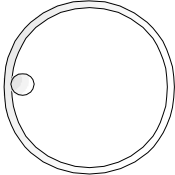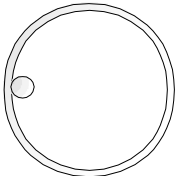
Operating steps	Explanations
MENU / VARIATION PRESET SELECT	Reset the instrument to the defined state.
DATA INPUT FREQ 2 . 5 G/n **[dBμV]**	Set the frequency to 2.5 GHz. The menu cursor marks the permanent frequency indication.
DATA INPUT LEVEL 1 0 x1 ENTER **dB(m)**	Set the level to 10 dBm. The menu cursor marks the permanent level indication.
BACK	Reset the menu cursor to the menu field.

AM modulation of the output signal

The output signal is to be amplitude-modulated next.

- AM modulation depth   30 %
- AM signal   1-kHz sine

Operating steps	Explanations
MENU / VARIATION MENU / VARIATION Modulation [SELECT]	Select menu Modulation using rotary knob. Press [SELECT] key or rotary knob. The submenu is displayed.
MENU / VARIATION MENU / VARIATION AM [SELECT]	Select submenu AM. Press [SELECT] key or rotary knob. The AM setting menu is displayed.
MENU / VARIATION MENU / VARIATION AM Depth [SELECT]	Select parameter AM Depth using rotary knob. Press [SELECT] key or rotary knob. The menu cursor marks the setting value.
DATA INPUT [3] [0] [.] [0] [x1 ENTER]	Enter modulation depth 30 % and acknowledge using [x1/Enter] key.
[BACK]	Reset menu cursor to AM Depth using [BACK] key.
MENU / VARIATION MENU / VARIATION AM Source [SELECT]	Select AM Source using rotary knob. Press [SELECT] key or rotary knob. A pop-up menu displays the current 1-out-of-n selection.
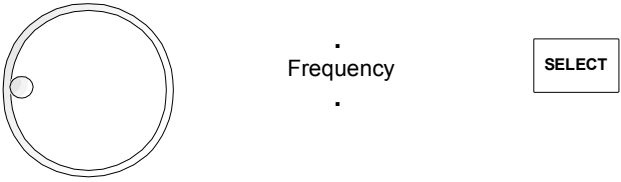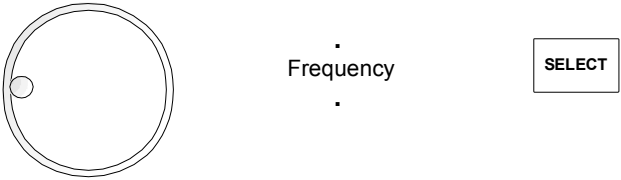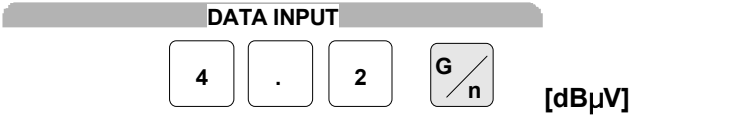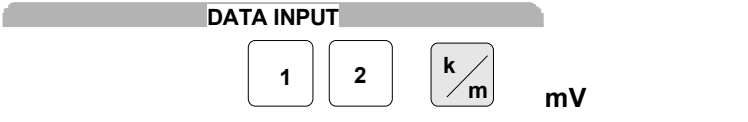
Operating steps		Explanations
MENU / VARIATION . LFGen .	MENU / VARIATION SELECT	Select LF generator as modulation source using rotary knob. The selection mark marks LFGen. Press [SELECT] key or rotary knob. The cursor is set back to AM Source.
BACK		Press [BACK] key.
MENU / VARIATION . LFGen Freq .	MENU / VARIATION SELECT	Select parameter LFGen Freq using rotary knob. Press [SELECT] key or rotary knob. The menu cursor marks the current frequency selection.
MENU / VARIATION . 1k .	MENU / VARIATION SELECT	Set the frequency of the LF generator to 1 kHz. The selection mark marks 1 kHz. Press [SELECT] key or rotary knob. The AM modulation setting is completed. The indications on the display are represented in Fig. 2-1.
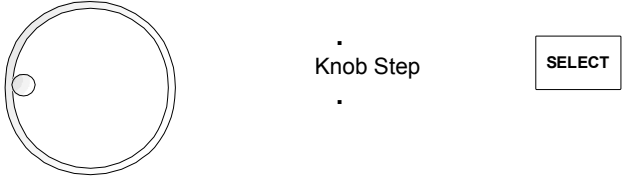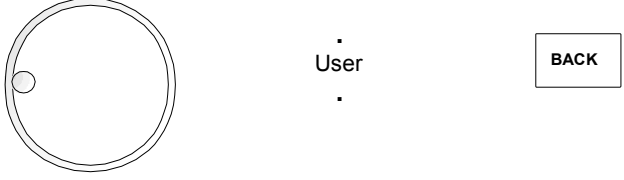
```
 10.000 000 000 0  GHz        -20.0  dBm
Modulation/AM
AM Depth                              30.0 %
AM Source                                Off
Scan State                               Off
Ext1 Coupling                             AC

Ext2 Coupling                             AC
Ext1 Impedance                       100 KΩ
Ext2 Impedance                       100 KΩ
Lfgen Freq                        1.0000 kHz
Lfgen Shape                              Sin
Back ↵
```

Fig. 2-1   Display for AM setting

Setting the step width

Subsequently to the above setting, 4.2 GHz as new RF frequency and 12 kHz as the step width for the RF frequency variation are set in the following.

Operating steps	Explanations
BACK BACK BACK	Reset the menu cursor to the main menu in 3 steps.
MENU / VARIATION MENU / VARIATION . Frequency SELECT .	Select menu Frequency using rotary knob. Press [SELECT] key or rotary knob. The frequency setting menu is displayed.
MENU / VARIATION MENU / VARIATION . Frequency SELECT .	Select parameter Frequency. Press [SELECT] key or rotary knob. The menu cursor marks the setting value.
DATA INPUT 4 . 2 G/n [dBµV]	Enter frequency 4.2 GHz. Press [SELECT] key or rotary knob. The menu cursor is set back to Frequency.
BACK	Press [BACK] key. The menu cursor is set back to Frequency.
MENU / VARIATION MENU / VARIATION . Knob Step User SELECT .	Select parameter Knob Step User using rotary knob. Press [SELECT] key or rotary knob.
DATA INPUT 1 2 k/m mV	Enter step width 12 kHz.
BACK	Press [BACK] key. The menu cursor is set back to Knob Step User.

Operating steps	Explanations
MENU / VARIATION • Knob Step • **MENU / VARIATION** [SELECT]	Select parameter Knob Step using rotary knob. Press [SELECT] key or rotary knob. A pop-up menu displays the available settings.
MENU / VARIATION • User • [BACK]	Select User (user-defined step width) using rotary knob. This results in step width 12 kHz being used in the case of variation using the rotary knob. Press [BACK] key. The menu cursor is set back to Knob Step.

```
 10.000 000 000 0 GHz        -20.0 dBm
Frequency
Frequency                  10.0000000000 GHz
Offset                              0.0 Hz
Multiplier                          1.0

Knob Step User                 12.0000 KHz
Knob Step                            User
Exclude from Recall                   Off
Back ↵
```

Fig. 2-2   Display after pattern setting

3   Manual Operation

This chapter shows the design of the display and describes the manual control of the microwave signal generator, for example calling up of menus, selection and editing of parameters, use of the list editor and the SAVE/RECALL function. This chapter also contains an overview of menus showing the functions available for the instruments and its options.

It is useful to read the sample settings for first users in Chapter 2, "Short Tutorial".

Design of the Display

(1)	**10.000 000 000 0** GHz **-20.0** dBm
(2)	Main
(3)	Frequency Level Modulation Digital Mod LF Output Pulse Output Sweep List Utilities Help

Fig. 3-1   Design of the display

(1) Header field   The header field of the display indicates frequency and level of the RF output signal. In the RF-sweep operating mode, the start and stop frequencies are displayed in two lines one above the other. The start and stop levels are indicated in the LEVEL-sweep operating mode correspondingly. With User Correction On, the current frequency and the corresponding correction value are indicated in two lines.

(2) Status line   The status line indicates at the left the menu path of the current menu and at the right the operating mode and operating state of the instrument. Error messages and notes for caution are also displayed in the status line.

(3) Menu fields   The indication fields below the status line are reserved for the menu representations. The image contents of these fields change as a function of the menu selected.

The lowest menu level shows the setting menu with the current settings of the selected menu. Settings are made in select or input windows which open when the current setting is activated.

Menu cursor   The menu cursor shows the user at which position in the menu he is. The position of the menu cursor is evident from the inverse notation of the term (white characters on a black background).

Digit cursor   As a bright field, the digit cursor marks the position which can be varied by means of the rotary knob in a value indication.

Basic Operating Steps

To operate the instrument, menus are called in the display. All setting possibilities and the current setting status are evident from the menus. All settings can be made by accessing the menus.
RF frequency and RF level can also be set without menu operation using keys [FREQ] and [LEVEL].
RF signal and modulation can also be switched on/off without menu operation using keys [RF ON/OFF] and/or [MOD ON/OFF].

Calling the menus

Accessing the menus is effected using rotary knob [VARIATION], [SELECT] key and [BACK] key.

Rotary knob   Rotary knob [VARIATION] moves the menu cursor over the positions of a menu level to be selected.
If a scrollbar is visible at the right-hand margin of a menu, the menu is larger than the screen window. If the menu cursor is moved to the margin of the screen window, the covered lines become visible.

If the rotary knob is pressed after a position has been selected, the lower menu level or the respective settings are called. The rotary knob hence has the same function as the [SELECT] key.

If the rotary knob is pressed while [BACK] is selected, the menu cursor wraps back to the menu last called.

[SELECT] key   The [SELECT] key acknowledges the selection marked by means of the menu cursor. Depending on the position, the next lower menu level or the the respective setting is called.

[BACK] key   The [BACK] key

- returns the menu cursor to the next higher menu level; the menu cursor is shifted to the left into the preceding column of the menu structure,
- resets the menu cursor from frequency or level value indication in the header field into the menu field to the menu called last,
- closes the display pages called using keys [STATUS], [HELP] and [ERROR] again.

Settings are accessed in the setting menus ending with the right-hand display margin.
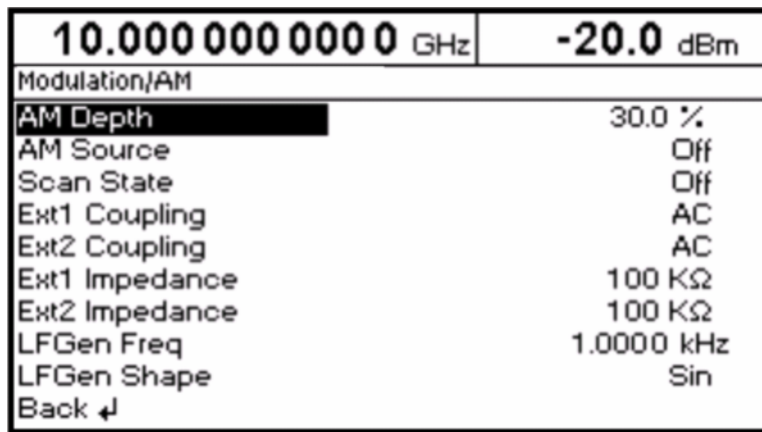
Fig. 3-2   Modulation - AM Menu

Selection and Change of Parameters

Select parameter
> ➢ Set the menu cursor to the name of the parameter desired using the rotary knob, e.g. to AM Depth in the AM menu, cf. Fig. 3-2.

Change setting value
> ➢ Select parameter.
>
> ➢ Press [SELECT] key or rotary knob.
> The menu cursor changes from the parameter selected in the left-hand column of the setting menu to the setting value on the right, e.g. from AM Depth to 30%, cf. Fig. 3-2.

Via value inputs
> ➢ Press the first digit of the new value or minus sign.
> The old value is deleted, the entry is indicated in the marked field.
>
> ➢ Enter further digits.
>
> ➢ Terminate the input using a unit key or, in the case of inputs in the base unit or in the case of inputs without unit, using the [1x/Enter] key.
>
> ➢ Press [BACK] key or mark selection BACK using rotary knob and then press rotary knob.
>
> The menu cursor wraps back to the appropriate parameter.

Using rotary knob
> ➢ Set the digit cursor (bright field) to the position of the setting value to be varied using keys [⇨] [⇦].
>
> ➢ Turn rotary knob.
> The value is varied in steps of 1.

> *Note:* *RF frequency and RF level can also be varied in a step width which can be defined arbitrarily, using the rotary knob. In the respective setting menu (Frequency or Level), the step width is entered as Knob Step User and the Knob Step set from Decimal to User. To point to the fact that the step width has been converted to the value programmed, the bright field as a symbol of the digit cursor disappears in the respective value indication.*

1-out-of-n selection   ➢ Select parameter.

➢ Press [SELECT] key or rotary knob.
A pop-up menu displays a selection of settings.

➢ Set the menu cursor to the position desired within the 1-out-of-n selection using the rotary knob or cursor keys [⇐] [⇒].

➢ Press [SELECT] key or rotary knob.
The setting is made.
The pop-up menu is closed and the current setting is indicated at the right margin of the display.

➢ Press [BACK] key or mark selection BACK using rotary knob and then press rotary knob.

The menu cursor wraps back to the next higher menu level.

Quick Selection of Menu (QUICK SELECT)

The keys of the QUICK SELECT control field are used to call selected menus quickly by one keystroke.

Store menus   ➢ Establish the desired operating status of the current menu.

➢ Press [ASSIGN] key.

➢ Press [MENU1] or [MENU2] key.
The current menu is stored as menu1 or menu2. That is to say, 2 menus can be stored in total.

Call menus   ➢ Press [MENU1] or [MENU2] key.
Menu1 or menu2 stored is displayed. Exactly the operating status which was current at the point of time of storing is reconstructed.

Use of [FREQ] and [LEVEL] Keys

RF frequency and RF level can be set without menu operation as well using direct keys [FREQ] and [LEVEL].

[FREQ] / [LEVEL] keys   ➤ Press [FREQ] or [LEVEL] key.
The frequency or the level indication in the header field of the display is marked. The current menu at the display is maintained.

➤ Alter the value via a value input or the rotary knob.

➤ Press [BACK] key or rotary knob.
The menu cursor wraps to the position marked last in the menu.

Use of [RF ON/OFF] and [MOD ON/OFF]

RF signal and modulation can be switched on/off without menu operation as well using keys [RF ON/OFF] and/or [MOD ON/OFF] (cf. Sections "[RF ON/OFF] Key" and "[MOD ON/OFF] Key").

[RF ON/OFF] key   ➤ Press [RF ON/OFF] key.
The RF output signal is switched on/off.

IEC/IEEE-bus short command: `:OUTP:STAT ON`

[MOD ON/OFF] key   ➤ Press [MOD ON/OFF] key.
Modulation is switched on/off.

A direct IEC-bus command is not available. The modulations have to be switched on and off in the respective modulation submenus.

Changing Unit of Level

For the level, the unit of the value set can be changed without a new value input.

Change level unit   ➤ Activate Level parameter.

- Press [LEVEL] key or

- set menu cursor in the level menu to the setting value of the Amplitude parameter.

➤ Press the unit key with with the desired level unit.
The level is indicated in the desired unit.

Correction of Input

Digits can be corrected by one of the following keys before the input is confirmed by the [Enter] key:

Key [-/←] The backspace key deletes the value entered digit by digit. When the last digit is deleted, the previous value is displayed.

[BACK] key Pressing the [BACK] key deletes the entire entry and results in the previous value being indicated again.

For a subsequent new input in the setting menu, the menu cursor is to be set to the setting value again using the [SELECT] key.

For a subsequent new input via the [FREQ] or [LEVEL] keys, the respective key has to be pressed again.

[FREQ]/[LEVEL] keys In the case of a frequency or level input by means of the [FREQ] or [LEVEL] keys, pressing the [FREQ] and/or [LEVEL] key again deletes the entire input.

List Editor

The SMR offers the facility of generating lists for automatic sequences (list mode, memory sequence) or for user-defined level correction (Ucor). The lists consist of elements (pairs of values) which are defined by an index and at least one parameter per index. Each list is assigned a separate name and selected by means of this name. Access to the lists is made in the associated menus. For example, sequences of frequency and level value pairs can be accessed in the List menu. How to generate and edit lists is explained in detail in this section by the example of the List mode (List menu, see Fig. 3-3).

Menu selection: List

```
 10.000 000 000 0 GHz      -20.0 dBm
List
Mode                                    Off
Reset List
Dwell                               15.0 ms
Current Index                           1
Select List                           List0
Delete List
Edit List                            Insert
Attenuator Mode                       Auto
Atten Fixed Range    -35.0 dBm  to unleveled
Back ↵
```

Fig. 3-3   List menu

The settings for Mode, Reset List, Current Index etc are not relevant for the general description of the list editor. They are described in greater detail in chapter 4 in section "List Mode".

The Select List, Delete List and Edit List lines are always displayed. They are intended for the selection and deletion of lists and for the calling of editing functions.

Select List   Opens a window in which a list out of 10 lists can be selected. In this line, the currently active list is displayed (see section "Select List").

Delete List   Opens a window from which a list can be selected whose contents are to be deleted (see section "Delete List").

Edit List   Selection of editing functions for list editing. When this item is selected, a pop-up menu with the following editing functions opens (see section "Edit List"):

       Insert   Insertion of elements into a list

       Fill   Filling of a list with elements

       Edit/View   Editing of individual elements of a list

       Delete   Deletion of elements of a list

Attenuator Mode   Auto   Normal setting. The mechanically switched attenuator switches in steps of 10 dB at fixed points.

                             IEC/IEEE bus command   `:OUTP:AMOD AUTO`

                Fixed   Level settings are made without switching the attenuator (see section "Non-Interrupting Level Setting").

                             IEC/IEEE bus command   `:OUTP:AMOD FIX`

Atten Fixed Range   Indicates the level range of non-interrupting level setting in "Attenuator Mode Fixed".

Select List

➢ Mark the desired list using the rotary knob (see Fig. 3-4).

➢ Press the [SELECT] key or the rotary knob.

   The selected list is included in the instrument setup. The selection window is closed. The selected list is displayed under Select List.

Selection: Select List

```
┌─────────────────────────────────────────────┬──────────────────────┐
│    11.000 000 000 0 GHz   │    -20.0 dBm     │
├─────────────────────────────────────────────┴──────────────────────┤
│ List/Select List                                                    │
│ List0  0000   List1  0000   List2  0000   List3  0000               │
│ List4  0000   List5  0000   List6  0000   List7  0000               │
│ List8  0000   List9  0000                                           │
└─────────────────────────────────────────────────────────────────────┘
```

Fig. 3-4   Select List window

LIST0   The currently selected list, in this case List0, is marked in the selection window.

0100   The length of the list, in this case 100 elements, is indicated in the column right of the list designation.

Delete List

➢ Mark the desired list using the rotary knob (see Fig. 3-5).

➢ Press the [SELECT] key or the rotary knob.
   The following query will appear:
   "Are you sure? Press SELECT to confirm   BACK to cancel".

➢ Press the [SELECT] key or the rotary knob.
   The contents of the list will be deleted. If the query is answered by pressing the [BACK] key, the contents of the list will be retained. The selection window is automatically closed upon answering the query.

Selection: Delete List

```
┌─────────────────────────────────────────────┬──────────────────────┐
│    11.000 000 000 0 GHz   │    -20.0 dBm     │
├─────────────────────────────────────────────┴──────────────────────┤
│ List/Delete List                                                    │
│ List0  0000   List1  0000   List2  0000   List3  0000               │
│ List4  0000   List5  0000   List6  0000   List7  0000               │
│ List8  0000   List9  0000   Back ↵                                  │
└─────────────────────────────────────────────────────────────────────┘
```

Fig. 3-5   Delete List window

Edit List

When Edit List is selected, a pop-up menu with the editing functions opens.

Insert editing function (see Fig. 3-6)

The Insert function inserts a desired number of elements with constant or linearly increasing/decreasing values ahead of the element with the indicated start index. All elements already existing from the start index are shifted so that they come at the end of the range of elements to be inserted.

Elements are inserted in a list according to the following procedure:

When Insert has been selected, the menu cursor is on the Insert At menu item.

➢ Press the [SELECT] key or the rotary knob.
   The menu cursor is on the value for At.

➢ Vary the index value by means of the rotary knob or enter an index value using the numerical keys and the [ENTER] key.

➢ Press the [SELECT] key or the rotary knob.
   The menu cursor is on the value for Range.

➢ Vary the Range value by means of the rotary knob or enter a value using the numerical keys and the [ENTER] key.

➢ Press the [SELECT] key or the rotary knob.
   The menu cursor is on the value for Start Frequency.

➢ Vary the start value for the frequency by means of the rotary knob or enter a value using the numerical keys and the [ENTER] key.

➢ Press the [SELECT] key or the rotary knob.
   The menu cursor is on the value for Increment Frequency.

➢ Vary the value of the increment by means of the rotary knob or enter a value using the numerical keys and the [ENTER] key.

➢ Press the [SELECT] key or the rotary knob.
   The menu cursor is on the value for Power.

➢ Vary the start value for the power by means of the rotary knob or enter a value using the numerical keys and the [ENTER] key.

➢ Press the [SELECT] key or the rotary knob.
   The menu cursor is on the value for Increment Power.

➢ Vary the value of the increment by means of the rotary knob or enter a value using the numerical keys and the [ENTER] key.

➢ The cursor is on Execute. Press the [SELECT] key or the rotary knob to execute the insertion. The menu cursor goes back to Edit List.

Upon pressing the [BACK] key, the editing window is exited without any change being made. The menu cursor goes back to Edit List.

Selection: Insert

```
10.000 000 000 0 GHz        -20.0 dBm
List/Insert
Insert At                              0001
Range                                  0001
Start Frequency          10.0000000000 GHz
Increment Frequency                   0.0 Hz
Power                                 0.0 dBm
Increment Power                       0.0 dB
Execute
Back ↵
```

Fig. 3-6   Edit function Insert

Insert At	Input of start index.
Range	Number of elements to be inserted.
Start Frequency	Input of start value for the frequency.
Increment Frequency	Input of increment between two successive frequency values. If 0 is entered as an increment, identical values will be inserted.
Power	Input of start value for the power.
Increment Power	Input of increment between two successive power values. If 0 is entered as an increment, identical values will be inserted.
Execute	Starts the insertion. After the execution of the function, the menu cursor goes back to Edit List.

Fill editing function (see Fig. 3-7)

The Fill function overwrites a parameter with constant or linearly increasing/decreasing values within a defined range. If the [BACK] key is pressed, the editing window will be exited without any change being made.
If the fill range extends beyond the end of the list, the list is automatically extended.

Filling of a list is done in the same way as the insertion of elements in a list, see "Insert editing function".
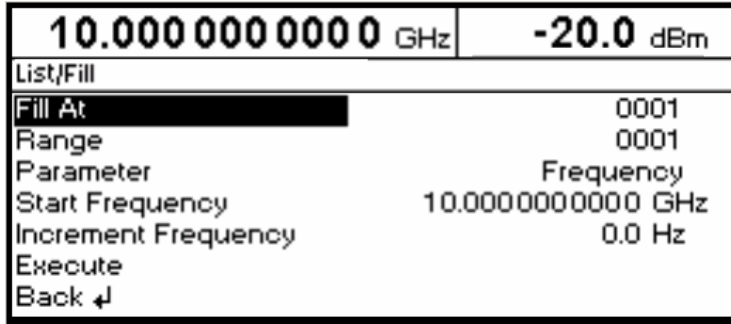
Selection: Fill

```
  10.000 000 000 0 GHz        -20.0 dBm
 List/Fill
 Fill At                              0001
 Range                               0001
 Parameter                      Frequency
 Start Frequency      10.0000000000 GHz
 Increment Frequency             0.0 Hz
 Execute
 Back ↵
```

Fig. 3-7   Fill editing function

Fill At   Input of start index.

Range   Number of elements to be included.

Parameter   Selection of parameters (frequency, power) to be filled. This menu option is not offered if a list contains only elements with one parameter.

Start Frequency   Input of start value for the selected parameter. This option is offered only if Frequency is selected as a parameter.

Increment Frequency Input of increment between two successive values. If 0 is entered as an increment, the list will be filled with identical values. This option is offered only if Frequency is selected as a parameter.

Power   Input of start value for the selected parameter. This option is offered only if Power is selected as a parameter.

Increment Power   Input of increment between two successive values. If 0 is entered as an increment, the list will be filled with identical values. This option is offered only if Power is selected as a parameter.

Execute   Starts the filling procedure. After the execution of the function, the menu cursor goes back to Edit List.

Edit/View editing function (see Fig. 3-8)

The Edit/View function allows viewing of a complete list or editing individual values of a list.

If the cursor is on a value in the left column of the list, the Edit/View mode can be exited by pressing the [BACK] key. The menu cursor goes back to Edit List.

There is no storage function for the list. This means that any modification of the list will be transferred to the internal data set and will be effective on exiting the Edit/View function.

Selection: Edit

```
 11.000 000 000 0 GHz        -20.0 dBm
List/Edit
0001   10.0000000000 GHz    0.0 dBm    List0
0002   10.1000000000 GHz    0.1 dBm    Free1900
0003   10.2000000000 GHz    0.2 dBm    Len 0100
```

Fig. 3-8   Edit editing function

List   Indication of list number

Free   Available space. Free 1900, for example, means that there is free space for a total of 1900 pairs of values (elements) in the list memory.

Len   Occupied space. Len 0100, for example, means that the current list occupies 100 elements in the list memory.

Selection of index   ➢ Select an index by means of the rotary knob or enter an index value by means of the numerical keys.

Editing of parameters   ➢ Select the parameter (frequency, power) to be edited by means of the [SELECT] key or the rotary knob.

                             ➢ Vary the numerical value by means of the rotary knob or enter a numerical value using the numerical keys and the [ENTER] key.

                             ➢ Upon pressing the [BACK] key, the menu cursor goes back to the column left of the current column or to the Edit List menu.

Delete editing function (see Fig. 3-9)

The Delete function deletes the elements of the indicated range. After a delete no gap is left in the list but the remaining elements move up. If the indicated range extends beyond the end of the list, the elements until the end of the list are deleted.

The inputs for deleting elements from a list are the same as for inserting elements into a list, see "Insert editing function".

Upon pressing the [BACK] key, the editing window will be exited without any change being made. The menu cursor goes back to Edit List.

Selection: Delete

```
  11.000 000 000 0 GHz      -20.0 dBm
 List/Delete
 Delete At                          0001
 Range                              0100
 Execute
 Back ↵
```
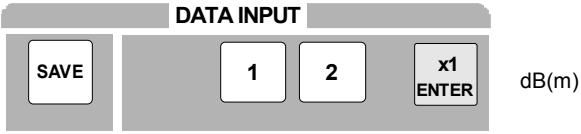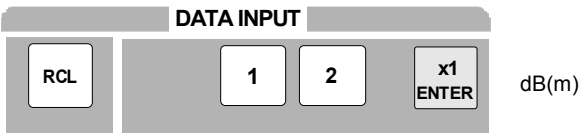
Fig. 3-9   Delete editing function

Delete At	Input of first element to be deleted in a list
Range	Number of elements to be deleted
Execute	Starts the deletion. After the execution of the function, the menu cursor goes back to Edit List.

SAVE/RECALL – Storing/Calling of Instrument Settings

50 complete instrument settings can be stored in memory locations 1 to 50.

Operating Steps	Explanations
DATA INPUT SAVE 1 2 x1 ENTER dB(m)	Store current instrument setting in memory location 12.
DATA INPUT RCL 1 2 x1 ENTER dB(m)	Call instrument setting of memory location 12.

The digital display during a save or recall entry is faded in a window.

If an instrument setting is stored in which a sweep was switched on, the sweep is started using the recall.

The parameter Exclude From Recall in the Frequency and Level-Level menus determines whether the saved RF frequency and RF level are loaded when an instrument setting is loaded, or whether the current settings are maintained.

Store IEC-bus command: `"*SAV 12"`

Call IEC-bus command: `"*RCL 12"`

Note: *The contents of lists, as they are used for the List mode or for user correction (Ucor), is not saved in the SAVE memory. It is stored under the respective list name and can be called. If instrument settings are called which go back to list data such as level setting using Ucor, the current list contents is used. If this has been altered, it is not identical to the list contents at the point of storing any more.*

Menu Summary

```
┌──────────────┐
│  Frequency   │
└──────────────┘

┌──────────────┐           Level
│    Level     │───────────ALC
└──────────────┘           Ucor
                           EMF

┌──────────────┐           AM        (Option SMR-B5)
│  Modulation  │───────────FM        (Option SMR-B5)
└──────────────┘           Pulse

┌──────────────┐           ASK       (Option SMR-B5)
│  Digital Mod │───────────FSK       (Option SMR-B5)
└──────────────┘

┌──────────────┐                     (Option SMR-B5)
│  LF Output   │
└──────────────┘

┌──────────────┐                     (Option SMR-B14)
│ Pulse Output │
└──────────────┘


┌──────────────┐           Freq
│    Sweep     │───────────Level
└──────────────┘           LFGen     (Option SMR-B5)

┌──────────────┐
│    List      │
└──────────────┘


┌──────────────┐   Display        ┌─── GPIB
│  Utilities   │───System ────────│    RS232
└──────────────┘   Ref Osc        │    Security
                   Protect        └─── Language
                   Calib ───────────────────────── Ref Osc
                   Diag ─────────── Config          Level
                   Test            TPoint          MainboardB
                   ModKey          Param           LFGen
                   Aux I/O                         Loop Gain
                   Setup

┌──────────────┐
│    Help      │
└──────────────┘
```

4   Index

This chapter contains the index for the present operating manual.

For your
User Documentation
CD-ROM