4   Instrument Functions

This chapter describes the functions of the instrument and its options which can be activated manually via menus or by remote control (frequency and level settings, analog modulations, sweep, and general functions not directly related to signal generation).

RF Frequency

The RF frequency can be set directly using the [FREQ] key or via the Frequency menu. In the Frequency menu, the frequency of the RF output signal is entered and indicated under Frequency.

In frequency settings made with the [FREQ] key, an arithmetic offset is taken into account. Such settings are indicated in the header line of the display. This makes it possible to enter the desired output frequency of subsequent units, if any (eg mixers). The offset can also be entered in the Frequency menu (see next section: "Frequency Offset").

Note:	*Further settings:*	*Frequency sweep*	*Sweep menu*
		LF frequency	*Modulation menu*
			LFOutput menu
		Int./ext. reference frequency	*Utilities - Ref Osc menu*

Menu selection: Frequency
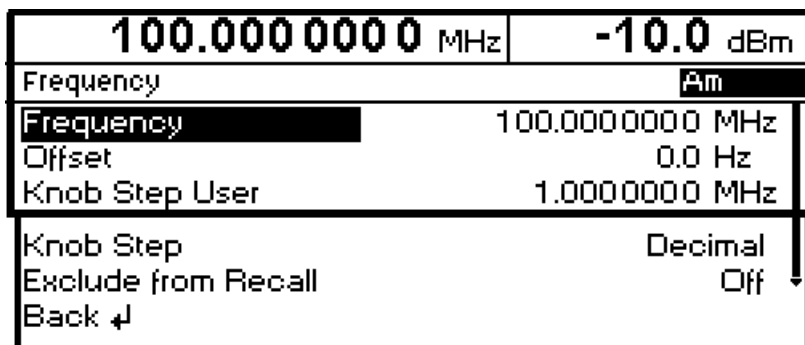
Fig. 4-1   Frequency menu

Frequency	Input value of RF frequency at RF output connector.
	IEC/IEEE-bus command `:SOUR:FREQ 100E6`

Offset	Input value of frequency offset, for example of subsequent mixer.
	IEC/IEEE-bus command `:SOUR:FREQ:OFFS 0`

Knob Step User	Input value of step size of frequency variation via rotary knob. The RF frequency is varied by the entered step size if Knob Step is set to User.
	IEC/IEEE-bus command `:SOUR:FREQ:STEP 1MHz`

Knob Step	Decimal	The variation step size corresponds to the position of the digit cursor.
	User	User-defined, the variation step size is as entered under Knob Step User.
Exclude from Recall	Off	Normal setting. The stored frequency is loaded too when instrument settings are loaded with the [RCL] key.
		IEC/IEEE-bus command `:SOUR:FREQ:RCL INCL`
	On	The stored frequency is not loaded when instrument settings are loaded, ie the current frequency setting is maintained.
		IEC/IEEE-bus command `:SOUR:FREQ:RCL EXCL`

Frequency Offset

On the SML it is possible to enter an offset for subsequent units, if any, in the Frequency menu. Such entries are taken into account in the frequency displayed in the header line, which indicates the frequency of the RF signal at the output of the units in question (see Fig. 4-2).

The frequency of the RF output signal in the Frequency menu is calculated from the frequency displayed in the header line and offset values as follows:

$$\text{RF output frequency} = \text{frequency displayed in header line} - \text{offset}$$

The entry of an offset causes a change of the frequency value displayed in the header line (the value taking into account the offset is displayed). The value of the RF output frequency is displayed under Frequency in the Frequency menu.

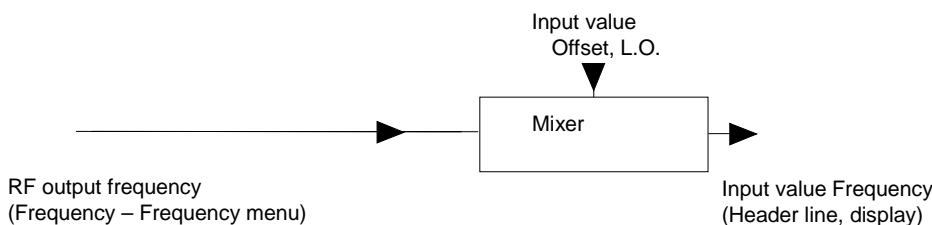The entered offset remains active also for frequency sweeps.

Fig. 4-2   Typical setups with frequency offset

RF Level

The RF level can be set directly using the [LEVEL] key or via the Level - Level menu.

In the Level - Level menu, the set RF output level is entered and indicated under Amplitude.

In level settings made with the [LEVEL] key, the offset of a subsequent attenuator/amplifier is taken into account (see section "Level Offset"). This makes it possible to enter the desired level at the output of subsequent units. The offset can also be entered in the Level - Level menu under Offset.

dBm, dBµV, mV and µV can be used as level units. The four unit keys are labelled with the respective units. To change to another level unit, simply press the corresponding unit key.

Note: - *The note "Unleveled" appears in the status line if the displayed level is not attained.*

               - *Further settings: Level Sweep   Sweep menu*

Menu selection: Level - Level

```
┌─────────────────────────────────────────────────────┐
│  100.000 000 0 MHz │  -10.0 dBm │
├─────────────────────────────────────────────────────┤
│ Level/Level                                          │
├─────────────────────────────────────────────────────┤
│ Amplitude                          -10.0 dBm         │
│ Offset                               0.0 dB          │
│ Limit                               19.0 dBm         │
├─────────────────────────────────────────────────────┤
│ Attenuator Mode                        Auto          │
│ Atten Fixed Range     0.0 dBm  to unleveled          │
│ Knob Step User                       1.0 dB          │
│ Knob Step                          Decimal           │
│ Power Resolution                     0.1 dB          │
│ Power On State                     Previous          │
│ Exclude from Recall                     Off          │
│ Back ↵                                               │
└─────────────────────────────────────────────────────┘
```

Fig. 4-3   Level menu

Amplitude   Input value of RF level at RF output connector.

                         IEC/IEEE-bus command   `:SOUR:POW -10`

Offset   Input value of level offset of a subsequent attenuator/amplifier. Input value in dB (see section "Level Offset").

                         IEC/IEEE-bus command   `:SOUR:POW:OFFS 0`

Limit   Input value of level limit. This value indicates the upper limit of the level at the RF output connector. A warning is output in the status line if an attempt is made to set a level above this limit.

                         IEC/IEEE-bus command   `:SOUR:POW:LIM 19 dBm`

Attenuator Mode	Auto	Normal setting. The mechanically switched attenuator switches in steps of 5 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".

Knob Step User   Input value of step size of level variation via rotary knob. The RF level is varied by the entered step size if Knob Step is set to User.

IEC/IEEE-bus command   :SOUR:POW:STEP 1

| **Knob Step** | Decimal | The variation step size corresponds to the position of the digit cursor. |
| | User | User-defined, the variation step size is as entered under Knob Step User (only in dB). |

Power Resolution   Selection of resolution of level display

| | 0.1 dB | The resolution of the level display is 0.1 dB. |
| | 0.01 dB | The resolution of the level display is 0.01 dB. |

Power On State   Selection of status to be assumed by RF output after power-up of the instrument.

| | RF Off | The RF output is switched off. |
| | Previous Setting | The RF output assumes the status active before switch-off. |

IEC/IEEE-bus command   :OUTP:PON OFF

Exclude from Recall	Off	Normal setting. The stored RF level is loaded too when instrument settings are loaded with the [RCL] key.
		IEC/IEEE-bus command :SOUR:POW:RCL INCL
	On	The stored RF level is not loaded when instrument settings are loaded, ie the current level setting is maintained.
		IEC/IEEE-bus command :SOUR:POW:RCL EXCL

Level Offset

On the SML, it is possible to enter an offset for a subsequent attenuator/amplifier, if any, in the Level menu. The offset is taken into account in the display in the header line (see below), which represents the level value of the signal at the output of the subsequent unit (see Fig. 4-4).

The level of the RF output signal is therefore calculated from the amplitude displayed in the header line and the offset entered in the Level - Level menu as follows:

$$\text{RF output level} = \text{amplitude displayed in the header line} - \text{offset}$$

The entered offset has no influence on the RF output signal of the SML; the offset is only taken into account in the displayed level value. The value with the offset can be directly entered with the [LEVEL] key.

The RF output level of the SML is indicated in the Level - Level menu.
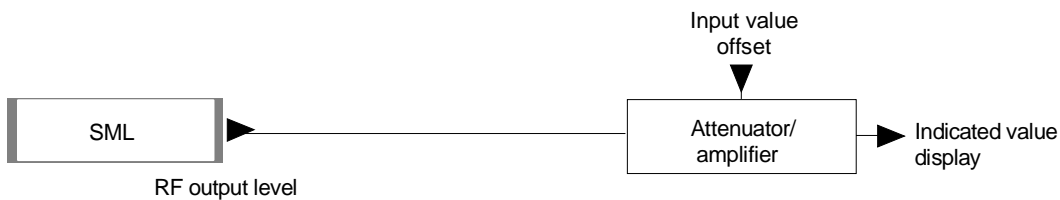
Fig. 4-4   Typical setup with level offset

Non-Interrupting Level Setting

With Attenuator Mode Fixed, non-interrupting level setting is performed. Electronic attenuator switching is used instead of interrupting, mechanical attenuator switching.

If the level falls below the permissible variation range, the warning "Level underrange" is output in the status line of the display; if it attains or goes beyond the upper limit value, the warning "Level overrange" or "Unleveled" is output. Level accuracy and spectral purity are not guaranteed.

Switching On/Off Automatic Level Control (ALC)

Settings for automatic level control (ALC) can be made in the Level – ALC menu.

When level control is switched off (ALC State Off), switchover is made to a sample-and-hold mode. In this mode, level control is switched on automatically for a short time after each level or frequency setting and the level control is held at the value attained. Level control OFF is used in multisource measurements to improve intermodulation suppression.

Menu selection: Level - ALC

```
┌─────────────────────────────────────────────┐
│     100.000 000 0 MHz│   -10.0 dBm │
├─────────────────────────────────────────────┤
│ Level/ALC                                    │
├─────────────────────────────────────────────┤
│ State                               On       │
│ Back ↵                                       │
│                                              │
└─────────────────────────────────────────────┘
```
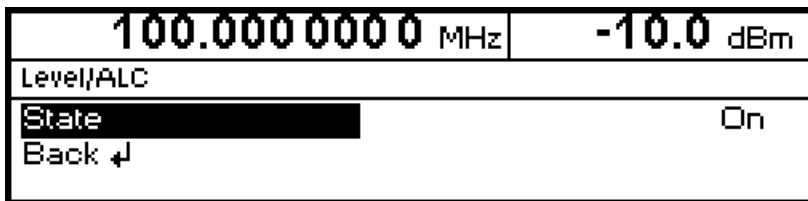
Fig. 4-5   Level - ALC menu (preset setting)

State	On	Normal status. Level control is switched on permanently.
	Off	Level control is switched off. No AM is possible in this status.
	IEC/IEEE-bus command	`:SOUR:POW:ALC OFF`
Search Once		Manual brief switch-on of level control for level calibration in the ALC State Off mode.
	IEC/IEEE-bus command	`:SOUR:POW:ALC ON;ALC OFF`

User Correction (Ucor)

The "User correction" function can be used to create and activate lists in which level correction values are assigned to arbitrary RF frequencies.

Up to 10 lists with a total of 160 correction values can be compiled. For frequencies not included in the list, level correction values are determined by interpolation based on the nearest correction values.

When user correction is switched on, Ucor (user correction) is displayed in the header field in addition to the level. The RF output level is the sum of both values.

<div align="center">Level + Ucor = output level</div>

If an offset is selected at the same time, the displayed level value is the difference between the amplitude and the offset entered in the Level menu.

<div align="center">Amplitude − offset = level</div>

User correction is active in all operating modes when switched on.
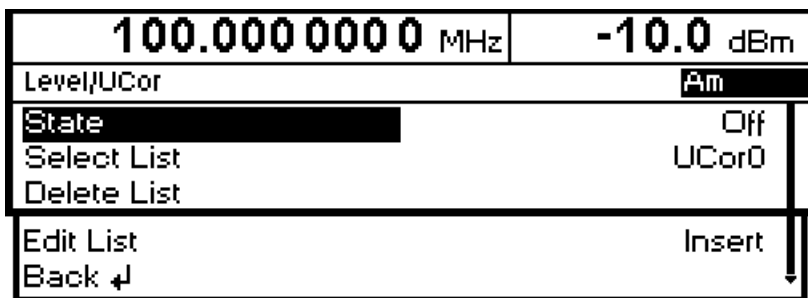
Menu selection: Level - UCor

```
┌─────────────────────────────────────┬──────────────────┐
│      100.000 000 0 MHz               │   -10.0 dBm      │
├─────────────────────────────────────┴──────────────────┤
│ Level/UCor                                         Am   │
├────────────────────────────────────────────────────────┤
│ State                                              Off  │
│ Select List                                      UCor0  │
│ Delete List                                             │
├────────────────────────────────────────────────────────┤
│ Edit List                                        Insert │
│ Back ↵                                                  │
└────────────────────────────────────────────────────────┘
```

Fig. 4-6   Level - UCor menu

State	Switching on/off user correction
	IEC/IEEE-bus command `:SOUR:CORR ON`
Select List	Selection of a list or generation of a new list (see Chapter 3, Section "List Editor")
	IEC/IEEE-bus command `:SOUR:CORR:CSET "UCOR1"`
Delete List	Deletion of a list (see Chapter 3, Section "List Editor")
	IEC/IEEE-bus command `:SOUR:CORR:CSET:DEL "UCOR2"`
Edit List	Selection of editing mode for modifying a selected list (see Chapter 3, Section "List Editor")
	IEC/IEEE-bus commands
	`:SOUR:CORR:CSET:DATA:FREQ 105MHz, 107MHz,...`
	`:SOUR:CORR:CSET:DATA:POW 1dB, 0.9dB, 0.8dB,...`

Menu selection: Level - UCor

```
 100.000 000 0  MHz  │   -10.0 dBm
Level/UCor/Edit              RF Off
0001  1.0000000000 GHz   0.0 dB  ▌UCor1
0002  1.0000000010 GHz   0.0 dB   Free  150
0003  1.0000000020 GHz   0.0 dB   Len   010
```

Fig. 4-7   UCor - Level menu

UCor   Indication of list item number.

Free   Available space. Free 150, for example, means that there is free space for a total of 150 pairs of values (elements) in the list memory.

Len   Occupied space. Len 010, for example, means that the current list occupies 10 elements in the list memory.

[RF ON/OFF] Key

The RF output signal can be switched on and off with the [RF ON/OFF] key. This does not influence the current menu. When the output signal is switched off, "RF Off" appears in the header field with the level display. With RF Off, the 50 Ω source impedance is maintained.

IEC/IEEE-bus command   :OUTP OFF

Modulation - General

The SML offers the following modulation types :

- amplitude modulation (AM),
- frequency modulation (FM),
- Phase modulation (ΦM),
- Pulse modulation PULSE (Option SML-B3).

Internal or external modulation sources can be used.

Modulation Sources

Internal modulation source

For AM and FM/ΦM, an internal modulation generator (Lfgen) is available. For more information see section "LF Generator".

For internal pulse modulation (option SML-B3), the instrument is equipped with a pulse generator. For more information see section "Pulse Generator".

External modulation source

For external modulation, input connectors MOD (AM, FM/ΦM) and PULSE (Pulse modualtion) are available at the rear panel of the instrument. External AM and FM/ΦM can be AC- or DC-coupled.

External modulation signals should have a voltage of V_p = 1 V (V_{rms} = 0.707 V) to maintain the displayed modulation depth or deviation.

Simultaneous Modulation

Basically, any combination of AM, FM/ΦM and pulse modulation is possible. There are restrictions only for FM and ΦM.
Two-tone AM and two-tone FM/ΦM can be selected via menu (Modulation - AM (FM/ΦM) - AM (FM/ΦM) Source - Two Tone).

Mutual Switch-Off of Modulation Types

As FM and ΦM use the same modulator, they cannot be activated simultaneously. They deactivate one another.

Note: *IEC/IEEE-bus control according to SCPI does not allow the selection of the incompatible modulation types FM and ΦM. With remote control, an error message is output when an attempt is made to activate these types of modulation (see Chapter 9).*

[MOD ON/OFF] Key

The various types of modulation can be switched on and off directly using the [MOD ON/OFF] key or via the Modulation menu. If switch-on is made using the [MOD ON/OFF] key, the modulation sources which are set in the modulation menus are used.

The [MOD ON/OFF] key can be effective either for all types of modulation or only for a selected modulation. The selection of modulation types for which the [MOD ON/OFF] key is to be effective is made in the Utilities – Mod Key menu.

If only one type of modulation is selected, it is switched on or off each time the [MOD ON/OFF] key is pressed.

If all modulation types are selected, the [MOD ON/OFF] key has the following effect:

- If at least one modulation type is active:
  Pressing the [MOD ON/OFF] key switches off all active modulation types. The modulation types which were active are stored.

- If no modulation type is active:
  Pressing the [MOD ON/OFF] key switches on the modulation types that were last switched off with this key.

Modulations

Amplitude Modulation

Settings for amplitude modulation can be made in the Modulation - AM menu.

Notes: – *The specified AM data are valid only up to 6 dB below the maximum level in each case.*
For level values exceeding this threshold, AM data are guaranteed only with linearly
decreasing modulation depth.

Menu selection: Modulation – AM

```
┌─────────────────────────────────────────────┐
│    100.000 000 0 MHz │   -10.0 dBm           │
├─────────────────────────────────────────────┤
│ Modulation/AM                          Am    │
├─────────────────────────────────────────────┤
│ AM Depth                            15.5 %    │
│ AM Source                           LFGen     │
│ Ext Coupling                          AC      │
├─────────────────────────────────────────────┤
│ LFGen Freq                      3.0000 kHz    │
│ Back ↵                                        │
└─────────────────────────────────────────────┘
```

Fig. 4-8   Modulation - AM menu (preset setting)

AM Depth	Input value of modulation depth
	IEC/IEEE-bus command `:SOUR:AM 30PCT`
AM Source	Selection of modulation source; Off, Ext, Lfgen or Two Tone are available.
	IEC/IEEE-bus command `:SOUR:AM:SOUR EXT; STAT ON`
Ext Coupling	Selection of AC or DC coupling with external modulation source
	IEC/IEEE-bus command `:SOUR:AM:EXT:COUP AC`
LFGen Freq	Selection of frequency of LF generator
	IEC/IEEE-bus command `:SOUR:AM:INT:FREQ 1kHz`

Frequency Modulation

Settings for frequency modulation can be made in the Modulation - FM menu.

Menu selection: Modulation – FM

```
 100.000 000 0 MHz        -10.0 dBm
Modulation/FM
FM Deviation              10.0000 kHz
FM Source                          Off
Ext Coupling                        AC
LFGen Freq                 1.0000 kHz
FM Bandwidth               Standard
FM Offset
Back ↵
```

Fig. 4-9   Modulation - FM menu (preset setting)

FM Deviation	Input value for deviation.
	IEC/IEEE-bus command `:SOUR:FM 10kHz`
FM Source	Switching on/off FM and selection of modulation source.
	IEC/IEEE-bus commands `:SOUR:FM:SOUR EXT; STAT ON`
Ext Coupling	Selection of AC or DC coupling for external input MOD.
	IEC/IEEE-bus command `:SOUR:FM:EXT:COUP AC`
LFGen Freq	Selection of frequency of LF generator.
	IEC/IEEE-bus command `:SOUR:FM:INT:FREQ 1kHz`
FM Bandwidth	Setting of bandwidth. Settings Standard and Wide are available.
	IEC/IEEE-bus command `:SOUR:FM:BAND WIDE`
FM Offset	This function is used to compensate DC offset.
	IEC/IEEE-bus command `:CAL:FMOF?`

Phase Modulation

Settings for phase modulation can be made in the Modulation – ☞M menu.
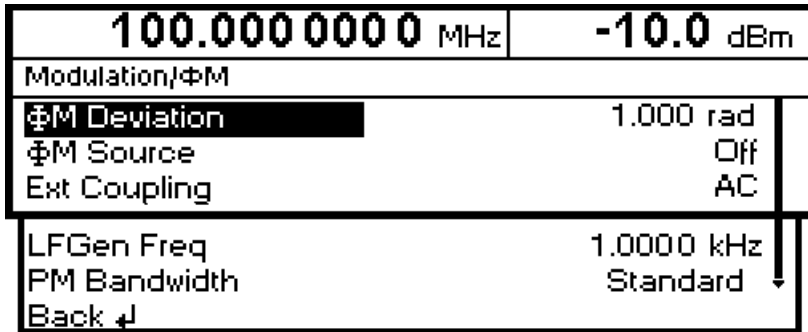
Menu selection: Modulation – ☞M

```
┌─────────────────────────────────────────────────┐
│   100.000 000 0 MHz │   -10.0 dBm │
├─────────────────────────────────────────────────┤
│ Modulation/ΦM                                    │
├─────────────────────────────────────────────────┤
│ ΦM Deviation                        1.000 rad    │
│ ΦM Source                                  Off   │
│ Ext Coupling                                AC   │
├─────────────────────────────────────────────────┤
│ LFGen Freq                          1.0000 kHz   │
│ PM Bandwidth                          Standard   │
│ Back ↵                                           │
└─────────────────────────────────────────────────┘
```

Fig. 4-10   Modulation - ☞M menu (preset setting)

☞M Deviation	Input value for deviation.	
	IEC/IEEE-bus command	`:SOUR:PM 1 RAD`
☞M Source	Switching on/off PM and selection of modulation source.	
	IEC/IEEE-bus commands	`:SOUR:PM:SOUR EXT; STAT ON`
Ext Coupling	Selection of AC or DC coupling for external input MOD.	
	IEC/IEEE-bus command	`:SOUR:PM:EXT:COUP AC`
LFGen Freq	Selection of frequency of LF generator.	
	IEC/IEEE-bus command	`:SOUR:PM:INT:FREQ 1kHz`
PM Bandwidth	Setting of bandwidth. Settings Standard and Wide are available.	
	IEC/IEEE-bus command	`:SOUR:PM:BAND WIDE`

Pulse Modulation (Option SML-B3)

The pulse modulator can be controlled from an external source or by an internal pulse generator. With external control, the external source feeds the pulse modulator directly. The envelope of the RF is identical to the control signal. With control by the internal pulse generator, the pulse shape of the pulse generator determines the envelope of the RF. The pulse delay, pulse width and pulse period can be set.

The polarity of pulse modulation is selectable. With Pulse Polarity = Normal, the RF level is switched on if HIGH level is present at the PULSE modulation input.

Settings for the pulse modulation and the pulse generator can be made in the Modulation - Pulse menu.

Menu selection: Modulation – Pulse

```
┌─────────────────────────────────────────────┐
│  100.000 000 0 MHz │   -10.0 dBm │
├─────────────────────────────────────────────┤
│ Modulation/Pulse                             │
├─────────────────────────────────────────────┤
│ Pulse Mod Source                        Off  │
│ Pulse Mod Polarity                   Normal  │
│ ---Pulse Generator Settings----------------- │
├─────────────────────────────────────────────┤
│ Pulse Period                       10.00 µs  │
│ Pulse Width                         1.00 µs  │
│ Pulse Delay                         0.02 µs  │
│ Double Pulse State                      Off  │
│ ---Pulse Trigger Settings------------------- │
│ Trigger Mode                      Auto Trig  │
│ Ext Trigger Slope                       Pos  │
│ Ext Gated Input Polarity             Normal  │
│ Back ↵                                       │
└─────────────────────────────────────────────┘
```

Fig. 4-11   Modulation - Pulse menu (preset setting), equipped with option SML-B3

Pulse Mod Source	Selection of modulation source. Off, Ext and Pulse Gen are available.
	IEC/IEEE-bus commands `:SOUR:PULM:SOUR EXT; STAT ON`
Pulse Mod Polarity	Selection of polarity of modulation signal.
	Normal The RF signal is on with HIGH level present.
	Inverse The RF signal is suppressed with HIGH level present.
	IEC/IEEE-bus command `:SOUR:PULM:POL NORM`
Pulse Period	Input value of pulse period.
	IEC/IEEE-bus command `:SOUR:PULS:PER 10us`
Pulse Width	Input value of pulse width.
	IEC/IEEE-bus command `:SOUR:PULS:WIDT 1us`
Pulse Delay	Input value of single pulse delay. This value is indicated only if Double Pulse State is set to Off.
	IEC/IEEE-bus command `:SOUR:PULS:DEL 1us`
Double Pulse Delay	Delay between the two pulses of a double pulse. This value is indicated only if Double Pulse State is set to On.
	IEC/IEEE-bus command `:SOUR:PULS:DOUB:DEL 1us`

Double Pulse State   Switching on/off double pulse.

On	Double pulse is switched on
Off	Single pulse

IEC/IEEE-bus command   `:SOUR:PULS:DOUB OFF`

Trigger Mode   Selection of trigger mode.

Auto Trig   The pulse generator is triggered automatically. The pulse period is as entered under Pulse Period.

Ext Trig   The pulse generator is externally triggered. The pulse period is determined by an external signal at the PULSE input.

Ext Gated   The pulse generator is triggered if the gate signal is active.

IEC/IEEE-bus command   `:TRIG:PULS:SOUR AUTO`

Ext Trigger Slope   Selection of active edge of external trigger signal.

Pos   The pulse generator is triggered on the positive edge of the external signal.

Neg   The pulse generator is triggered on the negative edge of the external signal.

IEC/IEEE-bus command   `:TRIG:PULS:SLOP POS`

Ext Gated Input Polarity Definition of active level of gate signal (HIGH or LOW). Normal (HIGH) and Inverse (LOW) are available.

Pulse Generator

As an internal modulation source, the pulse generator offers the possibility of setting single and double pulses with variable pulse delay, pulse width and pulse period. The pulse generator can be triggered internally or by an external signal at the PULSE input. The following Pulse modi can be selected: Auto Trig, Ext Trig, and Ext Gated (see Fig. 4-12 to Fig. 4-14). The internal trigger signal is derived from the reference frequency and hence very stable. In the trigger mode Ext Trig, the positive or the negative edge can be used for triggering the pulse generator. In the trigger mode Ext Gated, the pulse generator is triggered as long as an active Gate signal arrives at the PULSE input.

The pulse generator can also be used as an independent unit, ie without the pulse modulator being controlled if the pulse modulation source (Pulse Source) is switched to OFF or EXT. The pulse can be tapped at the VIDEO output.
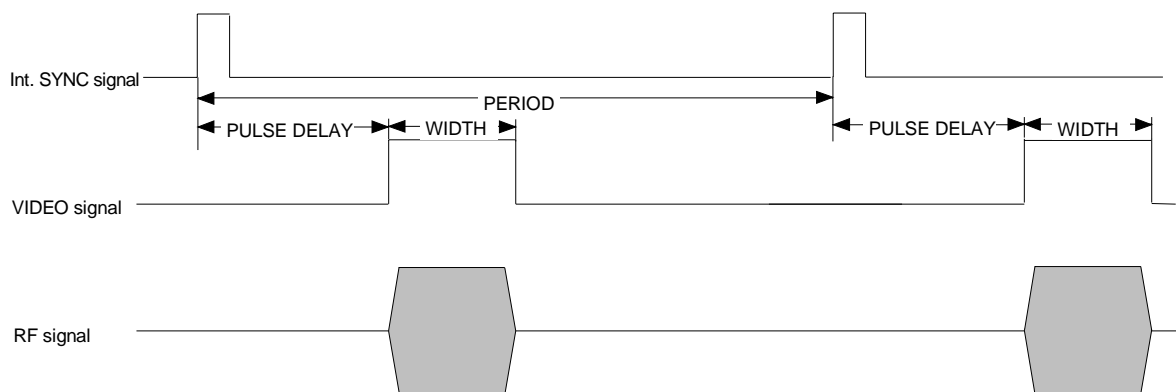
Fig. 4-12   Signal example 1: single pulse, Pulse mode = Auto Trig

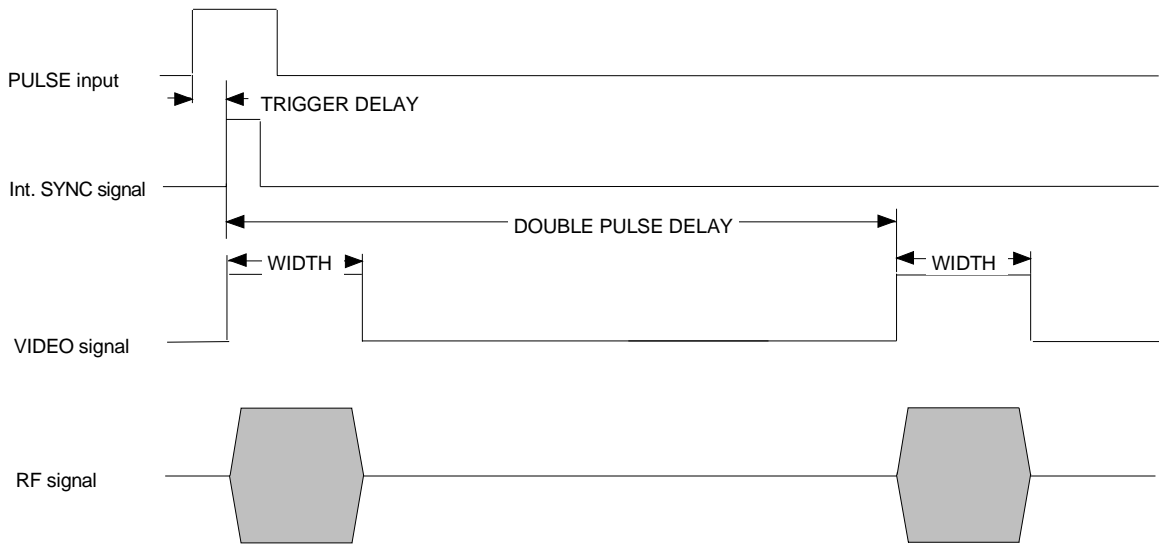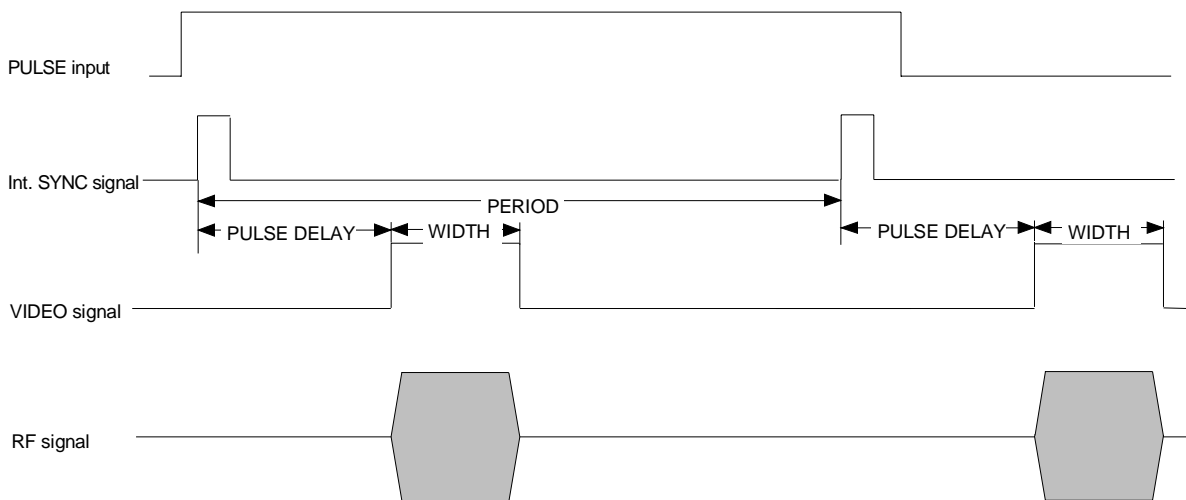Fig. 4-13   Signal example 2: double pulse, Pulse mode = Ext Trig, Slope = Pos

Fig. 4-14   Signal example 3: single pulse, Pulse Mode = Ext Gated

LF Generator

The frequency of internal modulation signals can be selected in one of the modulation menus (AM, FM/ΦM) or in the LF Output menu (cf. Chapter 4, Sections "Amplitude Modulation", "Frequency Modulation", "Phase Modulation" and "LF Output").

LF Output

The internal LF generator is available as a signal source for the LF output.

Settings for the LF output can be made in the LF Output menu.

Note: -   *Any change to the frequency of the internal modulation generator in the LF Output menu*
             also affects the modulation for which the generator has been selected as a modulation
             source.
             -   *The sweep function of the LF generator can be activated in the Sweep - Lfgen menu.*
             -   *Inputs can only be made in V or mV.*

Menu selection: LF Output

```
  100.000 000 0 MHz      -10.0 dBm
 LF Output
 State                           Off
 Voltage                      1.000 V
 LFGen Freq                1.0000 kHz
 Back ↵
```
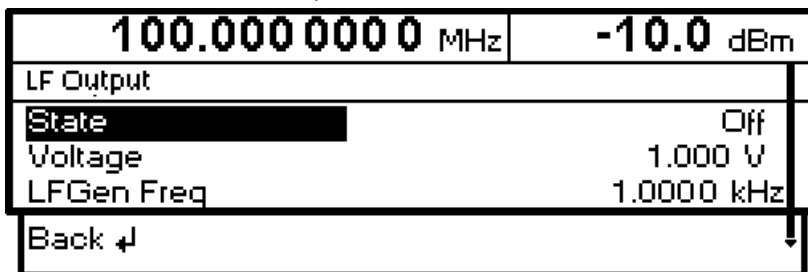
Fig. 4-15   LF Output menu (preset setting)

State   Switching on/off LF output. This parameter has no effect on the modulation
                       settings.
                       IEC/IEEE bus command   :OUTP2 ON

Voltage   Input value of output voltage of LF output. A peak voltage is to be entered
                       here.
                       IEC/IEEE bus command   :OUTP2:VOLT 1V

LFGen Freq   Input value of frequency of internal modulation generator.
                       IEC/IEEE bus command   :SOUR2:FREQ 3kHz

PULSE/VIDEO Output

The pulse generator output or video output is only available with Option SML-B3, pulse generator, cf. Section "Pulse Generator".

Menu selection: Pulse Output

```
┌─────────────────────────────────────────────────┐
│   100.000 000 0 MHz │   -10.0 dBm │
├─────────────────────────────────────────────────┤
│ Pulse Output                                     │
├─────────────────────────────────────────────────┤
│ Pulse Outp Source                          Off   │
│ Pulse Outp Polarity                     Normal   │
│ ---Pulse Generator Settings-------------------   │
├─────────────────────────────────────────────────┤
│ Pulse Period                           10.00 μs  │
│ Pulse Width                             1.00 μs  │
│ Pulse Delay                             0.02 μs  │
│ Double Pulse State                         Off   │
│ ---Pulse Trigger Settings--------------------    │
│ Trigger Mode                         Auto Trig   │
│ Ext Trigger Slope                          Pos   │
│ Ext Gated Input Polarity                Normal   │
│ Back ↵                                           │
└─────────────────────────────────────────────────┘
```
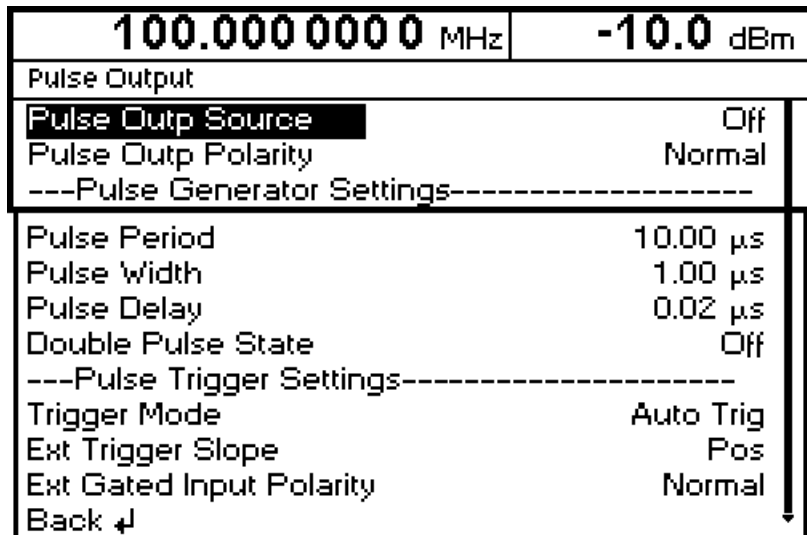
Fig. 4-16   Pulse Output menu

Pulse Output Source	Switching on/off pulse source. Off, PulseGen or Video can be selected.
	IEC/IEEE bus command `:OUTP3:SOUR OFF`
Pulse Output Polarity	Selection of polarity of pulse signal. Normal or Inverse can be selected.
	IEC/IEEE bus command `:OUTP3:POL:PULS NORM`
Pulse Period	Input value of pulse period.
	IEC/IEEE-bus command `:SOUR:PULS:PER 10us`
Pulse Width	Input value of pulse width.
	IEC/IEEE-bus command `:SOUR:PULS:WIDT 1us`
Pulse Delay	Input value of single pulse delay. This value is indicated only if Double Pulse State is set to Off.
	IEC/IEEE-bus command `:SOUR:PULS:DEL 1us`
Double Pulse Delay	Delay between the two pulses of a double pulse. This value is indicated only if Double Pulse State is set to On.
	IEC/IEEE-bus command `:SOUR:PULS:DOUB:DEL 1us`
Double Pulse State	Switching on/off double pulse.
	On Double pulse is switched on
	Off Single pulse
	IEC/IEEE-bus command `:SOUR:PULS:DOUB OFF`

Trigger Mode   Selection of trigger mode:

Auto Trig   The pulse generator is triggered automatically. The pulse period is
             as entered under Pulse Period.

Ext Trig   The pulse generator is externally triggered. The pulse period is
             determined by an external signal at the PULSE input.

Ext Gated   The pulse generator is triggered if the gate signal is active.

IEC/IEEE-bus command   `:TRIG:PULS:SOUR AUTO`

Ext Trig Slope   Selection of active edge of external trigger signal.

Pos   The pulse generator is triggered on the positive edge of the external
             signal.

Neg   The pulse generator is triggered on the negative edge of the external
             signal.

IEC/IEEE-bus command   `:TRIG:PULS:SLOP POS`

Ext Gated Input   Definition of active level of gate signal (HIGH or LOW). Normal (HIGH) and
Polarity   Inverse (LOW) are available.

Sweep

The SML features digital, step-by-step sweep for the following parameters:

● RF frequency

● LF frequency

● RF level

A sweep is set in four basic steps, which are demonstrated by the following example, ie the setting of a frequency sweep:

1. Set sweep range (Start Freq and Stop Freq or Center Freq and Span).

2. Select linear or logarithmic sweep (Spacing).

3. Select step size (Step Lin or Step Log) and dwell time (Dwell).

4. Switch on sweep (Mode set to Auto, Single, Step, Ext Single or Ext Step).

Setting the Sweep Range (Start Freq, Stop Freq, Center Freq, Span)

The sweep range for RF sweeps can be entered in two ways. Either the Start Freq and Stop Freq are entered or Center Freq and Span. Please note that the two parameter sets mutually affect each other as follows:

Start Freq altered:	Stop Freq	=	unaltered
	Center Freq	=	(Start Freq + Stop Freq)/2
	Span	=	(Stop Freq – Start Freq)
Stop Freq altered:	Start Freq	=	unaltered
	Center Freq	=	(Start Freq + Stop Freq)/2
	Span	=	(Stop Freq – Start Freq)
Center Freq altered:	Span	=	unaltered
	Start Freq	=	(Center Freq – Span/2)
	Stop Freq	=	(Center Freq + Span/2)
Span altered:	Center Freq	=	unaltered
	Start Freq	=	(Center Freq – Span/2)
	Stop Freq	=	(Center Freq + Span/2)

Selecting Linear or Logarithmic Sweep (Spacing Lin, Log)

Linear or logarithmic sweep can be selected with Spacing. For RF and LF sweeps, both the linear and logarithmic modes are selectable. For level sweeps, only the logarithmic mode is possible.

With logarithmic sweeps, the step size (Step) is equal to a constant fraction of the current setting. The logarithmic step size for RF and LF sweeps is entered in % and for level sweeps in dB.

Operating Modes (Mode)

The following sweep modes are available:

Auto
Sweep from start point to stop point with automatic restart at start point. If another sweep mode was active prior to selection of the auto mode, the sweep is continued from the setting active at that time.

IEC/IEEE bus commands

RF sweep:	LF sweep:	Level sweep:
SOUR:FREQ:MODE SWE	SOUR2:FREQ:MODE SWE	SOUR:POW:MODE SWE
SOUR:SWE:MODE AUTO	SOUR2:SWE:MODE AUTO	SOUR:SWE:POW:MODE AUTO
TRIG:SOUR AUTO	TRIG2:SOUR AUTO	TRIG:SOUR AUTO

Single
Single sweep from start point to stop point. The selection of Single does not start a sweep run. The sweep run is started by means of the Execute Single Sweep function, which is displayed below the Mode line.

IEC/IEEE bus commands

RF sweep:	LF sweep:	Level sweep:
SOUR:FREQ:MODE SWE	SOUR2:FREQ:MODE SWE	SOUR:POW:MODE SWE
SOUR:SWE:MODE AUTO	SOUR2:SWE:MODE AUTO	SOUR:SWE:POW:MODE AUTO
TRIG:SOUR SING	TRIG2:SOUR SING	TRIG:SOUR SING

Step
Step-by-step, manual run within the sweep limits. Activating Step stops a running sweep and the cursor moves to the value indicated for Current. The sweep can now be controlled upwards or downwards in discrete steps using the rotary knob or the numeric keys.

IEC/IEEE-bus commands:

RF sweep:	LF sweep:	Level sweep:
SOUR:FREQ:MODE SWE	SOUR2:FREQ:MODE SWE	SOUR:POW:MODE SWE
SOUR:SWE:MODE STEP	SOUR2:SWE:MODE STEP	SOUR:SWE:POW:MODE STEP
TRIG:SOUR SING	TRIG2:SOUR SING	TRIG:SOUR SING

Ext Single
Single sweep from start point to stop point as with Single, but triggered by an external signal

IEC/IEEE-bus commands:

RF sweep:	LF sweep:	Level sweep:
SOUR:FREQ:MODE SWE	SOUR2:FREQ:MODE SWE	SOUR:POW:MODE SWE
SOUR:SWE:MODE AUTO	SOUR2:SWE:MODE AUTO	SOUR:SWE:POW:MODE AUTO
TRIG:SOUR EXT	TRIG2:SOUR EXT	TRIG:SOUR EXT

Ext Step   Step-by-step run controlled by an external trigger signal. Each trigger event triggers a single step.

IEC/IEEE-bus commands:

RF sweep:	LF sweep:	Level sweep:
`SOUR:FREQ:MODE SWE`	`SOUR2:FREQ:MODE SWE`	`SOUR:POW:MODE SWE`
`SOUR:SWE:MODE STEP`	`SOUR2:SWE:MODE STEP`	`SOUR:SWE:POW:MODE STEP`
`TRIG:SOUR EXT`	`TRIG2:SOUR EXT`	`TRIG:SOUR EXT`

Off   Switching-off sweep mode.

IEC/IEEE-bus commands:

RF sweep:	LF sweep:	Level sweep:
`SOUR:FREQ:MODE CW`	`SOUR2:FREQ:MODE CW`	`SOUR:POW:MODE CW`

Sweep Inputs

TRIGGER   An external signal at the rear input triggers the sweep in the Ext Single and Ext Step modes or stops the sweep in all modes.

RF Sweep

Settings for RF sweeps can be made in the Sweep - Freq menu.

Menu selection: Sweep - Freq

Fig. 4-17   Sweep - Freq menu

Start Freq
Input value of start frequency.
IEC/IEEE-bus command   `:SOUR:FREQ:STAR 100MHz`

Stop Freq
Input value of stop frequency.
IEC/IEEE-bus command   `:SOUR:FREQ:STOP 500MHz`

Center Freq
Input value of center frequency.
IEC/IEEE-bus command   `:SOUR:FREQ:CENT 300MHz`

Span
Input value of span.
IEC/IEEE-bus command   `:SOUR:FREQ:SPAN 400MHz`

Current Freq
Display of current frequency value.
In Step mode: input value of frequency.

Spacing
Selection of linear or logarithmic sweep.
IEC/IEEE-bus command   `:SOUR:SWE:SPAC LIN`

Spacing Lin
Input value of step size. Depending on whether Spacing Lin or Log is selected, Step Lin or Step Log is displayed.
IEC/IEEE-bus command   `:SOUR:SWE:STEP:LIN 1MHz`

Dwell
Input value of dwell time per step.
IEC/IEEE-bus command   `:SOUR:SWE:DWEL 15ms`

Mode
Selection of sweep mode. See section "Operating Modes".
IEC/IEEE-bus commands   `:SOUR:FREQ:MODE SWE;`
                                                `:SOUR:SWE:MODE AUTO;`
                                                `:TRIG:SOUR SING`

Reset Sweep
Resets the start frequency.
IEC/IEEE-bus command   `:ABOR`

Exec Single Sweep
Starts a single sweep. This function is displayed and is effective only if Single Mode is selected.
IEC/IEEE-bus command   `:TRIG`

Level Sweep

Settings for level sweeps can be made in the Sweep - Level menu.

Menu selection: Sweep - Level

```
 100.000 000 0 MHz    -10.0 dBm
Sweep/Level
Start Level              -30.0 dBm
Stop Level               -10.0 dBm
Current Level            -10.0 dBm

Step                      1.0 dB
Dwell                    15.0 ms
Mode                        Off
Reset Sweep
Back ↵
```

Fig. 4-18   Sweep - Level menu

Start Level	Input value of start level.
	IEC/IEEE-bus command `:SOUR:POW:STAR -30dBm`
Stop Level	Input value of stop level.
	IEC/IEEE-bus command `:SOUR:POW:STOP -10dBm`
Current Level	Display of current level.
	In Step mode: Input value of level.
Step	Input value of step width.
	IEC/IEEE-bus command `:SOUR:SWE:POW:STEP 1dB`
Dwell	Input value of dwell time per step.
	IEC/IEEE-bus command `:SOUR:SWE:POW:DWEL 15ms`
Mode	Selection of sweep mode (see "Operating Modes").
	IEC/IEEE-bus command `:SOUR:POW:MODE SWE;`
	`:SOUR:SWE:POW:MODE AUTO;`
	`:TRIG:SOUR SING`
Reset Sweep	Sets the start level.
	IEC/IEEE-bus command `:ABOR`
Exec Single Sweep	Starts a single sweep. This function is displayed and is effective only if Single Mode is selected.
	IEC/IEEE-bus command `:TRIG`

LF Sweep

Settings for LF sweeps can be made in the Sweep - LFGen menu.

Menu selection:　　Sweep - LFGen

```
┌────────────────────────────────────────────────┐
│  100.000 000 0 MHz  │   -10.0 dBm               │
├────────────────────────────────────────────────┤
│ Sweep/LFGen                                      │
├────────────────────────────────────────────────┤
│ Start Freq                     1.0000 kHz        │
│ Stop Freq                    100.0000 kHz        │
│ Current Freq                   1.0000 kHz        │
├────────────────────────────────────────────────┤
│ Spacing                            Lin           │
│ Step Lin                       1.0000 kHz        │
│ Dwell                            15.0 ms         │
│ Mode                               Off           │
│ Reset Sweep                                      │
│ Back ↵                                           │
└────────────────────────────────────────────────┘
```

Fig. 4-19　　Sweep - LFGen menu

Start Freq	Input value of start frequency.
	IEC/IEEE-bus command　　　　`:SOUR2:FREQ:STAR 1kHz`
Stop Freq	Input value of stop frequency.
	IEC/IEEE-bus command　　　　`:SOUR2:FREQ:STOP 100kHz`
Current Freq	Display of current frequency value. In Step mode: input value of frequency.
Spacing	Selection of linear or logarithmic sweep.
	IEC/IEEE-bus command　　　　`:SOUR2:SWE:SPAC LIN`
Step Lin	Input value of step size.
	IEC/IEEE-bus command　　　　`:SOUR2:SWE:STEP:LIN 1kHz`
Dwell	Input value of dwell time per step.
	IEC/IEEE-bus command　　　　`:SOUR2:SWE:DWEL 15ms`
Mode	Selection of sweep mode (see "Operating Modes").

	IEC/IEEE-bus command　　　　`:SOUR2:FREQ:MODE SWE`
	`:SOUR2:SWE:MODE AUTO`
	`:TRIG2:SOUR SING`

Reset Sweep	Sets the start frequency.
	IEC/IEEE-bus command　　　　`:ABOR`
Exec Single Sweep	Starts a single sweep. This function is displayed and is effective only if Single Mode is selected.
	IEC/IEEE-bus command　　　　`:TRIG`

Utilities

The Utilities menu contains submenus for general functions not directly related to signal generation.

Menu selection: Utilities

```
┌─────────────────────────────────────────────────┐
│   100.000 000 0 MHz  │  -10.0 dBm                │
├─────────────────────────────────────────────────┤
│ Utilities                                         │
│ ■Display■   System      Ref Osc     Protect      │
│ Calib       Diag        Test        Mod Key      │
│ Back ↵                                            │
└─────────────────────────────────────────────────┘
```

Fig. 4-20   Utilities menu

Display

Menu Utilities – Display offers the contrast settings of the display. Setting range is 0 to 63.

Menu selection: Utilities - Display

```
┌─────────────────────────────────────────────────┐
│   100.000 000 0 MHz  │  -10.0 dBm                │
├─────────────────────────────────────────────────┤
│ Utilities/Display                                 │
│ ■Contrast■                              32        │
│ Back ↵                                            │
│                                                   │
└─────────────────────────────────────────────────┘
```

Fig. 4-21   Utilities - Display menu

System

Menu selection: Utilities - System

```
┌─────────────────────────────────────────────────────┐
│     100.000 000 0 MHz│    -10.0 dBm                   │
├─────────────────────────────────────────────────────┤
│ Utilities/System                                      │
│ ▮GPIB▮      RS232       Security      Language        │
│ Back ↵                                                │
└─────────────────────────────────────────────────────┘
```

Fig. 4-22   Utilities - System menu

IEC/IEEE-Bus Address (System - GPIB)

Access to the remote-control address is offered by the Utilities - System - GPIB - Address submenu. The setting range is 1 to 30. The address is factory-set to 28.

Menu selection: Utilities – System – GPIB – Address

```
┌─────────────────────────────────────────────────────┐
│     100.000 000 0 MHz│    -10.0 dBm                   │
├─────────────────────────────────────────────────────┤
│ Utilities/System/GPIB                                 │
│ ▮GPIB-Address▮                              28        │
│ Back ↵                                                │
└─────────────────────────────────────────────────────┘
```

Fig. 4-23   Utilities – System – GPIB – Address menu

GPIB-Address   Input value of IEC/IEEE-bus address.

IEC/IEEE-bus command   :SYST:COMM:GPIB:ADDR 28

Parameters of RS-232-C Interface (System – RS232)

Settings for the configuration of the RS-232-C interface can be made in the Utilities – System – RS232 submenu. The pin assignment of the interface corresponds to that of a PC.

Menu selection: Utilities – System – RS232

```
┌─────────────────────────────────────────────────┐
│  100.000 000 0 MHz │  -10.0 dBm                  │
├─────────────────────────────────────────────────┤
│ Utilities/System/RS232                           │
├─────────────────────────────────────────────────┤
│ Baud Rate                          9600 bps      │
│ Data Format                           7 Bit      │
│ Parity                                 Even      │
├─────────────────────────────────────────────────┤
│ Stop Bit                              1 Bit      │
│ Handshake                         XOn/XOff       │
│ Back ↵                                           │
└─────────────────────────────────────────────────┘
```

Fig. 4-24   Utilities – System – RS232 menu

Baud Rate   Selection of transmission rate.
                       IEC/IEEE-bus command   `:SYST:COMM:SER:BAUD 9600`

Data Format   Indication of number of data bits. This value can be set to 7 or 8.

Parity   Setting of parity. This setting defines the transmission mode for the parity bit for error protection. The following modes are available:
                       Odd   odd parity
                       Even   even parity
                       None   no parity
                       IEC/IEEE-bus command   `:SYST:COMM:SER:PAR  ODD`

Stop Bit   Indication of number of stop bits. This value can be set to 1 or 2.

Handshake   Selection of handshake.
                       None   No handshake
                                     IEC/IEEE-bus command `:SYST:COMM:SER:PACE NONE`
                                                          `:SYST:COMM:SER:CONT:RTS ON`

                       RTS/CTS   Hardware handshake via interface lines RTS and CTS. This setting is to be preferred to the XON/XOFF setting if the host computer permits it.
                                     IEC/IEEE-bus command `:SYST:COMM:SER:CONT:RTS RFR`

                       XON/XOFF Software handshake via ASCII codes 11h <XON> and 13h <XOFF>. This setting should not be used for binary data transmission and for baud rates higher than 9600 baud.
                                     IEC/IEEE-bus command `:SYST:COMM:SER:PACE XON`
                       Note: *To avoid problems in the binary data tranmission, the RS-232-C interface should be set to 8 data bits, no parity and 1 stop bit. This data format is in line with the provisional IEEE P1174.*

Suppression of Indications and Clearing of Memories (System – Security)

For reasons of security, indications can be suppressed and memories cleared in the System – Security submenu.

Menu selection: Utilities – System – Security

```
┌────────────────────────────────────────────────────────┐
│   100.000 000 0 MHz │   -10.0 dBm │
├────────────────────────────────────────────────────────┤
│ Utilities/System/Security                              │
│ State                                          Off     │
│ Annotation Freq                                On      │
│ Annotation Amplitude                           On      │
├────────────────────────────────────────────────────────┤
│ Clear Memory                                          ↓│
│ Back ↵                                                 │
└────────────────────────────────────────────────────────┘
```
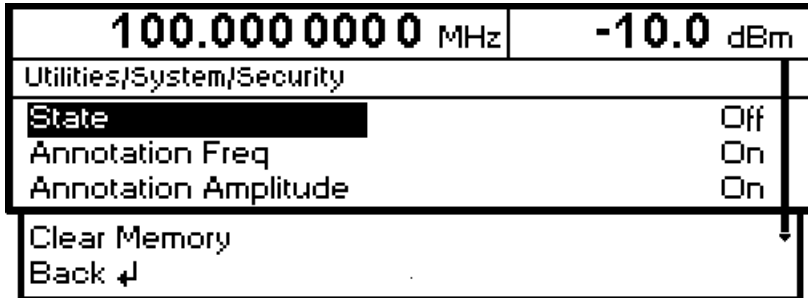
Fig. 4-25   Utilities – System – Security menu

State   Selection of Security status.

On   Locks the suppression of indications. Can be set only via the IEC/IEEE bus.

Off   Deactivates the interlock of the indication suppression. On the ON→OFF transition, the preset state is set, and all data such as stored settings, user correction and list settings are saved. Can be set only via the IEC/IEEE bus.

IEC/IEEE-bus command   `:SYST:SEC OFF`

Annotation Freq   Off   All frequency indications are suppressed.

On   The frequency setting is displayed.

IEC/IEEE-bus command   `:DISP:ANN:FREQ ON`

Annotation Amplitude   Off   All level indications are suppressed.

On   The level setting is displayed.

IEC/IEEE-bus command   `:DISP:ANN:AMPL ON`

Clear Memory   Clearing of all stored data, such as stored settings and user correction settings.

Two IEC/IEEE-bus commands are required for this action:
IEC/IEEE-bus command   `:SYST:SEC ON; SEC OFF`

Indication of IEC/IEEE-Bus Language (System – Language)

The Utilities – System – Language submenu indicates the IEC/IEEE-bus language and the current SCPI version.

Internal/External Reference Frequency (RefOsc)

In the internal-reference mode, the internal reference signal with a frequency of 10 MHz is available at the 10 MHz REF socket on the rear of the instrument.

Signal level: V_{rms} (sine) > 0.5 V at 50 Ω.

In the external-reference mode, an external signal with a frequency of 1 MHz to 16 MHz (steps: 1 MHz) is to be fed to the 10 MHz REF socket . The external-reference mode can be selected in the Utilities – RefOsc menu.

Signal level: V_{rms} = 0.5 V to 2 V

Settings for the reference frequency can be made in the RefOsc menu.

Menu selection: Utilities – RefOsc

```
┌─────────────────────────────────────┬──────────────┐
│  100.000 000 0 MHz │  -10.0 dBm │
├─────────────────────────────────────┴──────────────┤
│ Utilities/RefOsc                                    │
├─────────────────────────────────────────────────────┤
│ Source                                        Int   │
│ ---Internal Frequency Adjustment-------------       │
│ Adjustment State                              Off   │
├─────────────────────────────────────────────────────┤
│ Frequency Adjustment                          0     │
│ Calibration Data                              0     │
│ Back ↵                                              │
└─────────────────────────────────────────────────────┘
```
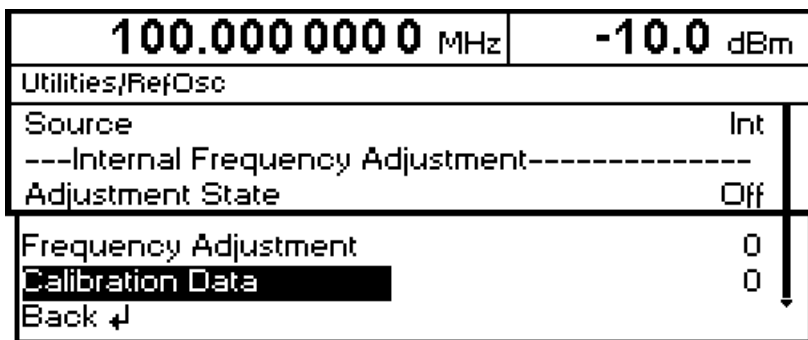
Fig. 4-26   Utilities – RefOsc menu (preset setting)

Source

Selection of operating mode.

Int   Internal-reference mode

Ext   External-reference mode

IEC/IEEE bus command   `:SOUR:ROSC:SOUR INT`

Adjustment State

Off   Tuning value of internal reference frequency as calibrated (see Utilities – Calib menu).

On   Tuning value corresponding to value set under Frequency Adjustment. If option SML-B1 (Reference Oscillator OCXO) is installed, it is affected by these settings.

IEC/IEEE-bus command   `:SOUR:ROSC:ADJ:STAT ON`

Frequency Adjustment

Input value in the range 0 to 4095 for setting the internal reference frequency.

IEC/IEEE bus command   `:SOUR:ROSC:ADJ:VAL 2047`

Calibration Data

Display of the calibration value entered in the Utilities – Calib – RefOsc menu.

IEC/IEEE bus command   `:CAL:ROSC?`

Passwords for Accessing Protected Functions (Protect)

Calibration and service functions are password-protected. To access these functions, passwords (6-digit numbers) have to be entered and confirmed with the [ENTER] key. These functions are automatically locked out on power-up of the instrument.

Password 1   deactivates the lock for the calibration of Main Loop, Level Preset, LFGen Level, Level.

Password 2   deactivates the lock for the calibration of RefOsc, IF Filter, Harm Filter, Mult Filter.

Password 3   factory internal

Password 4   factory internal

Access to protected functions is possible in the Utilities - Protect menu.

Menu selection: Utilities - Protect

```
┌─────────────────────────────────────────────────────┐
│    100.000 000 0 MHz │    -10.0 dBm │
├─────────────────────────────────────────────────────┤
│ Utilities/Protect                                    │
│ ┌─────────────────────────────────────────────┐     │
│ │ Lock Level 1                          On    │     │
│ │ Lock Level 2                          On    │     │
│ │ Lock Level 3                          On    │     │
│ └─────────────────────────────────────────────┘     │
│ Lock Level 4                          On ↓           │
│ Back ↵                                               │
└─────────────────────────────────────────────────────┘
```
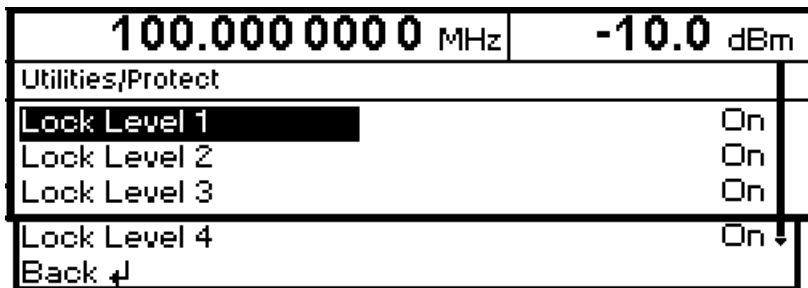
Fig. 4-27   Utilities - Protect menu (preset setting)

Lock Level x   Activation/deactivation of lock.

                    On   The lock is active.

                              IEC/IEEE-bus command `:SYST:PROT1 ON`

                    Off   The entry of the password is enabled automatically. After entering the password, a pop-up menu is displayed. The lock can be deactivated by selection Off.

                              IEC/IEEE-bus command `:SYST:PROT1 OFF, 123456`

Calibration (Calib)

The Utilities - Calib menu offers access to calibration routines and correction values for the purpose of servicing.

Menu selection: Utilities - Calib

```
┌─────────────────────────────────────────────────┐
│   100.000 000 0 MHz      -10.0 dBm              │
├─────────────────────────────────────────────────┤
│ Utilities/Calib                                 │
├─────────────────────────────────────────────────┤
│ Ref Osc     Level      Attenuator  IF Filter    │
│ Main Loop   Mult Filter Harm Filter Level Preset│
│ LFGen Level FM Offset   All         Back ↵      │
└─────────────────────────────────────────────────┘
```

Fig. 4-28   Utilities - Calib menu (preset setting)

Seven internal calibration routines are run on the main board. The evaluated calibration values are stored on the module and if secured by Lock Level must be measured only when the unit is put into operation for the first time or circuit components are to be repaired.
To enable the calibrations, switch off Lock Level 1 in the Utilities-Protect menu (see section "Passwords for Accessing Protected Functions (Protect)" and enter password 123456.

If calibrations are to be performed, the unit is to be warmed up to its normal operating temperature. If a cold unit is calibrated when putting the unit into operation, the calibration has to be repeated with the unit at operating temperature.

Calibrations should be performed in the order indicated in Table 4-1. This is done automatically by the All function in the Calibrate menu.

Table 4-1   Overview of internal calibration routines

No.	Calibration	Function	Lock Level	Module/ component
1	IF Filter	Calibration of IF bandpass filter Calibration of IF gain	1	Mainboard/ synthesizer
2	Main Loop	Calibration of VCO preset voltage Calibration of main loop gain	1	Mainboard/ synthesizer
3	Mult Filter	Calibration of bandpass filters after multiplier	1	Mainboard/ synthesizer
4	Harm Filter	Calibration of harmonics filters	1	Mainboard/ output section
5	Level Preset	Calibration of operating point of AM modulator	1	Mainboard/ output section
6	LFGen Level	Calibration of LF generator level	1	Mainboard/ LF generator
7	FM Offset	Calibration of FMDC offsets	None	Mainboard/ synthesizer
	All	All internal calibrations are performed one after the other in the given order.		

For further information on Calibration of Ref Osc see SML service manual (Order No. 1090.3123.24). Level and attenuator do not need any settings.

Display of Module Versions (Diag - Config)

The versions and modification states of the modules installed can be displayed for servicing purposes. The modules can be displayed in the Utilities - Diag - Config submenu.

Menu selection: Utilities - Diag - Config

```
┌─────────────────────────────────────────────────────┐
│  100.000 000 0 MHz │        0.0 dBm │
├─────────────────────────────────────────────────────┤
│ Utilities/Diag/Config                                │
├─────────────────────────────────────────────────────┤
│ MBRD                        Var 0      Rev 0         │
│ ATT 2                       Var 0      Rev 0         │
│ OCXO   SML-B1               Var 0      Rev 0         │
├─────────────────────────────────────────────────────┤
│ PUM    SML-B3               Var 0      Rev 0         │
└─────────────────────────────────────────────────────┘
```

Fig. 4-29   Utilities - Diag - Config menu

IEC/IEEE-bus command   `:DIAG:INFO:MOD?`

For further information see Service Manual.

Display of Voltages of Test Points (Diag - TPoint)

Access to internal test points is offered by the Diag - TPoint submenu. If a test point is switched on, the voltage is displayed in a window in the header field. For more detailed information see Service Manual.

Menu selection: Utilities - Diag - TPoint

```
┌─────────────────────────────────────────────┐
│   100.000 000 0 MHz │  -10.0 dBm             │
├─────────────────────────────────────────────┤
│ Utilities/Diag/TPoint                        │
├─────────────────────────────────────────────┤
│ State                                    Off │
│ Test Point                              0000 │
│ Back ↵                                       │
└─────────────────────────────────────────────┘
```

Fig. 4-30   Utilities - Diag - TPoint menu

State   Switching on/off the voltage display in the header field.

Test Point   Input value of test point.
                         IEC/IEEE-bus command   :DIAG:POIN? xxxx

Display of Service Data (Diag - Param)

The Diag - Param submenu offers access to various parameters such as serial number, software version, operating-hours counter and overvoltage count.

Menu selection: Utilities - Diag - Param

```
┌─────────────────────────────────────────────────┐
│   100.000 000 0 MHz    │   -10.0 dBm             │
├─────────────────────────────────────────────────┤
│ Utilities/Diag/Param                             │
│ ████████████████████████      01234567/8     ▐█ │
│ Serial No.                                       │
│ Software Version                    1.24         │
│ Software Date                 Feb 10 2000        │
├─────────────────────────────────────────────────┤
│ Power On Count                         2         │
│ Operation Time                      22 h         │
│ Overload Prot. Count                   0         │
│ Boot Code                          FLASH         │
│ Boot Code Version                   1.03         │
│ Flash Size                       4096 kB         │
│ Ram Size                         1024 kB         │
│ MMI Version                      02.00.2         │
│ Back ↵                                           │
└─────────────────────────────────────────────────┘
```

Fig. 4-31   Utilities - Diag - Param menu

For information on IEC/IEEE-bus commands see section "DIAGnostic - System".

Test

The SML carries out a selftest on switching on the instrument. On switching on, the RAM and ROM contents are checked.If an error is detected, this is indicated through a corresponding error message. The battery voltage of the non-volatile RAM is also checked on power-up. If the voltage falls below 2.5 V, storage of data is no longer guaranteed and a message is displayed on the screen.

The most important instrument functions are automatically monitored during operation.
If a faulty function is detected in the selftest, „Err" is displayed in the status line. To identify the error, the ERROR menu, in which the error messages are entered, can be called by pressing the [ERROR] key (cf. Chapter 9, "Error Messages"). The tests can additionally be called via the menu.

Access to the tests is offered by the Utilities - Test menu.
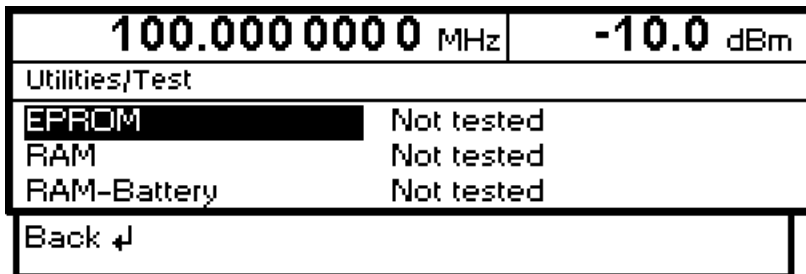
Menu selection: Utilities - Test

```
┌─────────────────────────────────────────────┐
│  100.000 000 0 MHz │  -10.0 dBm │
├─────────────────────────────────────────────┤
│ Utilities/Test                              │
├─────────────────────────────────────────────┤
│ ▐EPROM▌          Not tested                 │
│ RAM              Not tested                 │
│ RAM-Battery      Not tested                 │
├─────────────────────────────────────────────┤
│ Back ↵                                      │
└─────────────────────────────────────────────┘
```

Fig. 4-32   Utilities - Test menu

EPROM   Tests the EPROM. The test result is displayed in a window.
                             IEC/IEEE-bus-command   `:TEST:ROM?`

RAM   Tests the RAM. The test result is displayed in a window.
                             IEC/IEEE-bus-command   `:TEST:RAM?`

RAM-Battery   Tests the RAM battery. The test result is displayed in a window.
                             IEC/IEEE-bus-command   `:TEST:BATT?`

Assigning Modulations to the [MOD ON/OFF] Key (ModKey)

Modulation types can be switched on/off in the modulation menus and with the [MOD ON/OFF] key.

It can be defined in the Utilities - ModKey menu for which modulation types the [MOD ON/OFF] key is to be effective. The key is effective either for all types of modulation or only for a selected modulation.

Function of [MOD ON/OFF] key if effective for only one type of modulation:
➢ The status (on/off) of the selected modulation type will change at each keypress.

Function of [MOD ON/OFF] key if effective for all types of modulation (All):
➢ If at least one type of modulation is switched on, pressing of the [MOD ON/OFF] key will switch off the modulation(s). The modulation types previously active are stored.

If switch-on is made with the [MOD ON/OFF] key, the modulation sources set in the modulation menus are used.

The modulation types to be switched on or off with the [MOD ON/OFF] key can be selected in the Utilities - ModKey menu.

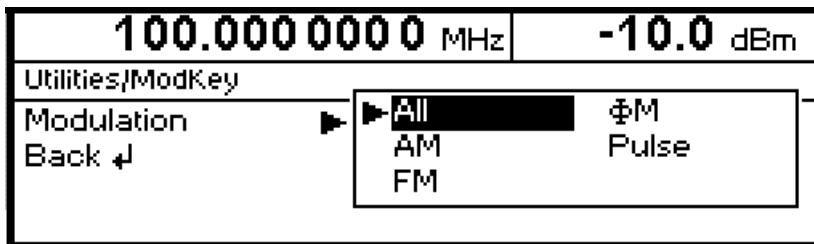Menu selection: Utilities - ModKey

```
┌─────────────────────────────────────────────────────┐
│   100.000 000 0 MHz │   -10.0 dBm                    │
├─────────────────────────────────────────────────────┤
│ Utilities/ModKey                                      │
│ Modulation        ▶ │▶All        ΦM                  │
│ Back ↵              │ AM         Pulse                │
│                     │ FM                              │
└─────────────────────────────────────────────────────┘
```

Fig. 4-33   Utilities - ModKey menu (preset setting)

Modulation   Selection of modulation type(s) for which the [MOD ON/OFF] key is to be effective.

Note: *Preset switches off all modulations, sets this parameter to All and stores AM 30% as default setting.*

Setting the Sweep Blank Time

Settings for the Sweep Blank Time can be made in the Utilities – AuxIO menu.

Menu selection: Utilities – AuxIO

Fig. 4-34   Utilities – AuxIO menu

Sweep Blank Time   Selection of blank duration

Norm   The blank duration is set to the shortest possible time.

Long   The blank duration is set to approx. 500 ms.

IEC/IEEE-bus command   :SOUR2:SWE:BTIM NORM

Status

The SML has a STATUS page which provides an overview of all instrument settings. The settings are displayed in abbreviated form. The STATUS page is called by pressing the [STATUS] key. Return to the previous menu is made with the [BACK] key.

```
┌────────────────────────────────────────────────┐
│  100.000 000 0 MHz │   -10.0 dBm               │
├────────────────────────────────────────────────┤
│ Status                                          │
├────────────────────────────────────────────────┤
│ AM              Off                             │
│ FM              Off                             │
│ ΦM              Off                             │
├────────────────────────────────────────────────┤
│ LF              Off                             │
│ Sweep           Off                             │
│ ALC             On                              │
│ Remote Channel       Both      Unlocked         │
│ Back ↵                                          │
└────────────────────────────────────────────────┘
```

Fig. 4-35   STATUS menu