



ROHDE & SCHWARZ

SPN

GENERATOR SPN



1 Hz to 1.3 MHz

IEEE 488 IEC 625 Bus

CHARACTERISTICS

- Compact, attractively priced generator with wide frequency range from 1 Hz to 1.3 MHz
- High frequency stability
- Extremely low distortion
- Wide output-voltage range
- High spectral purity
- Flat frequency response
- Sinewave and squarewave outputs
- Switch-selected output impedance
- Input for external sweep voltage (lin/log)
- Output voltage proportional to frequency
- Standardized octave and third-octave sequences selectable
- Easy to operate through microprocessor
- Options: IEC bus and balun

Characteristics

The **Generator SPN** is a programmable synthesizer whose sinewave output signal features a wide level range and low distortion. It is suitable both for use in computer-controlled test assemblies (photo below) and for manual operation. Due to its attractive price and remote-control capability via the IEC bus, the SPN finds a wide field of use in production, service, research and development. Since the SPN combines latest technology and modern circuit design, it is able to comply with the most exacting requirements in measurements, e.g. in acoustics and hifi technology. There is also a large number of other fields in which accurate frequencies are required, for instance in telemetry and physics or in mechanical control processes. In addition, the outputs of two SPN generators can be connected in parallel for measuring non-linear distortions.

Frequency. Modern synthesizer technology ensures highly accurate, crystal-referenced output frequencies from 1 Hz to 1.3 MHz with a frequency setting time of only 15 ms. The short setting time is important in computer-controlled test systems with a high measuring rate or for the generation of tone sequences such as those required for measurements on selective calling equipment. The frequency entered via the keyboard is read out on the display in five digits (smallest resolution: 0.1 Hz) with a floating decimal point. The frequency can be varied quasi-continuously using a rotary knob. The SPN offers another

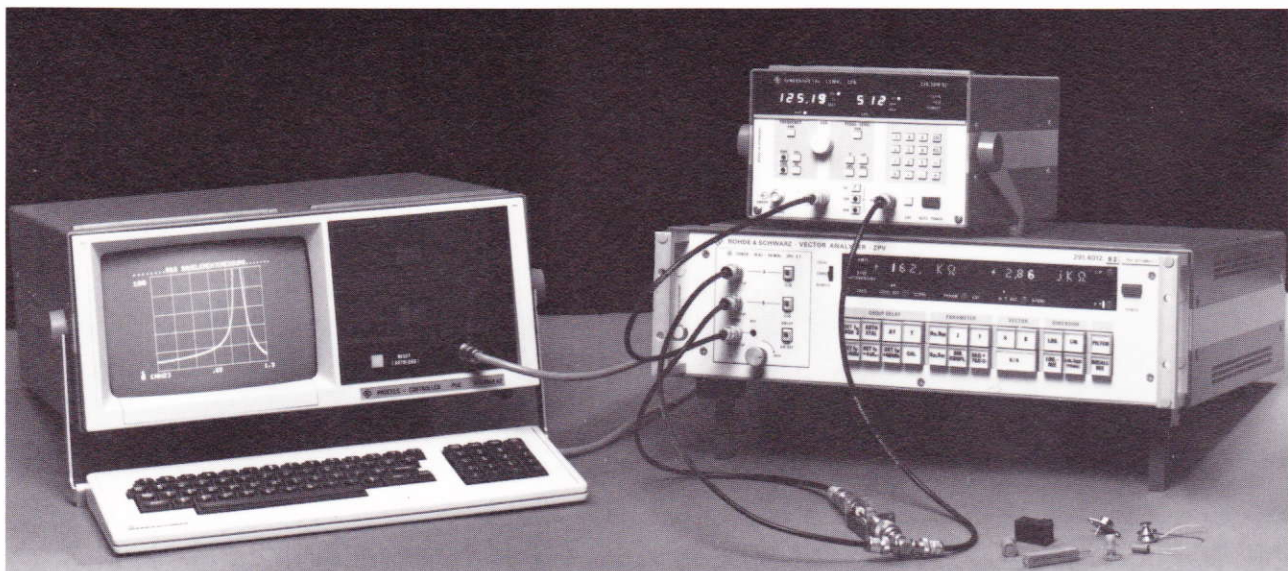
convenient way of frequency variation by frequency jumps with selectable step size and by calling up the standard octave and third-octave sequences. Logarithmic frequency variation is possible by entering a multiplication or division factor between 1.00 and 2.00.

Output level (sinewave output). Adjustable between 0.1 mV and 10V with smallest resolution of 0.01 mV (depending on output impedance selected). The output level is read out in three digits with a floating decimal point on the level display (in mV, dBV or dBm). The output level entered can also be varied quasi-continuously or in steps and it can be converted from one unit into another simply at the push of a button. The maximum output EMF is 10 V_{rms}.

Distortion is as low as 0.03% in the frequency range from 50 Hz to 100 kHz, so that the SPN fulfils the most demanding requirements of the audio-frequency range.

Output impedance. The output impedance of the sinewave output can be selected between 600, 50 and approximately 5 Ω at the push of a button and thus be matched to the standard system impedances. The output impedance is linear and real, allowing the sinewave outputs of two SPN generators to be connected in parallel. The output level can be switched off at another push of the impedance button.

Squarewave output. In addition to the sinewave output, an output with a squarewave signal of the same frequency is available for driving digital circuits as well as for other measuring tasks; output level: TTL, positive.



Automatic test assembly with Generator SPN, Vector Analyzer ZPV and Process Controller PUC

External sweeping. The generator frequency can be swept in a linear or logarithmic mode over the entire frequency range or certain subranges – required sweep voltage 0 to 1.3 V. The logarithmic conversion is done internally. The sweep range is from 1 Hz up to the upper range limit which can be selected and is indicated on the display.

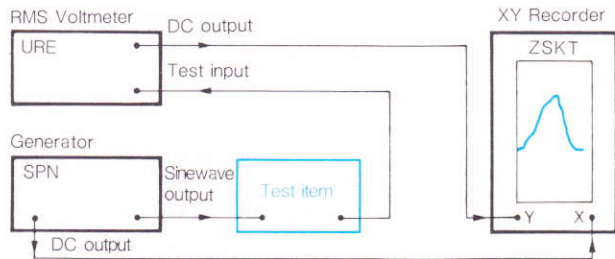
Range 1	1 Hz to 1.3000 kHz
2	1 Hz to 13.000 kHz
3	1 Hz to 130.00 kHz
4	1 Hz to 1300.0 kHz

Setting example: sweep range from 1 Hz to 130 kHz



Frequency-proportional output voltage. In the manual and remote control mode the SPN provides at the SWEEP socket a DC output voltage proportional to the frequency (0 to 1.3 V), the value of 1.3 V corresponding to the selected upper frequency limit (as in sweep mode). This output voltage can be used for plotting the measured curves, e.g. frequency responses, on XY recorders.

With logarithmic frequency variation the DC output voltage also varies logarithmically.



Test setup for frequency response recording using the generator's frequency-proportional DC voltage at the X input of the recorder

Options

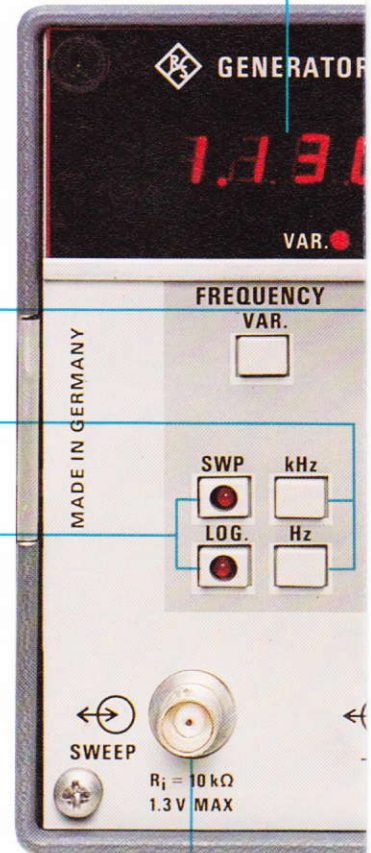
For special applications the performance of the SPN Generator can be extended simply and at low cost.

Remote control. All settings of the Generator SPN can be made remotely using the **IEC Bus option SPN-B4** which can easily be retrofitted. The short programming time makes the SPN suitable for use in automatic measuring assemblies and test systems.

Balun SPN-Z1. Used for feeding balanced line systems or amplifiers and for eliminating hum pickup in test setups; stepdown transformation, therefore low internal impedance (approx. 15 Ω); mumetal-shielded, therefore immune to external interference fields.



5-digit frequency read



Quasi-continuous frequency and level setting

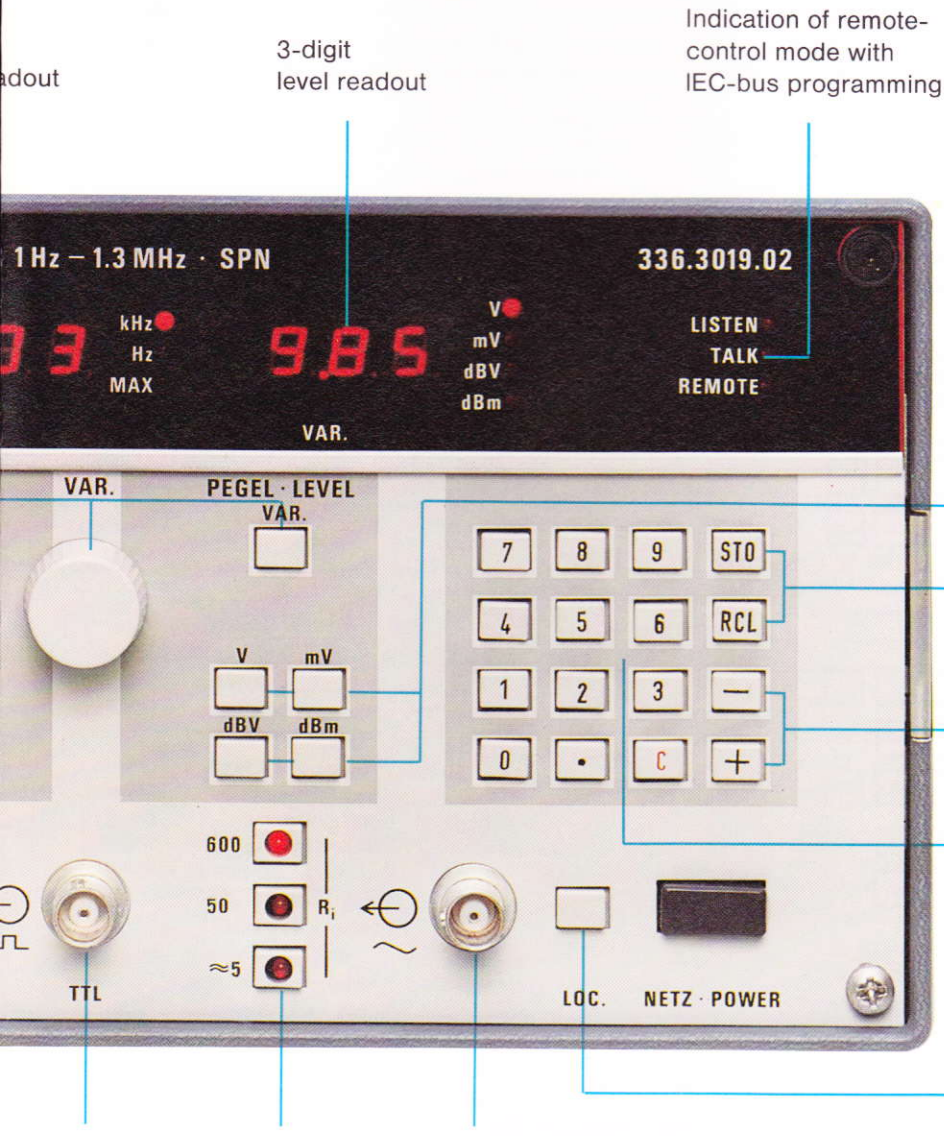
Frequency unit selection

Selection of lin/log sweep mode, voltage available at X output

Input for sweep voltage, X output (proportional to frequency) for recorder/oscilloscope

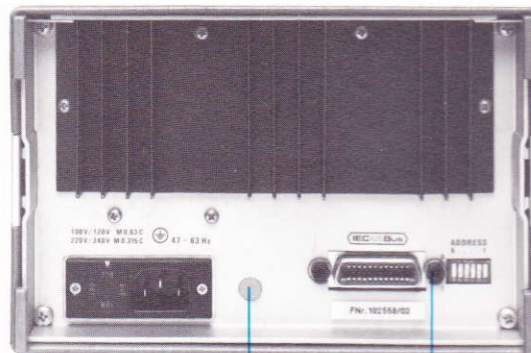
Square wave 1 Hz to 100 kHz

FRONT PANEL and REAR VIEW



- Level unit selection
- Memory for five complete settings
- Addition of subtraction of frequency and level values
- Numerical entry of frequency, level, frequency and level step size, and sweep (X output) range
- IEC-bus control/ local mode

- Sweep output 0.3 MHz
- Output impedance selection and sinewave cut-off – without variation of other settings
- Sinewave output
1 mV to 10 V ($Z_{out} = 600$ und 50Ω)
0.1 mV to 1 V ($Z_{out} \approx 5 \Omega$)



- Opening for bringing out sinewave or squarewave output
- IEC-bus connector and address switch

Operation

High operating convenience. Thanks to the microprocessor control the SPN is easy to operate. Data entry is made via keys, the numerical value being entered first, then the unit. Quasi-analog settings are possible using the rotary knob.

Frequency setting

1.1303 kHz

5 Hz

Step-up by 1 kHz

Step-down by 100 Hz

Variation with 100 Hz step size

Logarithmic variation (10%)

(Freq.)

Level setting

9.85 V

122 mV

18.2 dBV

6 dBm

Variation with 10 mV step size

(Level)

Output impedance

50 Ω

Storage facility. The SPN can store five complete instrument settings (memory addresses: 1 to 5). RCL recalls either complete settings or individual frequency or level settings.

Storage: complete setting

Recall: complete setting

level value only

frequency value only

Special functions. The frequency steps commonly used in acoustics (DIN 45401, ISO 266) are possible by calling up special functions:

for 1st octave sequence (16/31.5/63/125/... Hz)

for 2nd octave sequence (22.4/45/90/180/... Hz)

for 1st third-octave sequence (16/20/25/31.5/... Hz)

for 2nd third-octave sequence (18/22.4/28/35.5/... Hz)

The VAR knob allows the selected sequence to be stepped up or down.

Programming

Programming examples for the Process Controller PUC from Rohde & Schwarz for setting the level, output impedance and frequency on the Generator SPN (address 11).

Setting of
 level IECOUT11,"9.85V"
 output impedance IECOUT11,"R5"
 frequency IECOUT11,"1.1303KH"
 Several instructions in one program line
 IECOUT11,"9.85V R5 1.1303KH"

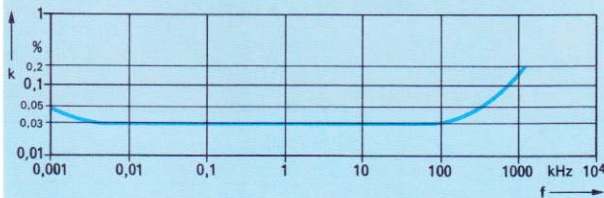
IEC-bus commands. The setting instructions consist of data and a combination of two characters which are also the delimiter.

Function	Data	Instructions
Setting the frequency in kHz in Hz for short transient time in kHz in Hz	max. 5 digits with or without decimal point	KH HZ KS HS
Setting the level in V in mV in dBV in dBm	max. 3 digits with or without decimal point	V MV DV DM
Switching off the level		R0
Switching on linear SWEEP range 1 range 2 range 3 range 4		S1 S2 S3 S4
Switching off SWEEP		S0
Switching on logarithmic SWEEP range 1 range 2 range 3 range 4		L1 L2 L3 L4
Switching off log SWEEP		L0
Setting the output impedance 600 Ω 50 Ω ≈ 5 Ω		R6 R5 R1
Storing the complete setting		ST n
Recalling the complete setting		RC n
Recalling the frequency	n: storage location 1 to 5	RCKH n RCHZ n
Recalling the level		RCV n RCMV n RCDV n RCDM n
Switching on the special function	n: number of special function	RC n
Enabling service request		SR

SPECIFICATIONS

Specifications

Frequency	
Range	1 Hz to 1.3 MHz
Setting	keyboard entry or rotary knob, in Hz or kHz
Indication	
Resolution	5-digit readout
from 1 Hz to 1.3 kHz	0.1 Hz
1.3 to 13 kHz	1 Hz
13 to 130 kHz	10 Hz
130 to 1300 kHz	100 Hz
Frequency switching time	15 ms
Ageing	$< 1 \times 10^{-5}$ /month
Temperature effect	$\leq 1 \times 10^{-6}/^{\circ}\text{C}$
Outputs	
separate outputs for sinewave and squarewave signals (one output can be brought out on rear panel)	
Sinewave output (short-circuit-proof)	
Output EMF in V_{rms}	1 mV to 10 V ($Z_{\text{out}} = 600$ and 50Ω)
Level setting	0.1 mV to 1 V ($Z_{\text{out}} \approx 5 \Omega$)
Indication	keyboard entry or rotary knob
Resolution	3-digit readout of EMF
from 0.1 to 0.99 mV	0.01 mV
1 to 99.9 mV	0.1 mV
100 to 999 mV	1 mV
1 to 10 V	0.01 V
for dBV and dBm	0.1 dB
Error of output EMF	
from 300 mV to 10 V	$\leq \pm 2\%$
10 to 300 mV	$\leq \pm 3\%$
1 to 10 mV	$\leq \pm 5\%$
Frequency response flatness of output EMF	
from 1 Hz to 9.999 kHz	$\leq \pm 0.5\%$
10 kHz to 1.3 MHz	corresponding to ± 0.05 dB
1 Hz to 1.3 MHz	corresponding to ± 0.05 dB
Distortion at 10 V EMF	
1 to 50 Hz	$< 0.05\%$
50 Hz to 100 kHz	$< 0.03\%$
0.1 to 1.3 MHz	$< 0.2\%$



Distortion limits for maximum output EMF of $10 V_{\text{rms}}$ ($k = \text{distortion}$)

Spectral purity:	
Harmonics	
at $f_{\text{carrier}} \leq 100$ kHz	< -70 dBc ¹⁾
$f_{\text{carrier}} > 100$ kHz	< -54 dBc ¹⁾
Non-harmonics	
(at $V_{\text{out}} > 100$ mV)	
at $f_{\text{carrier}} \leq 700$ kHz	< -70 dBc ¹⁾
$f_{\text{carrier}} > 700$ kHz	< -65 dBc ¹⁾
AC supply- and microphony-dependent interfering signals	
at $f_{\text{carrier}} \leq 130$ kHz	< -65 dBc ¹⁾
$f_{\text{carrier}} > 130$ kHz	< -50 dBc ¹⁾
Output impedance,	
switch-selected	$600/50 \Omega \pm 1\%$
	$\approx 5 \Omega$
Switching off level	by pressing Z_{out} button
Level switching time	< 30 ms
Connector	BNC female
Squarewave output	
Fan-out	TTL levels, positive
Connector	10
	BNC female
Sweep operation	
with external signal; linear or logarithmic scale, switch-selected	
Sweep range	
1 Hz to	1.3 kHz/13 kHz/130 kHz/1.3 MHz
Sweep voltage	0 to 1.3 V/10 k Ω
Sweep frequency	0 to 10 kHz
Local/remote control	
Frequency-proportional output voltage	0 to 1.3 V/200 Ω
Connector	BNC female

Options

IEC Bus SPN-B4	
System	IEC 625-1/IEEE 488
Functions	L4 basic listener, unaddress if MTA T6 basic talker, serial poll, unaddress if MLA RL1 remote/local DC1 device clear SR1 service request
Connector	24-way female (Amphenol)
Balun SPN-Z1	
Input	BNC connector with coaxial cable (25 cm)
Output	4-mm knurled terminals (telephone jacks)
Frequency range	30 Hz to 100 kHz
No-load transformation ratio	3.16 : 1 corresponding to -10 dB (± 0.1 dB)
Asymmetry of output voltage	
from 30 Hz to 15 kHz	< 0.1 dB
up to 20 kHz	< 0.2 dB
up to 30 kHz	< 0.3 dB
up to 100 kHz and symmetrical about centre tap of load impedance	< 0.5 dB
Source impedance	$\approx 15 \Omega$
Permissible load impedance	$\geq 150 \Omega$
Distortion	$< 0.2\%$ (with source voltage of $10 V_{\text{rms}}$ max and $Z_{\text{out}} = 50 \Omega$)
Frequency response flatness of output level	
up to 30 kHz	$< \pm 0.2$ dB
up to 100 kHz	$< \pm 1$ dB
Max. permissible primary voltage	
10 to 30 Hz	$5 V_{\text{rms}}$
30 to 60 Hz	$15 V_{\text{rms}}$
60 Hz to 100 kHz	$32 V_{\text{rms}}$
Dimensions, weight	83 mm x 130 mm x 105 mm, 1.5 kg

General data

Rated temperature range	+5 to +45 $^{\circ}\text{C}$
Storage temperature range	-40 to +70 $^{\circ}\text{C}$
RF screening	full compliance with VDE 0871 and MIL Std. 461 A to method CE03 and RE02 (radio interference and faults in connecting lines) and VDE 0875 (limit values of radio interference degree K)
Mechanical load	shock- and vibration-tested to DIN 40046, parts 7 and 8 (corresponding to IEC Publications 68-2-27 and 68-2-6)
AC supply	100/120/220/240 V $\pm 10\%$, 47 to 63 Hz (55 VA), safety class I to VDE 0411
Dimensions, weight	245 mm x 154 mm x 347 mm, 6.5 kg

Ordering information

Order designation	► Generator SPN 336.3019.02
Accessories supplied	power cable, manual

Recommended extras

Options:	
IEC Bus SPN-B4	265.4019.02
Balun SPN-Z1	265.4319.02
19" Adapter ZZA-23	078.8397.00

¹⁾ dBc = relative level, referred to carrier amplitude.