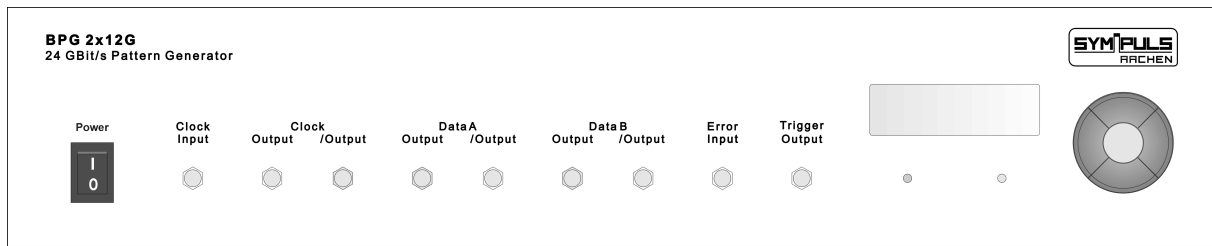# Multichannel Pattern Generator BPG 2x12G

(Illustration similiar)

Key Features

Wide-band Multi-Channel Test Generator for Multiplexer Circuits up to 24 Gbps

Maximum Data Rates of 12 Gbps per Channel

Differential Data Outputs with Adjustable Amplitudes $0.4\,V_{pp} \ldots 0.6\,V_{pp}$ single-ended

2*32 Mbit Memory for User Programmable Patterns of Variable Length

Operation via USB Interface or Front Panel Controls

Compact Desktop Design with Low Power Consumption and Low Fan Noise

Optionally Available:

- Extended Pattern Memory of 2*64 Mbit or 2*128 Mbit
- Independently Adjustable Amplitude and Offset for Each Channel
- Integrated Synthesizer
- Independent Time Delay for Each Channel
- Other Customizer Specific Features on Demand

Brief Description

The multichannel bit pattern generator BPG 2x12G is a wide-band tuneable test generator with two independent output channels for the development of fast multiplexer circuits.

User programmable patterns and pseudo random binary sequences at data rates between 5 Mbps and 12 Gbps can be generated. An external clock signal is needed to provide the time base for operation.

Both output channels A and B have complementary outputs and provide non-return-to-zero signals. In PRBS Mode there is a phase lag between the output channels that equals half the length of the pseudo random sequence to fulfill CCITT recommendations after 2 to 1 multiplexing.

The following patterns are selectable: Four Peudo Random Binary Sequences of $2^7 - 1$, $2^{15} - 1$, $2^{23} - 1$ und $2^{31} - 1$ bit length and structure according to CCITT standards and for each channel a short user pattern with a length of 64 bit and a user pattern of 32 Mbit length.

All user patterns are freely programmable via USB interface. Each bit can be set to a positive pulse or to zero and the length of the long user pattern is configurable from 64 bit up to 33 554 432 bit. The programmed bit sequence is repeated periodically. Additionally the pattern memory can be split in 2 or 4 parts to toggle synchronously between different waveforms.

Several clock and trigger signals are available: Complementary clock signals, a divided clock signal (Clock/8) and a word frame trigger signal.

Single errors and programmable error sequences can be added to the data outputs over the error input.

The BPG 2*12G can be operated over its front panel controls or remotely controlled via its USB-interface. An easy-to-use graphical user interface is included in the supplied software and allows simple operation by mouse-clicking. Additionally self programmed software may be used to control the instrument.

Optionally the instrument is available with an integrated synthesized clock generator, independently adjustable time delay for each channel and/or extended amplitude and offset regulation.
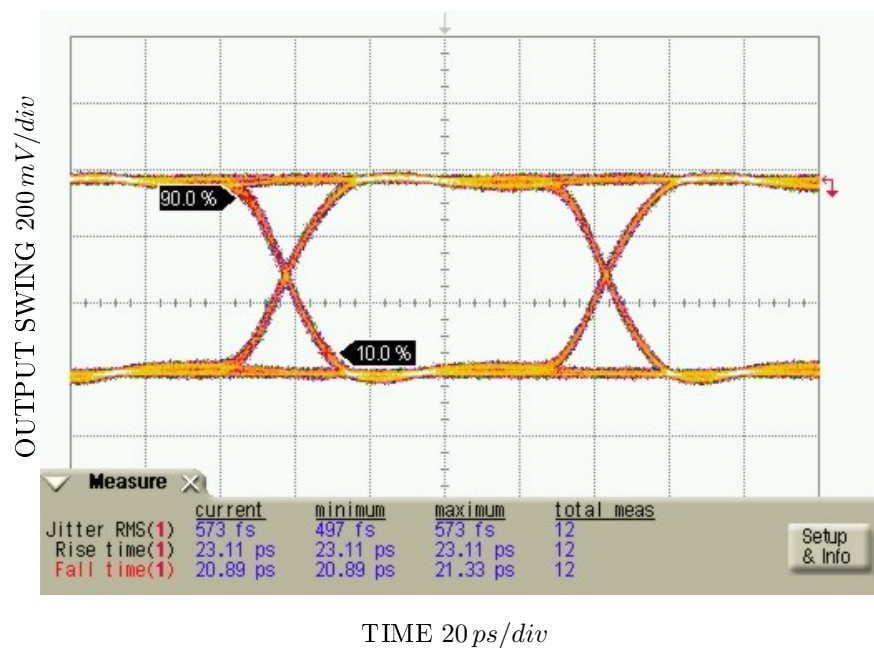
Output Signals

All oscillograms taken using Agilent 86100B sampling oscilloscope with sampling module 86118A (70 GHz cut-off frequency).

Pseudo Random Binary Sequence $2^7 - 1$ at 12 Gbps:

In PRBS mode there is a phase lag of half the length of the pseudo random sequence between the two output channels to fulfill CCITT recommendations after 2 to 1 multiplexing.
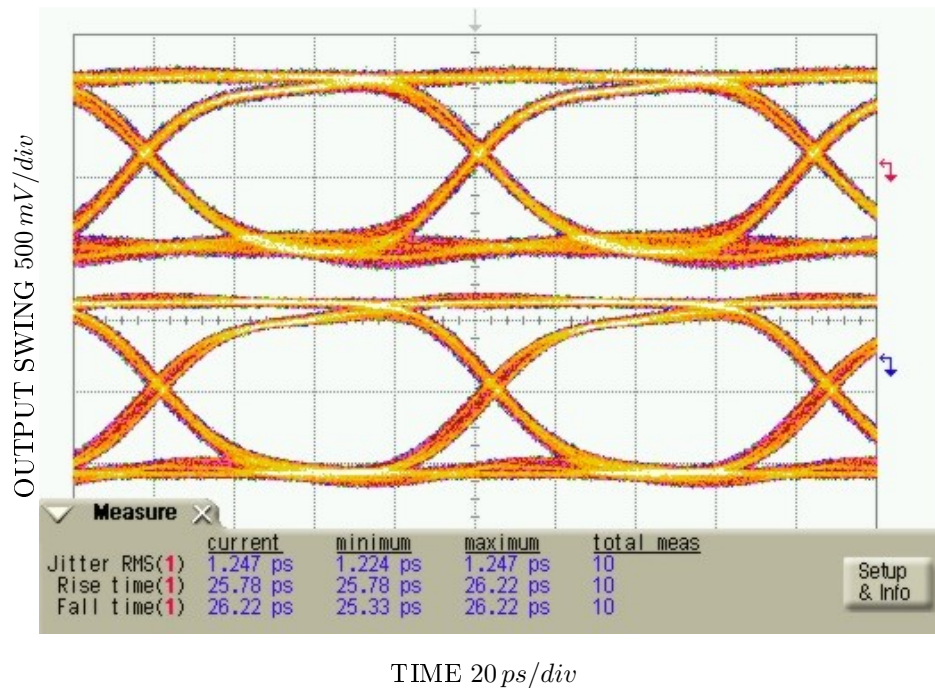

TIME $500\,ps/div$
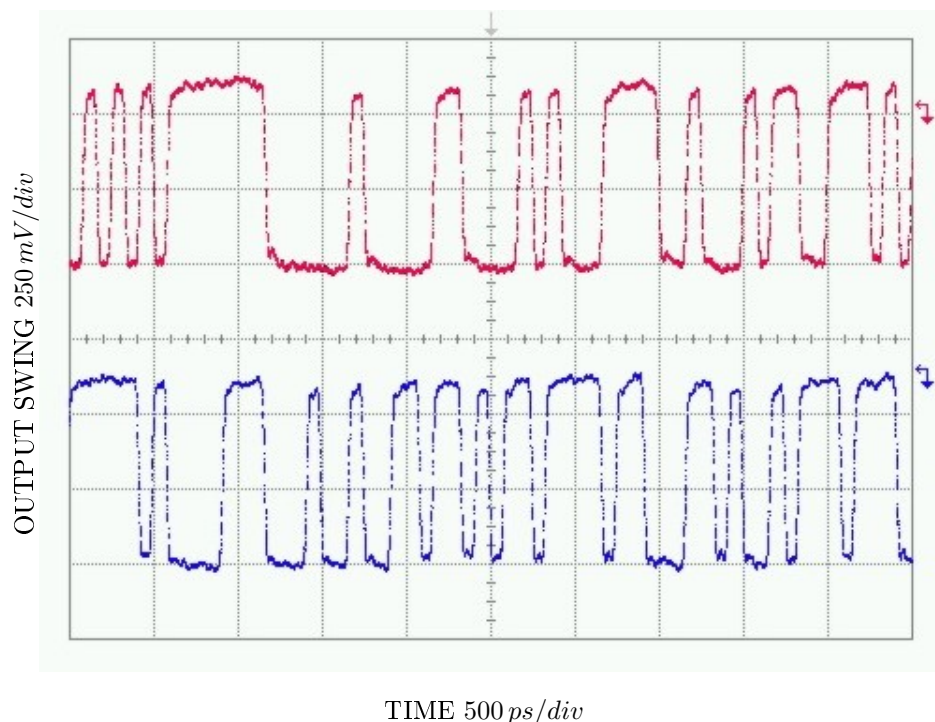
Jitter and Rise-/Fall-Times of the Output Signal at 12 Gbps:

TIME $20\,ps/div$

Eye Diagram of Output Signal with Option 2:

The output signal is delayed in steps of $5\,ps$.

TIME $20\,ps/div$
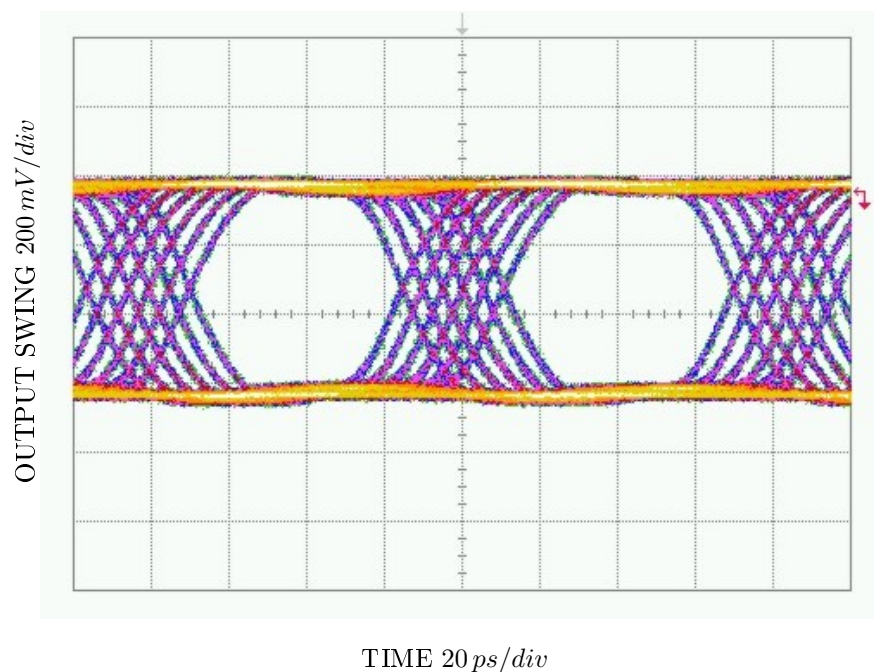
Eye Diagram of Two Complementary Output Signals with Option 3:

The amplitude of the output signals is set to $1.3\,\mathrm{V}_{pp}$.

TIME $20\,ps/div$

Technical Data

BPG 2x12G	
Bit Rate	5 Mbps … 12 Gbps, full-range tuneable
Clock Input	5 MHz … 12 GHz,
	$U_i = 0,5 … 1\,V_{pp}$, $R_i = 50\,\Omega$,
	$\lvert r \rvert < 0,2$, $50\,\Omega$ SMA
	6-Digit Frequency Display
	Optionally: Internal Synthesizer 100 MHz … 12 GHz, Resolution 100 kHz
Pulse Patterns	1. PRBS $2^{31} - 1$, PRBS $2^{23} - 1$, PRBS $2^{15} - 1$, PRBS $2^7 - 1$
	For Each Channel A and B:
	2. User Pattern 64 Bit
	3. User Pattern 64*m Bit ($m = 1, 2 …, 2^{19}$),
	(= max. 33 554 432 Bit)
	4. User Pattern Consisting of Two Parts, Each of Length $64 * m$ Bit
	($m = 1, 2, …, 2^{18}$), Synchronously Selectable via USB-Port
	(Two Waveform Mode)
	5. User Pattern Consisting of Four Parts, Each of Length $64 * m$ Bit
	($m = 1, 2, …, 2^{17}$), Synchronously Selectable via USB-Port
	(Four Waveform Mode)
	All User Pattern Programmable and Selectable via USB Interface.
Data Outputs	A: NRZ and /NRZ, $50\,\Omega$ SMA,
	B: NRZ and /NRZ, $50\,\Omega$ SMA,
	Adjustable Amplitude $0.4\,V_{pp} … 0.6\,V_{pp}$ into $50\,\Omega$
	Rise / Fall time $< 25\,\text{ps}$ (10/90%)
	Jitter (rms) $< 750\,\text{fs}$
	Polarity Reversible
Clock Outputs	Clock and /Clock, $0.5\,V_{pp} \pm 0.1\,V$,
	AC-Coupled, $50\,\Omega$ SMA
	Data to Clock Skew $\pm 20\,ps$
Trigger Outputs	1. Clock/8
	2. Word Frame Trigger
	CML: 0 V/-0.4 V into $50\,\Omega$ SMA
Error Addition	Programmable: 10^{-4}, 10^{-4}, …, 10^{-10}
	Single Errors via Push Button or TTL Signal, max. 100 KHz, SMA
Interface	High Speed USB
	Max. Data Transmission Rate 2 MByte/s

BPG 2x12G

Dimensions	19" Desktop W x H x D = 462 x 90 x 360 mm
Weight	approx. 8 kg
Power Supply	110 V-120 V/60 Hz/65 VA or 220 V-240 V/50 Hz/65 VA

Optionally Available

Option 1	Internal Synthesizer, Frequency Range 100MHz to 12 GHz, Resolution 100 kHz, Internal or External Clock Selectable, 10 MHz Reference Input and Output
Option 2	Independent Time Delay of $\pm 40\,ps$ for each Channel, Resolution 1 ps
Option 3	Integrated Output Amplifier with Amplitude Adjustment. Amplitude: $0.5\,V_{pp}\ldots 1.3\,V_{pp}$, Jitter (rms) < 1.5 ps, Rise-/Fall-Time < 30 ps (20/80%)
Option 4	Integrated Output Amplifier with Amplitude and Offset Adjustment. Amplitude: $0.5\,V_{pp}\ldots 1.3\,V_{pp}$, Offset: $\pm 2\,V$ Jitter (rms) < 1.5 ps, Rise-/Fall-Time < 30 ps (20/80%)
Option 5	Extended Pattern Memory of 2*64 Mbit
Option 6	Extended Pattern Memory of 2*128 Mbit

Ordering Information

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D-52064 Aachen

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Fax: +49 241 35335
Email: mail@sympuls-aachen.de
Internet: www.sympuls-aachen.de

Included in delivery:

- BPG 2x12G
- 115/230 V Mains, User Manual, USB Cable Set
- CD-ROM with Device Drivers and Operating Software

The instrument is produced by SYMPULS in Germany.
We offer a reliable service and 24 month warranty.