

Pattern Generator BPG 12G



Pattern Generator BPG 12G

Key Features

Pattern Generator with Differential Outputs and Wide-band Tunable Bit Rate up to 12 Gbps

PRBS and User Programmable Pattern with Variable Length from 16 bit up to 32 Mbit

Differential Outputs with Adjustable Amplitude between $0.35 V_{pp}$ and $0.55 V_{pp}$ single-ended

Jitter-transparent for Jitter Tolerance Testing

Compact Desktop Design with Low Power Consumption and Low Fan Noise.

Optionally Available:

- Extended Pattern Memory of 64 Mbit, 128 Mbit or 256 Mbit
- Integrated Signal Amplification with Adjustable Amplitude
- Integrated Synthesizer
- Other Customer Specific Features on Demand

Brief Description

The pattern generator BPG 12G is a universal test instrument for fast communication systems and electronic components in the picosecond range. The instrument works gap-free at data rates between 5 MHz and 12 GHz. An external clock signal is needed to provide the time base for operation. The generator is jitter-transparent and follows even abrupt frequency changes.

The complementary data outputs provide non-return-to-zero signals. The following patterns are selectable: Pseudo Random Binary Sequences of $2^7 - 1$, $2^9 - 1$, $2^{11} - 1$, $2^{15} - 1$, $2^{23} - 1$ and $2^{31} - 1$ bit length, two short user patterns with a length of 16 and 64 bit and a user pattern of 33554432 bit length. Larger pattern memory of up to 256 Mbit is optionally available.

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.

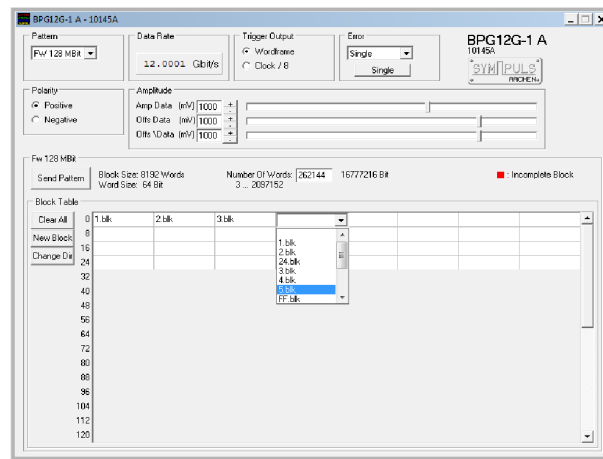
Single errors and programmable error sequences can be added to the data outputs over the error input.

All instrument settings can be changed over the navigation buttons on the front panel and the current parameter settings are displayed on the LCD on the front panel. Additionally the pattern generator can be remotely controlled by a personal computer (PC) over the USB-port. The enclosed graphical user interface allows simple operation by mouse-clicking or self-programmed software may be used to control the instrument.

Optionally integrated signal amplification with amplitude adjustment and an integrated synthesized clock generator is available.

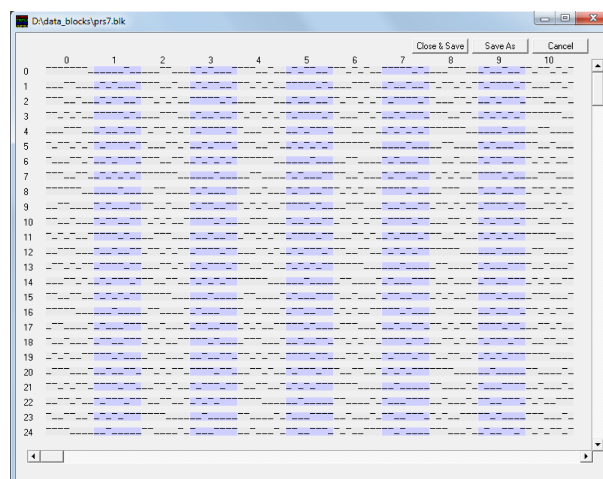
Graphical User Interface

All instrument settings and patterns are programmed via an easy-to-use graphical user interface on your PC.



Graphical User Interface

The pattern memory is split into 64 blocks. Each block has 8192 words, each word 64 bit. The pattern length can be set from 3 to 524288 words. The block editor allows to set or unset each bit by mouse-clicking. The pattern data can also be generated using customer-specific software and then loaded into the pattern memory from a binary data file.

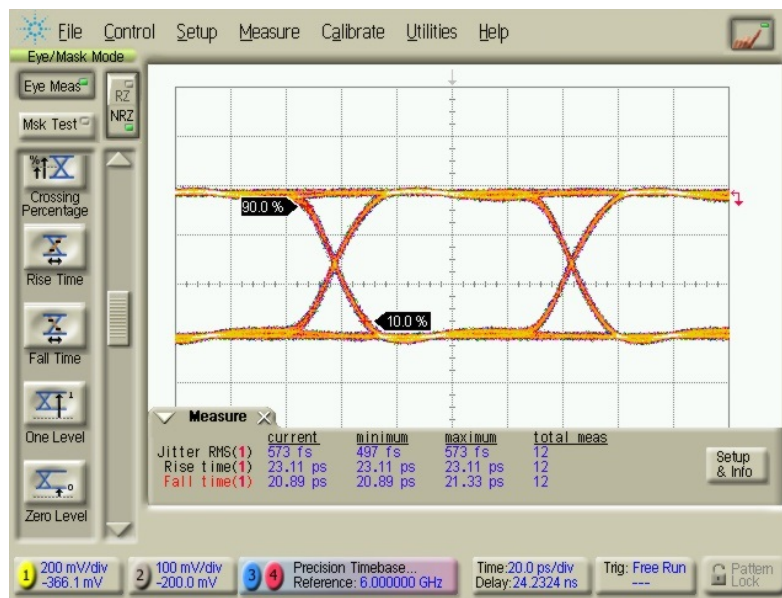


Block Editor for Programming the Long User Patterns

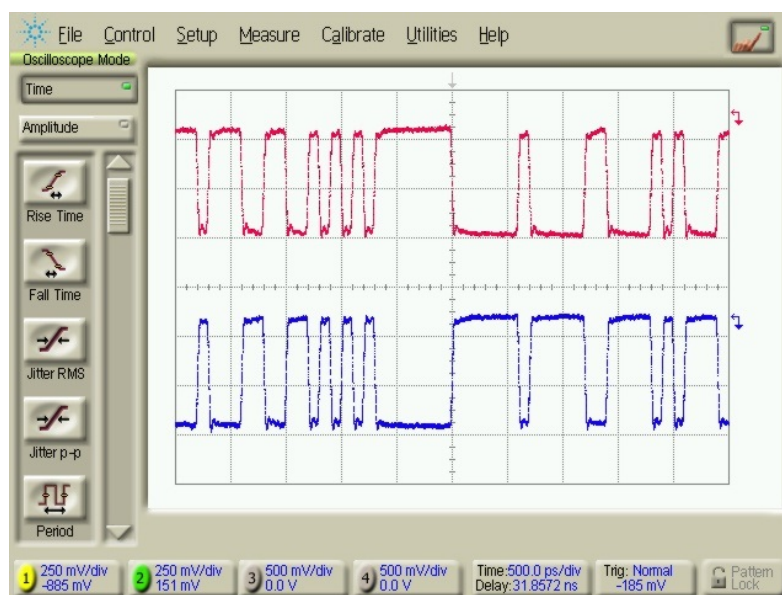
Output Signals

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

Jitter and Rise-/Fall-Times of the Output Signal at 12 Gbps:



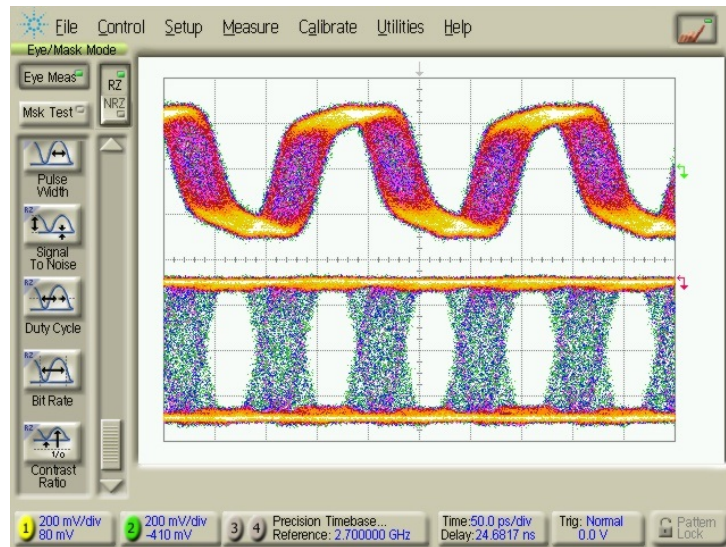
Pseudo Random Binary Sequence $2^7 - 1$ at 10 Gbps:



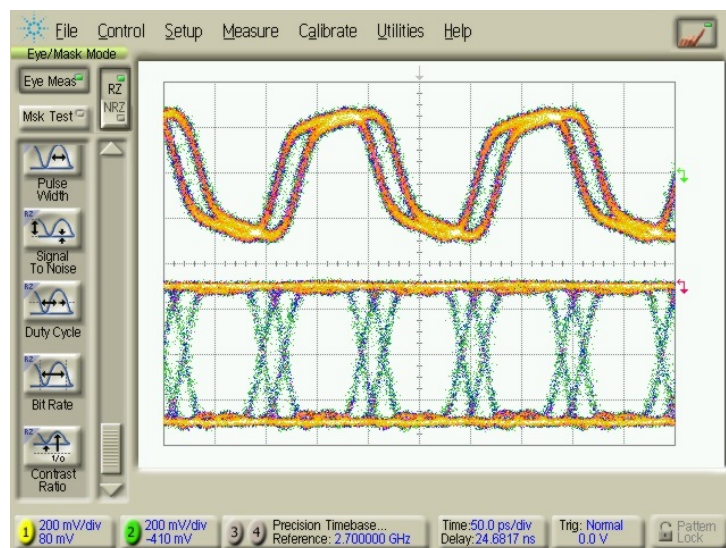
Jitter-Transparency

The pattern generator works gap-free with input clock frequencies between 5 MHz and 12 GHz and follows even abrupt frequency changes. By modulating the external clock source jitter-modulated data signals can be generated.

Clock and Data Output with a jitter-modulated input signal at 10 GHz



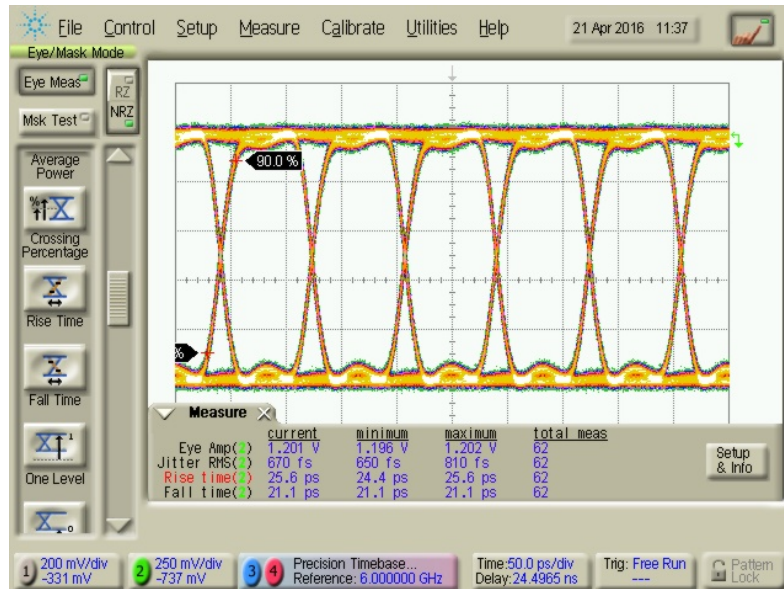
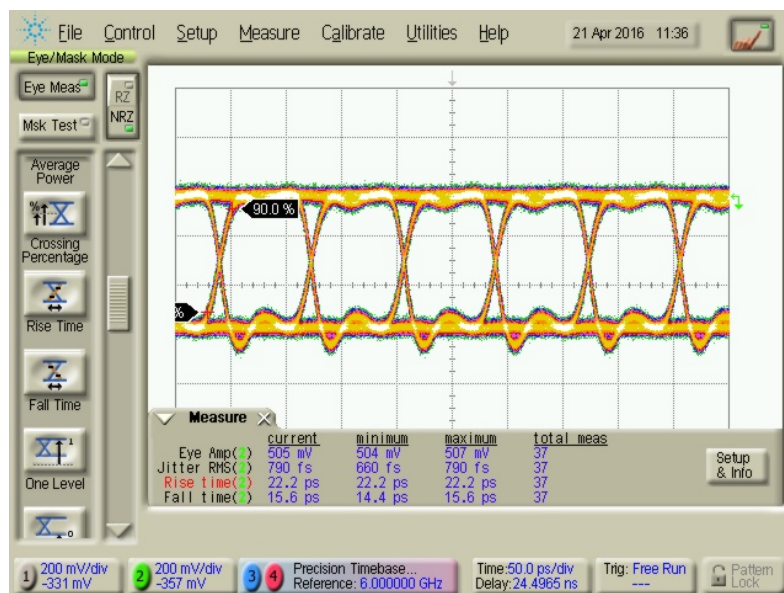
(a) Sinusoidal Modulation Source



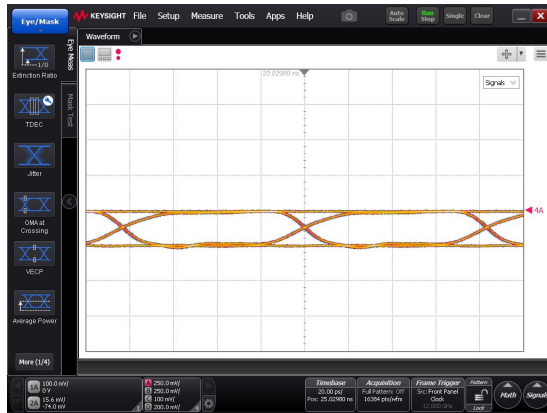
(b) Rectangular Modulation Source

Option 1: Internal Synthesizer

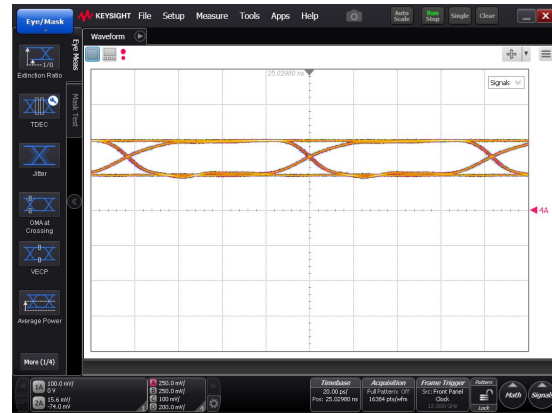
The pulse pattern generator BPG12G is available with an internal quartz controlled clock generator. It has a wide frequency range from 125 MHz to 12 GHz with a resolution of 10 Hz. The external clock input combined with an internal selector allows to switch between the internal and external clock signal.

Option 2: Extended Output Amplitude 250 mV... 1200 mV:**12 Gbps Output Signal at Maximum Amplitude****12 Gbps Output Signal at 500 mV Amplitude**

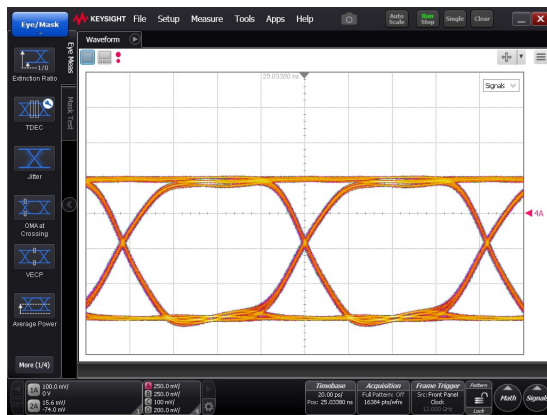
Option 3: Extended Output Amplitude with Offset Adjustment



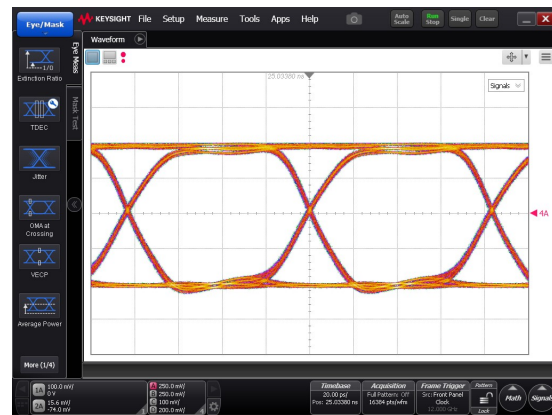
(c) Amplitude $0.25 V_{pp}$, Offset: 0 mV



(d) Amplitude $0.25 V_{pp}$, Offset: 500 mV



(e) Amplitude $1 V_{pp}$, Offset: 250 mV



(f) Amplitude $1 V_{pp}$, Offset: 500 mV

Figure 1: Offset Settings

With no added offset voltage the output levels are 0 V and -0.25 V ... -1.0 V depending on the amplitude settings. The offset voltage of 0 V ... +1.0 V is added to these output levels.

Technical Specifications

BPG12G

Clock Input

Frequency Range	5 MHz ... 12 GHz
	Rectangular input clock signal required for input frequencies < 1 GHz
Impedance	$R_i = 50 \Omega$, $ r < 0,2$
Input Level	$U_i = 0.5 \dots 1.0 V_{pp}$
Connector	50 Ω SMA

Frequency Display	6-digit frequency display
-------------------	---------------------------

Pulse Patterns

Data Format	Non-Return-To-Zero
Data Rate	According to input clock frequency, 5 Mbps ... 12 Gbps
PRBS	$2^{31} - 1$, $2^{23} - 1$, $2^{15} - 1$, $2^{11} - 1$, $2^9 - 1$, $2^7 - 1$
Pattern Memory	33 554 432 Bits
Programmable Pattern Length	$64 * m$ Bit, ($m = 1, 2, 3, \dots, 2^{19}$)

Data Outputs

Complementary data outputs *NRZ* and */NRZ* with negative output amplitude, DC-coupled

Amplitude	adjustable, 0V / $(-0.35 V \dots -0.55 V)$ into 50 Ω
Rise/Falltime (20%-80%)	< 25 ps
Jitter (pp)	< 5 ps
Jitter (rms)	< 1 ps
Duty Cycle	50% Nominal
Data Polarity	Normal or Inverted Logic
Impedance	$R_i = 50 \Omega$, $ r < 0.2$
Connector	50 Ω SMA, $ r < 0.2$

Clock Outputs

Complementary clock outputs *Clock* and */Clock*, AC-coupled

Amplitude	$0.5 V_{pp} \pm 0.1 V$
Rise/Falltime (20%-80%)	< 25 ps
Data to Clock Skew	± 20 ps
Connector	50 Ω SMA

BPG12G**Trigger Output**

Trigger Modes	1. Clock/8
	2. Wordframe (data synchronous trigger signal)

Amplitude	$(-0.4\text{ V} \pm 0.1\text{ V})/0\text{ V}$, DC-coupled
-----------	--

Connector	50 Ω SMA, $ r < 0.2$
-----------	------------------------------

Error Insertion

Programmable Error Addition	Single, 10^{-4} , 10^{-5} , ..., 10^{-10}
-----------------------------	---

AUX Input	Input Range $U_i = -8\text{ V} \dots +8\text{ V}$,
	Impedance 1k Ω
	Programmable threshold voltage -4000 mV ... +4000 mV
	Resolution 10 mV
	Maximum error frequency $\leq \max\{(\text{data rate})/256, 10\text{ MHz}\}$

General Information

Interface	Operation via front panel controls or High Speed USB max. Data Transfer Rate 6 MByte/s
-----------	---

Software	Graphical User Interface
----------	--------------------------

Dimensions	19" Desktop
	W x H x D = 462 x 90 x 360 mm ³

Weight	approx. 6 kg
--------	--------------

Power Supply	110 V – 120 V/60 Hz/40 VA or
	220 V – 240 V/50 Hz/20 VA

Optionally available**Option 1: Internal Synthesizer**

System clock selectable between internal clock generator and external clock input

Frequency Range	100 MHz ... 12 GHz
-----------------	--------------------

Resolution	1 Hz
------------	------

10 MHz Reference Input	$U_i = 1 V_{pp} \dots 3 V_{pp}$
	50 Ω SMA, AC-coupled

10 MHz Reference Output	Amplitude $1.5 V_{pp}$
	50 Ω SMA, AC-coupled

BPG12G

Option 2: Extended Output Amplitude

Complementary data outputs *NRZ* and */NRZ* with negative output amplitude, DC-coupled

Amplitude	adjustable, $0\text{ V} / (-0.25\text{ V} \dots -1.2\text{ V})$ into $50\ \Omega$
Rise/Falltime (10%-90%)	$< 30\text{ ps}$
Jitter (rms)	$< 1\text{ ps}$
Impedance	$R_i = 50\ \Omega$, $ r < 0.2$
Connector	$50\ \Omega$ SMA, $ r < 0.2$

Option 3: Extended Output Amplitude with Offset Adjustment

Complementary data outputs *NRZ* and */NRZ*

Amplitude	adjustable, $0\text{ V} / -0.25\text{ V} \dots -1.0\text{ V}$ into $50\ \Omega$
Offset	$0\text{ V} \dots +1.0\text{ V}$ Independently adjustable for outputs <i>NRZ</i> and <i>/NRZ</i>
Rise/Falltime (20%-80%)	$< 25\text{ ps}$
Jitter (rms)	$< 1\text{ ps}$
Impedance	$R_i = 50\ \Omega$, $ r < 0.2$
Connector	$50\ \Omega$ SMA, $ r < 0.2$

Option 4: Pattern Memory Extension 64 MBit

Pattern Memory	67 108 864 Bits
Programmable Pattern Length	$64 * m$ Bits, ($m = 1, 2, 3, \dots, 2^{20}$)

Option 5: Pattern Memory Extension 128 MBit

Pattern Memory	134 217 728 Bits
Programmable Pattern Length	$64 * m$ Bits, ($m = 1, 2, 3, \dots, 2^{21}$)

Option 6: Pattern Memory Extension 256 MBit

Pattern Memory	268 435 456 Bits
Programmable Pattern Length	$64 * m$ Bits, ($m = 1, 2, 3, \dots, 2^{22}$)

Option 7: Extended Bandwidth 14 Gbps

Input Frequency Range	$5\text{ MHz} \dots 14\text{ GHz}$
Data Rate	According to input clock frequency, $5\text{ Mbps} \dots 14\text{ Gbps}$

Ordering Information

Included in delivery:

- BPG 12G
- User Manual
- CD-ROM with Device Driver and Operating Software

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