



PG1604, PG1601 14.5 Gb/s 4-Channel & 1-Channel Programmable Pattern Generators

Data Sheet



PGs 1, 4



SmartTest

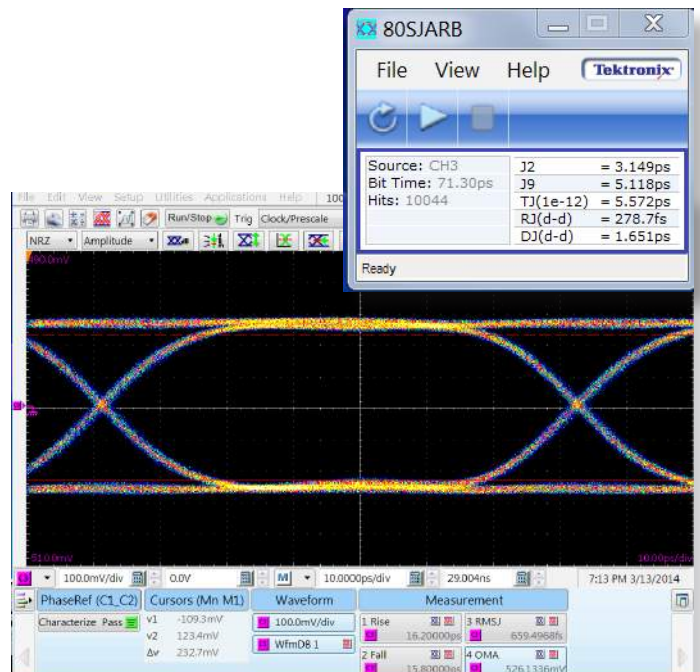
The Pattern Generator Re-imagined

- 1 & 4 channel pattern generators
- 14.5 Gb/s with excellent signal fidelity
- USB controlled with simple set up
- Flexible, compact and expandable

When you see a PG1604 in real life, you'll be amazed at how small and light it is. However, don't be deceived – this is a high quality, flexible and feature-rich platform designed to be at the heart of any high speed digital testing.

Most test setups start with a high quality test source. Look closely at the front panel and you'll see a high quality 2.92mm connector, the first hint at the impressive output waveform. Fast rise times and low jitter are evident in the high fidelity output eye, ensuring you will measure the performance of your test device, and not your test equipment.

Usability is key to a fast time-to-productivity, and is designed in from the ground up with the SB & PG-series BERTS and PGs as we'll see.



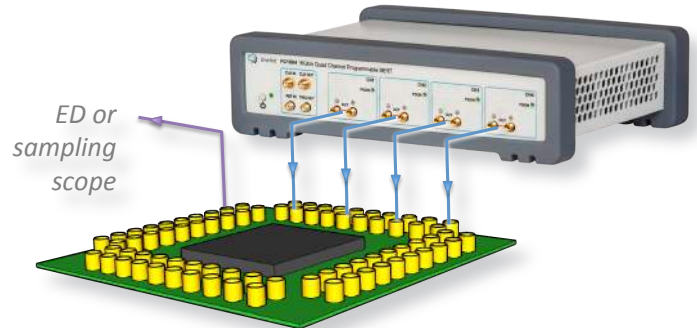
Example PG output at 14.0125 Gb/s, PRBS-31 showing fast rise and fall times, low jitter



Applications

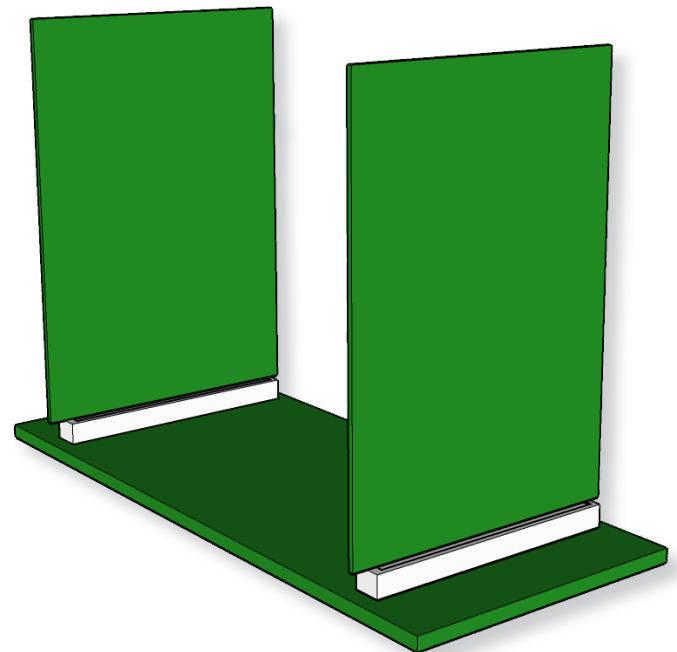
Many test set ups have a BERT at their core for good reason. Whether you are in an R&D lab evaluating silicon, or a transceiver test line in production we have you covered.

Whether you want a single clean, fast signal source for device stimulation in eye diagram or mask testing, or many channels for backplane or semiconductor crosstalk measurements, PG-series pattern generators have the flexibility for now and the future.



Four channels of pattern generation being used to provide 3 aggressor channels and one victim channel in this example IC evaluation set up.

Frequency Point	Data Rate (Gb/s)	Standard
1	1.25	Ethernet
2	2.125	Fibre Channel
3	2.5	Ethernet
4	3.125	XAUI
5	4.25	Fibre Channel
6	5	Infiniband
7	6	SATA/SAS
8	6.25	XAUI2
9	8.5	Fibre Channel
10	9.95328	Telecom
11	10	Infiniband
12	10.3125	Ethernet
13	10.51875	Fibre Channel
14	10.70922	Telecom
15	11.181	Telecom
16	11.317	Fibre Channel
17	11.5	Telecom
18	12.5	Ethernet
19	12.8	Telecom
20	14.0125	Fibre Channel

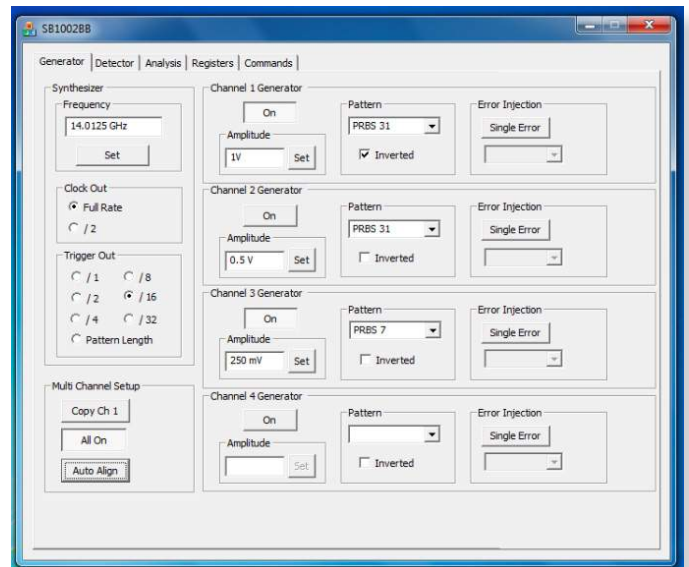


While the system is data rate agile, in addition all common data rates are easily available using built in presets

User Interface

Many channels often means many screens, confusing controls and a lot of time wasted. We've put everything you need for the PG on one screen; it's easy to see all operational aspects in one glance, and changes can be made to channels individually, or all together. User custom setups can be easily saved and reload for future use.

The graphical user interface may be loaded on any Intel®-based PC running Windows® XP or later, and connects to the SB-series instrument over USB.



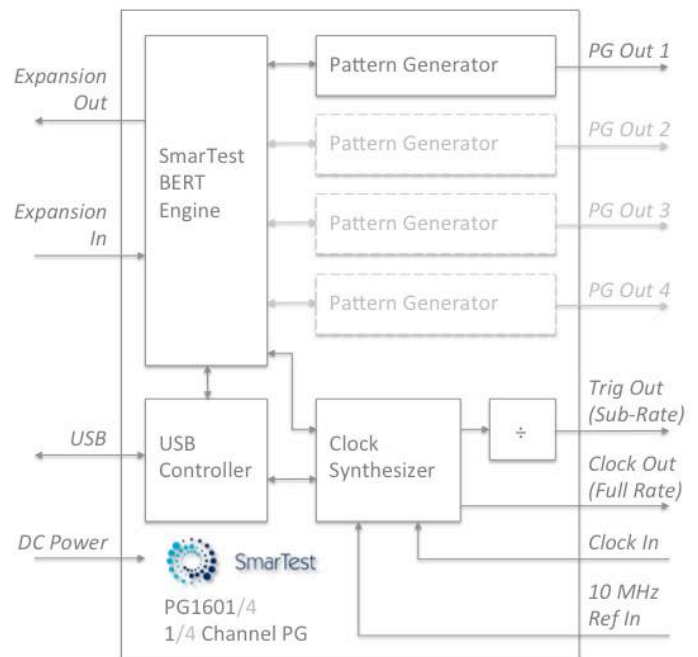
Pattern generator setup screen showing fast and simple user interface

Built in Flexibility

The heart of the PG-series instruments is the SmarTest BERT Engine that powers the PG and clock source.

For applications requiring multiple channels, SB-series instruments may be chained together using the Expansion port and special cables (sold separately). This provides sharing of clock and timing as well as communication so that the system may be controlled over a single USB connection from a PC.

SB-series instruments are also available as single-channel (SB1601) and 4-channel (SB1604) BERT models.



Internal block diagram with front panel (right) and rear panel (left) connections



Rear panel showing power input (left), USB interface (right) and expansion ports (middle)



Specifications

PG1601 & PG1604 Clock System

Internal Clock

Frequency	625 MHz to 16 GHz Selectable full rate internal clock loopback connection between PG and ED
Stability	1 ppm
Intrinsic RMS jitter	<500 fs typical

External Clock Input

Frequency	Full Rate, 625 MHz to 16 GHz
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Clock Out²

Clock rate	Full rate equal to internal clock setting
Impedance	50 Ω nominal, AC-coupled
Amplitude	400 mV typical
Connector	SMA, single ended, front panel

Divided Clock/ Trigger Out

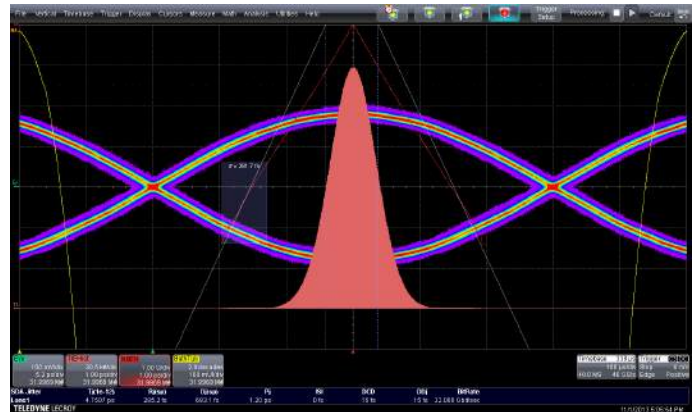
Clock rate	Selectable divided by n, with n=1, 2, 4, 8, 16, 32, 64
Output type	SMA, single ended, front panel
Impedance	50 Ω nominal, AC-coupled
Amplitude	400 mV typical
Connector	SMA, single ended, front panel

10 MHz Reference Input

Front panel

PG 1601 Pattern Generator Specifications

Number of PG channels	1, front panel connectors
Connector ²	2.92 mm ¹ , differential, front panel
Front panel LED	Green = channel on
Data output	Differential, AC coupled
Line coding	NRZ
Data rate range	1.25 to 14.5 Gb/s (common on all channels)
Output patterns	PRBS 2 ⁿ -1, n=7, 9, 10, 11, 15, 23, 31 Up to 20 bits/ch, user defined
Pattern invert	Yes
Output amplitude	400 - 1,000 mVpp differential
Rise/fall times (20%-80%)	< 18 ps typical
Intrinsic jitter (RMS)	< 1 ps typical
Error injection	Yes



Synthesizer output at 16 GHz showing RJ <300 fs

Warnings

¹2.92mm connectors are not compatible with SMA. Use of SMA connectors risk damaging the unit and will void the warranty

²Terminate unused data and clock outputs

Specifications, continued

PG 1604 Pattern Generator Specifications

Number of PG channels	4, front panel connectors
Front panel LED	1 per PG channel, green = channel on
Data output	Differential, AC coupled
Line coding	NRZ
Data rate range	1.25 to 14.5 Gb/s (common on all channels)
Output patterns	PRBS 2^n-1 , n=7, 9, 10, 11, 15, 23, 31 Up to 20 bits/ch, user defined
Pattern invert	Yes
Output amplitude	400 - 1,000 mVpp differential
Rise/fall times (20%-80%)	< 18 ps typical
Intrinsic jitter (RMS)	< 1 ps typical
Error injection	Yes

General, Both Models

Control software	Requires Intel®-based computer running Windows® XP or later
Interfaces	USB 2.0 standard, SCPI syntax Exp In, Exp Out proprietary system expansion interfaces
Included power supply	100 V to 240 V AC, 50-60 Hz
Power consumption	150 VA max
Operating temperature	0°C to 55°C
Storage temperature	-30°C to 70°C
Operating altitude	Up to 2000 m
Dimensions (w x h x d)	Bench top Without bumper 10.5 x 2 x 7.8 inches (267 x 51 x 198 mm) With Bumper 11.5 x 3 x 8 inches (292 x 76 x 203 mm)
Weight	4 lbs (1.8 kg)
Warranty	1 year standard For warranty and calibration services, contact SmarTest sales at sales@smarTest.us.com

Included Accessories

US power cord with external power supply; regional-specific replacement power cord options available

USB cable

User guide with programming reference on CD



SmarTest

Ordering

PG1601	1 channel 14.5 Gb/s integrated pattern generator and clock source
PG1601-3C	3 years total calibration service, return to factory
PG1601-3W	3 years total warranty
PG1604	4 channel 14.5 Gb/s integrated pattern generator and clock source
PG1604-3C	3 years total calibration service, return to factory
PG1604-3W	3 years total warranty

Power cord options - replace US power cord with region-specific one as follows

SB160x-AC-AU	Australia
SB160x-AC-CN	China
SB160x-AC-EU	Europe
SB160x-AC-JP	Japan
SB160x-AC-UK	United Kingdom

About us

We are an experienced group of test professionals with decades of combined experience at some of the biggest companies in the measurement business. We've brought BERTs, oscilloscopes and many other instruments to market for the big guys, but wanted to take high speed testing in a new direction. We're based in the heart of Silicon Valley, California.



Also available are full BERT systems, here showing an SB1604 4-channel paired with an SB1601 1-channel 14.5 Gb/s BERT

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PG1604EN 5-Jul-14