Agilent

N4971A Pattern Generator 13 Gb/s (PPG12500)

Data Sheet

Product highlights

- 24 Mb pattern memory supports virtually any pattern
- Integrated two tap de-emphasis
- Fully programmable data and clock output parameters
- Transparent jitter pass-through
- Output calibrated near the point of use, not the front panel
- Single port remote control of all parameters through USB or GPIB
- GUI interface for multiple instrument control – N4980A application or LabVIEW® driver and GUI

Cost Effective Solution for Receiver Characterization

An affordable generator for characterization needs beyond PRBS patterns

The Agilent Technologies N4971A pattern generator 13 Gb/s (PPG12500) is a single channel generator capable of producing any serial data pattern up to 24 Mbits in length. An internal non-volatile pattern library comes preloaded with PRBS along with several common telecom and PC data bus test patterns. It can also store multiple user generated patterns. Output parameters of the data and clock outputs can be independently programmed, presets for common logic families simplify user set up. All outputs can supply differential or single ended signals.

Figure 1. Pattern generator 13 Gb/s plus clock synthesizer 16 GHz

Pass-through jitter

Any calibrated jitter stress appearing on the clock input passes through to the data and clock outputs. Low intrinsic jitter contribution from the N4971A pattern generator 13 Gb/s (PPG12500) itself makes it ideal for receiver characterization using calibrated stress. The combination with the N4972A clock synthesizer 16 GHz (SCS16000J) results in a stressed programmable pattern generator priced less than half of competing serial BERT generator only versions.

Typical applications

- Transmitter emulation for general receiver characterization
- Verification of tolerance to over and under applied pre-emphasis
- Protocol simulation during development of systems employing closed loop equalization optimization such as 10 Gb/s Base-KR
- Packet generation for initiating receiver loopback, internal BER counting, or other test modes

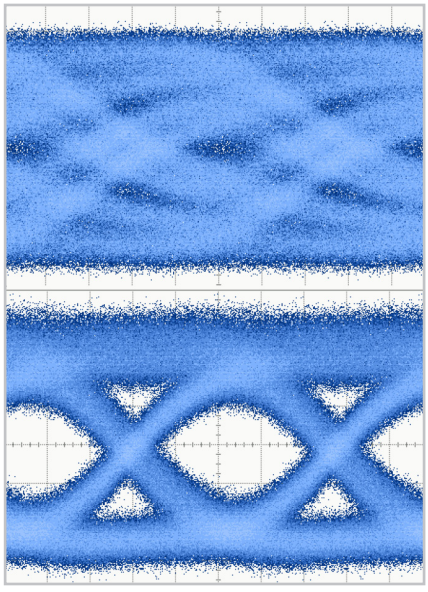

Figure 2. Integrated de-emphasis

Integrated de-emphasis

The N4971A pattern generator 13 Gb/s (PPG12500) includes integrated two tap de-emphasis signal conditioning. Commonly used in higher data rate systems to open eyes by counteracting high frequency loss in the channel, applying de-emphasis to the test signal is required for receiver testing. Other vendors' generators require additional dedicated external signal processors. The internal de-emphasis conditioning in the N4971A pattern generator 13 Gb/s (PPG12500) eliminates the expense of additional signal processors, as well as the associated signal degradation resulting from the extra cables used to connect them.

Output calibration near the DUT

Most competitive pattern generators calibrate the output parameters at the output connector. As even the highest quality low loss cables create some frequency dependant loss, the user will generally need to adjust amplitude to de-embed cable loss effects in the system. The N4971A pattern generator 13 Gb/s (PPG12500) output parameters and waveshape are factory calibrated at the end of precision cables provided with the instrument, generally eliminating the need for de-embedding calibration.

Pattern editor

Pattern editor software included with the instrument provides a convenient tool for generation of user patterns in a PC running Microsoft Windows®. Familiar cut, copy and paste functions simplify the creation of repetitive portions of patterns. Data may be entered in hexadecimal or binary format. Integrated syntax checking screens for invalid characters before downloading patterns via USB interface into the N4971A pattern generator 13 Gb/s (PPG12500) library. The pattern editor software also allows for management of the user patterns in the N4971A pattern generator 13 Gb/s (PPG12500).

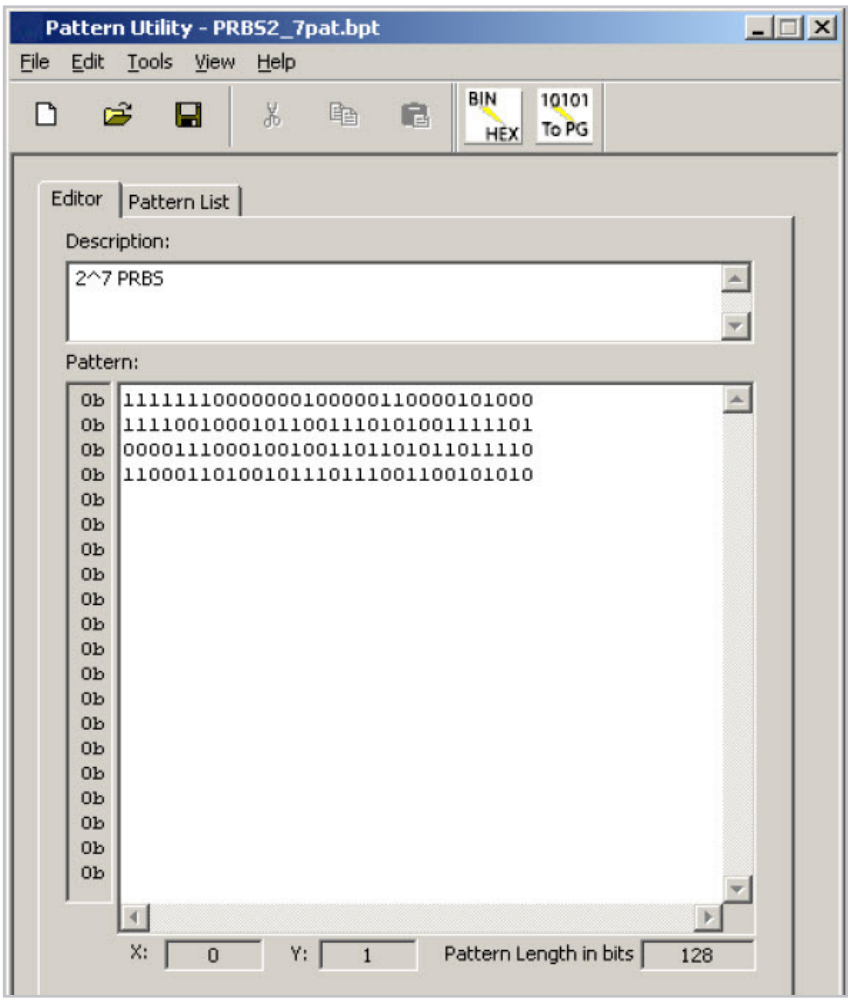

Figure 3. Pattern editor software

Eliminate downtime

User replaceable connector savers on the Data and Clock outputs eliminate down time. Should the output connectors be damaged through improper cable installation, simply replace the connector saver yourself without the need to send the instrument in for service.

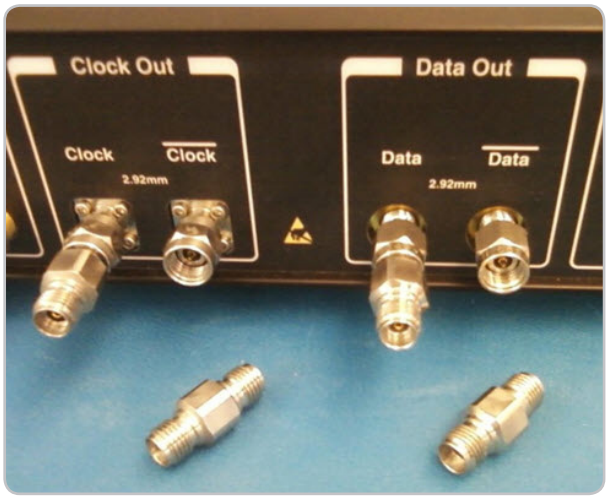

Figure 4. Connector savers

Centralized control

Controlling multiple pattern generators or signal sources for characterizing mutli-lane devices or cross talk is cumbersome and confusing. In addition to the need to address multiple instruments, the command syntax or user interface usually differs. The N4980A multi-instrument BERT software application provides customers the ability to control multiple instruments through a windows-based graphical user interface (GUI).

Set up is easy using N4980A multi-instrument BERT software application. For repetitive testing, setups can be stored and recalled at a later time.

The results view shows composite BER along with the performance of the individual lanes. Bar graphs give a quick indication of any lane specific problems without the need to look at the individual BER numbers.

Figure 5. Multi-instrument BERT software

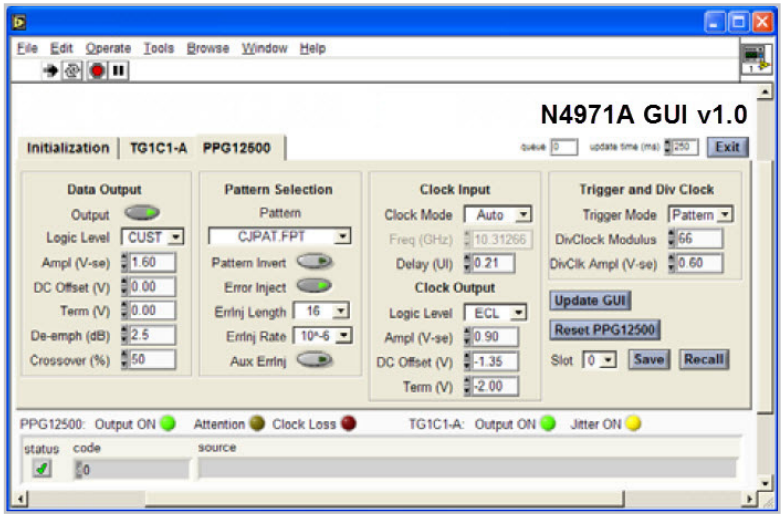

Figure 6. LabVIEW window

Also available, LabVIEW® open source code drivers and stand alone GUI for the N4971A pattern generator 13 Gb/s (PPG12500). All of the operating parameters of the N4971A pattern generator 13 Gb/s (PPG12500) are displayed in a single window, allowing the user to instantly see the state of the entire system.

Specifications

Clock input	
Input clock frequency	1 to 13 GHz
Input clock amplitude	200 mV to 2 V p-p

Differential data outputs	
Signal configuration	Differential. Will operate in single ended mode
Data line coding	Non-return to zero (NRZ)
Output amplitude	200 mV to 1.6 V p-p, single ended
Output offset range	–2.0 V to +2.0 V
Termination voltage range	–2.0 V to +2.0 V
Cross–over adjustment range	25 to 75%
Rise & fall time	≤30 ps, 25 ps typical
Additive jitter	≤20 ps p-p, 10 ps p-p typical
Data delay range	±10 UI
De-emphasis	0 to 20 dB in 0.1dB steps
Error injection	Single or continuous at rates of 10^{-9} – 10^{-3},Burst length of 1, 2, 4, 8, 16, 32, 54, 128
Data patterns	2n-1 PRBS, where n=7,9,10,11,15,23,29,31 2n PRBS, where n=7,10,11,13,15,23 with mark/space density of ⅛, ¼, ½, ¾, ⅞ Selection of other common patterns e.g. CJPAT, CRPAT, K28-X, etc
Data connectors	2.92 mm, male

Differential clock outputs	
Signal configuration	Differential. Will operate in single ended mode
Output amplitude	200 mV to 1.8 V p-p, single ended
Output offset range	–2.0 V to +2.0 V
Termination voltage range	–2.0 V to +2.0 V
Rise & fall time	≤40 ps
Additive jitter	≤3 ps rms, 1.5 ps rms typical
Clock connectors	2.92 mm, male

Differential divided clock outputs	
Signal configuration	Differential. Will operate in single ended mode
Clock output divider ratio	8 to 511 in steps of 1
Output amplitude	200 mV to 600 mV Vp-p, single ended
Rise & fall time	50 ps typical
Divided clock connectors	SMA female

Trigger output	
Output type	Clock ÷256 or pattern synchronized
Output amplitude	400 mV p-p, centered around +900 mV offset
Trigger connector	SMA female

System	
Remote control interface	USB2.0 and IEEE-488 (GPIB)
Power requirements	
Voltage	100 to 240 VAC, autoranging
Frequency	50 to 60 Hz
Power consumption	170 W maximum

Physical and environmental

Temperature, operating	+10° to +40 °C
Temperature, non-operating	–40° to +70 °C
Dimensions (height, width, and depth)	53 mm (2.1 in) x 425 mm (16.7 in) x 425 mm (16.7 in)
Mass	3.2 kg (7.0 lbs)

Regulatory standards

EMC	• CISPR Pub 11 Group 1, class A • AS/NZS CISPR 11 • ICES/NMB-001 This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.
Safety	Complies with European Low Voltage Directive 2006/95/EC • IEC/EN 61010-1, 2nd Edition • Canada: CSA C22.2 No. 61010-1 • USA: UL std no. 61010-1, 2nd Edition • German Acoustic statement Acoustic noise emission — Geraeuschemission LpA <70 dB — LpA <70 dB Operator position — Am Arbeitsplatz Normal position — Normaler Betrieb Per ISO 7779 — Nach DIN 45635 t.19

Ordering information

Model	Description
N4971A (PPG12500)	Pattern generator 13 Gb/s
N4972A (SCS16000)	Clock synthesizer 16 GHz

Warranty and calibration service

For warranty and calibration service information, contact your local authorized Agilent Distributor or Agilent Sales Department.

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