Agilent E8311A, E8312A Pulse/Pattern Generators 165 MHz and 330 MHz

Data Sheet

- **1-Slot, C-size, register based**
- **Two output channels**
- **16 Kbit patterns per channel**
- **Fast transition times: 2 ns to 200 ms variable (E8311A), 0.8 ns or 1.6 ns selectable (E8312A)**
- **Functionally compatible with the 81110A**
- **Broad range of trigger and synchronization capabilities**

Description

The Agilent Technologies E8311A and E8312A Pulse Pattern Generators are C-size, 1-slot, register-based VXI modules. Both generators offer highly accurate digital signals up to 165 MHz/330 MHz respectively and feature two output channels. They are both shipped with VXIplug&play software drivers.

The generators can be used for a wide variety of applications, ranging from:
- Functional verification of high-speed digital or mixed signal devices,
- Clock generation for synchronization of an automted test system,
- Radar testing,
- Serial bus testing,
- Flash memory testing.

The E8311A and E8312A Pulse Pattern Generators can be easily integrated into all phases of test system development. They are functionally compatible (programming and features) with the 81110A. This compatibility facilitates the transition of test routines used in laboratories (handling R&D and quality test applications running on the 81100 family of box instruments) to the production site.

Refer to the Agilent Technologies Website for instrument driver availability and downloading instructions, as well as for recent product updates, if applicable.

Agilent E8311A/E8312A

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Pattern Mode

- Pattern length: 16 Kbit/channel and strobe output
- Output format: RZ (return to zero), NRZ (non-returnto zero), DNRZ (delayed non-return to zero).
- Random pattern: PRBS 2^n-1, n = 7,8,...,14.

Trigger Modes

- **Continuous:** Continuous pulses, double pulses, bursts (single or double pulses) or patterns.
- **External*** triggered: Each active input transition (rising, falling or both) generates a single or double pulse, burst or pattern.
- **External*** gated: The active input level (high or low) enables pulses, double pulses, bursts or patterns. The last single/double pulse, burst or pattern is always completed.
- **External*** width: The pulse shape can be recovered. Period and width of an external input signal is maintained. Delay, levels and transitions can be set.
- **Manual:** Simulates an external input signal.
- **Internal triggered:** Internal PLL or up-command replaces an external trigger source. Pulses, double pulses, bursts or patterns can be set.
- ***External:** Choice of sources as described under the "Inputs/Outputs" section.

Clock Generation

Synchronization of an automated test system can be realized by clock distribution with the new Agilent VXI pulse pattern generators. Two channels combined with the 16-Kbit pattern capability supports even dual clock frequencies within the one module.

Variable delay ranges combined with a fixed trigger-in to signal-out delay allow synchronization even at precise points in time.

Reliable Measurements

Both models with their self-calibration provide clean, accurate pulses with excellent repeatability and reliability, thereby contributing to measurement integrity.

Glitch-free Timing Changes

Now you can sweep your timing values without the danger of spurious pulses or dropouts that could cause measurement errors. (Applies to continuous modes, values <100 ms, consecutive values between 0.5 and twice the previous value.)

Test Logic Technologies

The E8311A and E8312A Pulse Pattern Generators generate all the standard pulses and digital patterns needed to test current logic technologies (CMOS, TTL, LVDS, ECL, etc.). Multi-level and multi-timing signals up to 60 MHz can be obtained using the internal channel addition feature.

Burst count: 2 to 65536 (single or double pulses).
Delay: Delay, phase or % of period.
Double pulse and delay: Mutually exclusive.
Duty cycle: Set between 0.1% and 95% (subject to width limits. 99.9% with overprogramming).
Transition times: Leading/trailing edge or % of width. Leading and trailing edges are independent (E8311A only) within one of the following overlapping segments(1:20 ratio):

- 2 ns (3 ns) - 20 ns
- 10 ns - 200 ns
- 100 ns - 2 ms
- 1 µs - 20 µs
- 10 µs - 200 µs
- 100 µs - 2 ms
- 1 ms - 20 ms
- 10 ms - 200 ms

Output timing fidelity: Period, delay and width are continuously variable without any output glitches or dropouts.
Repeatability: Typically four times better than accuracy.
Level parameters: Voltage or current, high or low level, offset or amplitude.
Load compensation: The individual load value can be entered (for loads $\neq 50\ \Omega$) to output the actual values (only E8311A).
On/off: Relays connect/disconnect output (HiZ).
Normal/complement: Selectable.
Limit: Programmable high and low levels can be limited to protect the device-under-test.

Agilent E8311A and E8312A

Inputs and Outputs

Faceplate connector type: SMA
Connector for clock input or PLL reference input: The internal PLL is locked to an external 5 MHz or 10 MHz reference frequency. The output period is determined by the signal at clock input.
Connector for External input: Used for trigger, gate or external width. Choice of:
• Faceplate connector or
• 8 VXI backplane trigger lines (TTL)
• 2 VXI backplane trigger lines (ECL)
Input impedance: 50 Ω/10 kΩ selectable.
Threshold: -10 V to +10 V.
Max. input voltage: ±15 Vp-p.
Sensitivity: ≤300 mVp-p typical.
Transitions: <100 ns.
Frequency: dc to maximum frequency.
Minimum pulse width: 1.5 ns (as width of minimum external width mode).

Strobe Output and Trigger Output

Output selection:
Three choices:
• Faceplate connector or
• 8 VXI backplane trigger lines (TTL)
• 2 VXI backplane trigger lines (ECL)
Strobe output: User-defined, 16 Kbit pattern (NRZ) when in pattern mode.
Trigger format: One pulse per period with 50% duty cycle typical.
External mode: 1.5 ns typical.
Level: TTL or ECL selectable.
Output impedance: 50 Ω typical.
Maximum external voltage: -2 V/+7 V.
Transition times: 1.0 ns typical for TTL, 600 ps typical for ECL.

Remote Control

Overprogramming: All parameters can be over-programmed (exceeding specifications) to fully exploit the hardware limits.
Autoset: Resolves all timing conflicts.

Supported Computer Interfaces

• Agilent E8491B IEEE-1394 "FireWire" Slot-0 Command Module Controller: 300 MHz P-II
• Agilent E1406A GPIB Slot-0 Command Module. According to IEEE 488.2 SCPI Function Code: SH1,AH1,T6,L4,SR1,RL1, PP0,DC1,DT1,C0
• Agilent E9851A VXI Embedded PC, 700 MHz
• NI MXI-2 Slot-0 command module Controller: 300 MHz P-II
• NI embedded VXIpc-850

For more information, request a copy of the *Agilent Technologies' Family of Pulse Pattern Generators* brochure, publication no. 5980-489E.

Environmental Specifiactions

Operating temperature:	+ 5°C to + 40°C
Storage temperature:	- 40°C to + 70°C
Humidity:	35% - 95% rel. humidity up to 40°C ambient temperature
Altitude range:	Up to 12,000 m non-operating, Up to 2,000 m operating
EMC:	Conforms to EN50082-1, EN 55011: 91, Class A: TCF B801356L
Safety:	Conforms to IEC1010-1, A1 + A2 + CSA, Class A, TCF
Pollution:	Degree 2
Installation:	Category		
Weight:	1.8 kg net, 2.7 kg shipped (E8311A) 1.6 kg net, 2.5 kg shipped (E8312A)
Recalibration period:	Three years recommended

Agilent E8311A, E8312A Pulse Pattern Generators

Product Specifications

Timing Characterstics

	E8311A	E8312A
Frequency range:	1 mHz to **165 MHz**	1 mHz to **330 MHz**
From 1 kΩ : [1]	Up to 60 MHz typ.	N/A
Timing resolution:	3.5 digits, 5 ps best case	3.5 digits, 5 ps best case
RMS jitter (period, width, delay):		
With PLL:	0.001% ± 15 ps	0.001% ± 15 ps
With VCO: [2]	0.01% ± 15 ps	0.01% ± 15 ps
Period range:	6.06ns to 999.5s	3.03 ns to 999.5s
Accuracy with PLL:	±0.01% ± (0.5% typ. after self-cal., ± 3% without self-cal.) [2]	± 0.01% (±0.5% typ. after self-cal., ± 3% without self-cal.) [2]
Width range:	3.03 ns to (period - 3.03 ns)	1,515 ns to (period - 1,151ns)
Accuracy:	± 0.5% ± 250 ps typ. [3]/ ± 3% ± 250 ps [4]	± 0.5% ± 250 ps typ. [3]/ ± 3% ± 250 ps [4]
Add. Variable delay range: [5]	0 ns to (period - 3.03 ns)	0 ns to (period - 3.03 ns)
Accuracy: [6]	± 0.5% ± 0.5 ns . typ. [3]/ ± 3 % ± 0.5 ns[4]	± 0.5% ± 0.5 ns typ. [3]/ ± 3 % ± 0.5ns[4]
Double pulse delay : range	(width + 3.03 ns) to (period-width-3.03 ns)	(width + 1.5 ns) to (period-width-1.5 ns)
Min. period:	12.2 ns (82 MHz) typ.	6.06 ns (165MHz) typ.
Accuracy:	± 0.5% ± 150 ps Typ. [3] / ± 3% ± 150 ps [4]	± 0.5% ± 150 ps Typ. [3] / ± 3% ± 150 ps [4]
Transition time range (10/90):	2 ns to 200 ms variable	0.8 ns or 1.6 ns selectable
Minimum (with overprogram-ming):	≤ 2 ns/1.4 ns typ. for ECL levels (20/80) 5 ns typ. for 1 kΩ source impedence	≤600 ps for Vp-p ≤ 1V 450 ps typ. for ECL levels (20/80) ≤900 ps for Vp-p >1 V
Accuracy:	± 10% ± 200 ps	± 10% ± 200 ps
Linearity:	3% typ. For transitions > 100ns	N/A

[1] Source impendence is selectable from 50 Ω or 1kΩ for the E8311A.

[2] If the startable oscillator (VCO) is used (PLL not active).

[3] After self-calibration.

[4] Without self-calibration.

[5] O ns to (period - 17.6 ns) in external width mode.

[6] Changing of amplitutde may add 0.5 ns

Programming Times (all checks off)
(measured with an embedded VXI computer)

Command	Typical execution time
One parameter or mode	40 ms typ.
Recall setting	350 ms typ.
16 k pattern transfer	950 ms typ.

Typical Delays (E8311A) [1]

Instrument mode
External width:

From	To	Typ. Value
EXT. INPUT	STROBE/TRIGGER OUT	9.0 ns
	OUTPUT 1/OUTPUT 2	18.0 ns

All other modes:

From	To	Typ. Value
EXT. INPUT/CLK INPUT	STROBE/TRIGGER OUT OUTPUT 1/OUTPUT 2	12.0 ns 24,0 ns
STROBE/TRIGGER OUT	OUTPUT 1/OUTPUT 2	12.0 ns

[1] Subtract 4 ns from the typical delay value when referring to OUTPUT 1/2 the E8312A

Level/Pulse Performance Characteristics

	E8311A	E8312A
Amplitude:		
50 Ω into 50 Ω	100 m Vp-p to 10.0 Vp-p	100 m Vp-p to 3.8 Vp-p
1 kΩ into 50 Ω	200 m Vp-p to 20.0 Vp-p	N/A
Level Window:		
50 Ω into 50 Ω:	-10.0 V to + 10.0 V	-2.0 V to + 3.8 V
1 kΩ into 50 Ω:	-20.0 V to + 20.0 V	N/A
Accuracy:		
50 Ω into 50 Ω:	± (1% + 50 mV)	± (2% + 50 mV)
1 kΩ into 50 Ω:	± (1% + 100 mV) [1]	N/A
Resolution:		
50 Ω into 50 Ω:	10 mV	10 mV
1 kΩ into 50 Ω:	20 mV	N/A
Output connectors:	SMA single-ended	SMA differential
Source impendence:	Selectable 50 Ω or 1 kΩ	50 Ω only
Accuracy:	± 1% typ.	± 1 % typ.
Maximum external voltage:	± 24 V	-2.2 V to + 5.5 V
Short circuit current:	± 400 mA max. (doubles for channel addition)	- 84 mA to + 152 mA
Dynamic crosstalk:	<0.1% typ.	<0.1% typ.
Baseline noise:	10 mV RMS typ.	4 mV RMS typ.
Overshoot/ preshoot/ringing:	± 5% of amplitude ± 20 mV	± 5% of amplitude ±50 mV

[1] **In ± 19 V level window**

Channel Addition

VXI Module	E8311A
Amplitude:	
50 Ω into 50 Ω:	100 m Vp-p to 20.0 Vp-p
1 kΩ into 50 Ω:	200 m Vp-p to 20.0 Vp-p
Source impendence:	Selectable from 50 Ω or 1 KΩ
Level window:	
50 Ω into 50 Ω:	- 20.0 V to + 20.0 V
1 KΩ into 50 Ω:	- 20.0 V to + 20.0 V
Max. frequency:	
50 Ω channel:	60 MHz typ.
1 kΩ channel:	15 MHz typ.
Min. transitions:	
50 Ω channel:	2 ns typ. (channel one), 5 ns typ. (channel two)
1 kΩ channel:	20 ns typ. Both channels

Note: The E8312A does not feature channel addition**.**

General Specifications

VXI Characteristics

VXI device type: Register based

Size: C

Slots: 1

Connectors: P1/P2

Shared memory: none

VXI buses: TTL/ECL Trigger Bus

Instrumental Drivers - See the Agilent Technologies Website (http://www.agilent.com/find/inst_drivers) for driver availability and downloading.

Command module firmware:	No
Command module Firmware rev:	N/A
I-SCPI Win 3.1:	No
I-SCPI Series 700	No
C-SCPI LynxOS:	No
C-SCPI Series 700:	No
Panel Drivers:	No
VXI*plug&play* Win Framework:	No
VXI*plug&play* Win 95/NT Framework:	Yes
VXI*plug&play* HP-UX Framework:	No

Module Current

	I_{PM}(A)		I_{DM}(A)	
	E8311A	**E8312A**	**E8311A**	**E8312A**
+5 V:	1.8	1.6	0.05	0.05
+12 V:	1.1	0.9	0.25	0.05
-12 V:	0.9	0.8	0.05	0.05
+24 V:	1.1	0.07	0.6	0.01
-24 V:	1.1	0.02	0.6	0.01
-5.2 V:	5.0	5.0	0.1	0.1
-2 V:	0.6	0.35	0.05	0.02

Cooling/slot

	E8311A	**E8312A**
Watts/slot:	87 VA max.	50 VA max.
ΔP mm H$_2$O:	0.55	0.35
Air Flow Liter/s:	5.1 for 15°C rise	2.8 for 15°C rise

Ordering Information

Description Product No.

165 MHz VXI Pulse/Pattern Generator	E8311A
MIL Std. 45662A Calibration w/Test Data	E8311A IBP
Commercial Calibration Certificate	E8311A UK6
330 MHz VXI Pulse/Pattern Generator	E8312A
MIL Std. 45662A Calibration w/Test Data	E8312A IBP
Commercial Calibration Certificate	E8312A UK6
Pulse Adder/Splitter	15104A

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