Arbitrary Waveform Generator

AWG710B

Features & Benefits

4.2 GS/s Sample Rate
Simulates Real-world Signals Up To 2.1 GHz
2 Markers With 2.0 psRMS (at 4.2 GS/s, Typical) Jitter Deliver Stable Timing to the Device-Under-Test (DUT)
32.4M (32,400,000) or 64.8M (64,800,000) Point Record Length Provide Longer Data Streams
Analog Bandwidth to 2 GHz (Option 02, Calculated Based on Rise Time) Provides the Highest Signal Fidelity of All High-speed AWGs
Direct External Clock Input Allows Jittered and Non-jittered Signals for High-speed Data Stream Timing Margin Test Up to 4.2 Gb/s
Synchronous Operation Mode Supports Two AWG710B Outputs (2: Analog, 4: Marker) Synchronization for High Data Rate Wireless and Data Communication Test and Optical Write Channel Strategy Signal Test
Waveform Quick Editor with 300 fs Edge Timing Resolution Delivers Output Edge Control with Near Real-time Precision
Allows Two-Signal Mix Function Digitally to Support Disk Drive Noise Performance Test and Pre/De-emphasis Serial Data Communication Test
Real-time Sequencing Creates Infinite Waveform Loops, Jumps, Patterns and Conditional Branches

Applications

Disk Drive Read/Write Design and Test
Communications Design and Test
Arbitrary IF and IQ Base-band Signals
Standard Waveforms for Communications
Pulse Generation
High-speed, Low-jitter Data and Clock Source
Mixed Signal Design and Test
Real-world Simulations
Corruption and Enhancement of Ideal Waveforms
Timing and Amplitude Signal Impairments
Waveforms Imported from MathCad, MATLAB, Excel and Others

The AWG710B Arbitrary Waveform Generator Delivers World-class Signal Fidelity at 4.2 GS/s to Solve Ever-increasing Measurement Challenges

The AWG710B Arbitrary Waveform Generator Delivers World-class Signal Fidelity at 4.2 GS/s to Solve Ever-increasing Measurement Challenges. New two box synchronous operation function supports 2 ch 4.2 GS/s solution.

The AWG710B combines world-class signal fidelity with ultra high-speed mixed signal simulation, a powerful sequencing capability and graphical user interface with flexible waveform editor, to solve the toughest measurement challenges in the disk drive, communications and semiconductor design/test industries.

The built-in signal applications enable you to easily create standard waveforms for disk drive read channels, communications up to 4.2 Gb/s such as ITU-T, TI.102, Fibre Channel and SDH/SONET also various semiconductor applications.
Arbitrary Waveform Generator

AWG710B

Characteristics

Arbitrary Waveforms

Waveform Length – 860 to 32,400,000 points (or 64,800,000 points, Option 01) in multiples of four.
Sequence Length – 1 to 8,000 steps.
Sequence Repeat Counter – 1 to 65,536 or infinite.

Run Modes

Gated mode, Event Jump, and Software Jump are disabled in the synchronous operation.
Continuous – Waveform is iteratively output. If a sequence is defined, the sequence order and repeat functions are applied.
Triggered – Waveform is output only once when an external, internal, GPIB, LAN, or manual trigger is received.
Gated – Waveform begins output when gate is true and resets to beginning when false.
Enhanced – Waveform is output as defined by the sequence.

Extended Operation

Function Generator

Waveform Shape – Sine, Triangle, Square, Ramp, Pulse, or DC.
Frequency – 1.000 Hz to 400.0 MHz.
Amplitude – Range: 0.020 Vp-p to 2 Vp-p into 50 Ω. Resolution: 1 mV.
Offset – Range: –0.500 V to +0.500 V into 50 Ω. Resolution: 1 mV.
DC Level – DC waveform only. Range: –0.500 V to +0.500 V into 50 Ω. Resolution: 1 mV.
Polarity – Normal, Invert.
Duty Cycle – Range: 0.1% to 99.9%, Pulse waveform only. Resolution: 1.000 Hz to 4.000 MHz: 0.1% step. 4.001 MHz to 20.000 MHz: 0.5% step. 20.01 MHz to 40.000 MHz: 1% step. 40.01 MHz to 80.000 MHz: 2% step. 80.01 MHz to 100.0 MHz: 2.5% step. 100.1 MHz to 160.0 MHz: 4% step. 160.1 MHz to 200.0 MHz: 5% step. 200.1 MHz to 400.0 MHz: 10% step.

Marker Out – Marker1 Pulse Width:
Hi-Level: 20%±80% of Period.
Marker2 Pulse Width:
Hi-Level: 50%±50% of Period, except 100.1 MHz to 160.0 MHz.
Hi-Level: 52%±48% of Period, at 100.1 MHz to 160.0 MHz.
Marker Level:
Hi-Level: 1 V into 50 Ω.
Lo Level: 0 V into 50 Ω.

Waveform Mixing Operation – Supports two-signal mixed output digitally.
Synchronous Operation – Supports to synchronize two AWG710B signals output by two boxes.
NOTE: This operation is executed by Sync master and Sync slave operation combination.
Sync Master Operation – Set one AWG710B as a master box.
Sync Slave Operation – Set another AWG710B as a slave box.

Clock Generator

Sampling Frequency – 50.000000 kHz to 4,200,000 kHz.
Resolution – 8 digits.
Internal Clock – Accuracy: ±1 ppm.
Phase Noise – (VCO out)
At 4.2 GHz, 10 kHz offset: –65 dBc/Hz.
At 4.2 GHz, 100 kHz offset: –96 dBc/Hz.

Internal Trigger Generator

Internal Trigger Rate – Range: 1.0 μs to 10.0 s. Resolution: 3 digits, 0.1 μs minimum. Accuracy: ±0.1%.

Main Output

Output Signal – Complementary; CH1 and channel inverse.
Digital to Analog Converter –
Resolution: 8-bits.
Differential Non-linearity: ±1/2-LSB.
Integral Non-linearity: ±1-LSB.
Output Connector – Front Panel SMA.

Normal Out1

Amplitude –
Output Voltage: –1.5 V to +1.5 V into 50 Ω.
Amplitude: 20 mV to 1 V into 50 Ω.
Resolution: 1 mV.
DC Accuracy – ±0.2% of Amplitude ± 2 mV.
Offset – no function.
DC Offset Accuracy – 0 V ±10 mV at 20 V amplitude (waveform data = 0).
Pulse Response (–1 and 1 waveform data, at 0.5 Vp-p) –
Rise Time (10% to 90%): ±280 ps.
Fall Time (10% to 90%): ±280 ps.
Output Impedance – 50 Ω.

Extended Bandwidth Output (Option 02)

Amplitude – 500 mVp-p to 1.0 Vp-p into 50 Ω.
Resolution – 1 mV.
DC Accuracy – ±0.2% of amplitude ± 2 mV.
Offset – No function.
DC Offset Accuracy – 0 V ±10 mV at 500 mV amplitude (waveform data = 0).
Pulse Response (–1 and 1 waveform data, at 1.0 Vp-p) –
Rise Time (10% to 90%): ±175 ps.
Fall Time (10% to 90%): ±175 ps.
Output Impedance – 50 Ω.

Auxiliary Outputs

Marker Number – 2 (complementary).
Level –
High Level: –1.00 V to 2.45 V into 50 Ω to GND.
Low Level: +2.00 V to 2.49 V into 50 Ω to GND.
Amplitude: 0.05 Vp-p to 1.25 Vp-p, max. into 50 Ω to GND.

Sine Wave Characteristics –
(4.2 GS/s clock, 32 waveform points, 131.25 MHz signal frequency, 1.0 V amplitude, 0 V offset, through filter)
Harmonics: ±40 dBc, DC to 1000 MHz.
Phase Noise: ±85 dBc/Hz at 10 kHz offset.

Filter1

Type – 20, 50, 100, 200 MHz Bessel low-pass.
Rise Time (10% to 90%) – 20 MHz, 17 ns; 50 MHz, 7.0 ns; 100 MHz, 3.7 ns; 200 MHz, 2.0 ns.
Group Delay – 20 MHz, 18 ns; 50 MHz, 8 ns; 100 MHz, 4.7 ns; 200 MHz, 3 ns.

Direct D/A Out1

Amplitude – 20 mVp-p to 1.0 Vp-p into 50 Ω.
Resolution – 1 mV.
DC Accuracy – ±±0.2% of Amplitude ± 2 mV.
Offset – no function.
DC Offset Accuracy – 0 V ±10 mV at 20 V amplitude (waveform data = 0).

Group Delay (4.2 GS/s clock, 32 waveform points, 131.25 MHz signal frequency, 1.0 V amplitude, 0 V offset, through filter)
Harmonics: ±40 dBc, DC to 1000 MHz.
Phase Noise: ±85 dBc/Hz at 10 kHz offset.

2 Signal Sources • www.tektronix.com/signal_sources
At 1.05 GS/s 3.7 psRMS, 26 ps peak to peak.
At 2.1 GS/s 3.4 psRMS, 25 ps peak to peak.
At 1.05 GS/s 2.0 psRMS, 15 ps peak to peak.
At 2.1 GS/s 2.0 psRMS, 15 ps peak to peak.

Output: At 1 Vp-p.

Connector –

Direct Output: –1 ns.
Normal Output: 2.4 ns (Offset 0 V, Filter = "Through.").

At 4.2 GS/s 2.0 psRMS, 15 ps peak to peak.

Period Jitter (Typical) –

Connector –

Impedance –

0.2 V amplitude.

Trigger In

Auxiliary Inputs

Output Signal Style: Complementary.
Connector: SMA, Rear.
For 2 boxes synchronous usage.

T Out 1 and 2

For 2 boxes synchronous usage.
Connector: SMA, Rear.
Output Signal Style: Complementary.

Threshold –

Level: –5.0 V to 5.0 V.
Resolution: 0.1 V.

Trigger Mode – Minimum Pulse Width: 10 ns, 0.2 V amplitude.

Trigger Hold-off –

One Box Operation: ±109.5 clocks + 500 ns.
Two Boxes Synchronous Operation: ±109.5 clocks + 700 ns.
Delay to Analog Out: 275.5 clocks + 17 ns (Normal Output, Filter "Through.").

Gate Mode – (for one box operation).
Minimum Pulse Width: ±0.2 V amplitude).
1152 clocks + 10 ns.
Gate Hold Off: ±1920 clocks + 20 ns.
Delay to Analog Out: 1355 to 1563.5 clocks + 9 ns (Normal Output, Filter "Through.").

Event Input – (for one box operation).
Number of Events: 7-bits.
Input Signals: 7 event bits, strobe.
Threshold: TTL level.
Maximum Input: 0 V to +5 V (DC + peak AC).

Enhanced Mode –

Minimum Pulse Width: 320 clocks + 10 ns.
Event Hold Off: ±896 clocks + 20 ns.
Delay to Analog Out. (Jump timing: Async, Output Norm, Filter Through):
Strobe: ON, 1691.5 clocks + 10 ns.
Strobe: OFF, 1047.5 clocks + 6 ns.
Event Input to Strobe Input:
Setup Time: 192 clocks + 10 ns.
Hold Time: 192 clocks + 10 ns.

External Clock IN

Input Voltage Range – 0.4 Vp-p to 2.0 Vp-p.
Impedance – 50 Ω, AC coupled.
Frequency Range – 125 MHz to 4.2 GHz.
Note: Need >10 mV signal level rate.

Connector – Rear-panel SMA.

Reference 10 MHz Clock IN

Input Voltage Range – 0.2 Vp-p to 3.0 Vp-p.
±10 V maximum.
Impedance – 50 Ω, AC coupled.
Frequency Range – 10 MHz ±0.1 MHz.
Connector – Rear-panel BNC.

General Characteristics

Display – Color TFT LCD.
Display Area – Horizontal: 13.06 cm (5.14 in.), Vertical: 9.70 cm (3.81 in.).
Resolution – 640x480.

Data Storage

Internal Hard Disk – ±20.0 GB.
Flash Disk – 256 MB (Option 10).
Floppy Disk – 3.5 inch, 1.44 MB.

Environment

Temperature –
Operating: 10 °C to +40 °C.
Nonoperating: –20 °C to +60 °C.

Humidity –
Operating: 20% to 80%.
Nonoperating: 5% to 90%.

Altitude (Hard Disk Restriction) –
Operating: Up to 3,000 m (10,000 ft).
Nonoperating: up to 12,000 m (40,000 ft).

Random Vibration –
Operating: 2.65 m/s2peak, 0.27 Gmax, 5 Hz to 500 Hz, 10 minutes.
Nonoperating: 22.36 m/s2peak, 0.28 Gmax, 5 Hz to 500 Hz, 10 minutes.

Shock – Nonoperating: 294 m/s2 (30 G), half-sine, 11 ms duration (three times each axis, in each direction, 18 total).


Power Supply

Rating – 100 to 240 VAC.
Range – 90 to 250 VAC.
Maximum Power and Current – 240 VA and 5 A.
Frequency – 48 to 63 Hz.

Physical Characteristics

Dimensions mm in
Height 193 7.6
Width 434 17.1
Depth 508 20

Weight kg lb
Without Package 14.1 31.1
With Option 11 16.1 35.7
With Package 24.5 54
With Option 11 27.5 61.1

Interfaces – GPIB, Ethernet: 10/100Base-T, RJ-45.
PC Keyboard – 6-Pin mini-DIN, rear.
### Ordering Information

**AWG710B**

4.2 GS/s, 8-bit, 32 M point, single-channel arbitrary waveform generator.

**Includes:** User manual, Programmer’s manual, Poppy disk: sample waveform library (063-A3740-00), performance verification (063-3721-00), Sample Program (062-A258-50), Certificate of Calibration, power cable, 50 Ω SMA Terminator 2 ea (015-1022-01).

Please specify power plug when ordering.

**Options**

- **Opt. 01** – 64 M points waveform memory.
- **Opt. 02** – Extends analog bandwidth to 2 GHz (calculated based on rise time).
- **Opt. 10** – Flash disk and standby switch (alternative for standard hard disk drive).
- **Opt. 11** – Removable Hard Drive.
- **Opt. 1R** – Rackmount kit.

**Service**

- **Opt. C3** – Calibration service 3 years.
- **Opt. C5** – Calibration service 5 years.
- **Opt. D1** – Calibration data report.
- **Opt. B3** – Calibration data report 3 years (with option C3).
- **Opt. D5** – Calibration data report 5 years (with option C5).
- **Opt. R3** – Repair service 3 years.
- **Opt. R5** – Repair service 5 years.

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**Recommended Accessories**

**Service Manual** – 071-1417-xx.

**Protective Cover** – 200-3696-01.

**Power Plug Options**


**Language Option**


**Warranty**

One year parts and labor.

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4 Signal Sources • www.tektronix.com/signal_sources