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

- **Features & Benefits**
  - 4.2 GS/s Sample Rate
  - Simulates Real-world Signals Up To 2.1 GHz
  - Two Markers With 2.0 ps RMS (at 4.2 GS/s Typical) Jitter
  - Deliver Stable Timing to the Device-under-Test (DUT)
  - 32.4 M (32,400,000) or 64.8 M (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

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. Also included is AXW100 ArbExpress™ waveform creation and editing software. This software allows for easy waveform import from oscilloscopes or basic, advanced, and math waveform creation and edit capabilities.

![Disk drive read channel application.](Image)

![AXW100 ArbExpress Software.](Image)
Arbitrary Waveform Generator

AWG710B

### Characteristics

#### Arbitrary Waveforms

**Waveform Length** – 960 to 32,400,000 points (or 64,800,000 points, option 01) in multiples of four.

**Sequence Length** – One to 8,000 steps.

**Sequence Repeat Counter** – One 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 or DC.

**Frequency** – 1.000 Hz to 400.0 MHz.

**Amplitude** –
- Offset: –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.

**DC Level** – DC waveform only
- Range: –0.500 V to +0.500 V into 50 Ω
- Resolution: 1 mV.

**Output Impedance** –
- **Normal Out**
- **Direct D/A Out **

**Marker**

**Marker1 Pulse Width**
- Hi Lo: 20% to 80% of Period.

**Marker2 Pulse Width**
- Hi Lo: 50% to 50% of Period, except 100.1 MHz to 160.0 MHz.
- Hi Lo: 52%/48% of Period, at 100.1 MHz to 160.0 MHz.

**Marked Level**
- Hi Level: 1 V into 50 Ω
- Lo Level: 0 V into 50 Ω.

**Waveform mixing operation** –
- Supports two-signals mixed output digitally.
- **Synchronous operation** – Supports synchronization of two AWGxxx boxes allowing two synchronized signal outputs.

**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** – 50,000,000 kSa/s to 4,200,000 GSa/s.

**Resolution** – 8 digits.

**Phase Noise** – (VCO out)
- At 4.203G/s, 10 kHz offset: –65 dBc/Hz.
- At 4.203G/s, 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.

**Integral Non-linearity:** ±1-LSB.

**Differential Non-linearity:** ±1/2-LSB.

**Output Connector** –
- **Front Panel SMA.**

**Normal Out**

**Amplitude** – Into 50 Ω.

**Amplitude Range:**
- 20 mV to 2.0 V peak-to-peak.
- Resolution: 1 mV.
- DC Accuracy: ±2.0% of Amplitude + 2 mV at offset = 0 V.
- offset = 0 V.

**Offset** – Into 50 Ω.

**Range of Signal Center:** ±0.500 V offset = 0 V.

**Accuracy:** ±1.5%.

**Resolution:** 8-bits.

**Marker**

**Skew** – (Option 02 eliminates the ability to switch between normal and direct D/A out, as well as filter and offset control)

**Cycle-to-cycle Jitter** (Typical) – by1010 clock pattern.

### 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 2.40 V into 50 Ω to GND.
- Amplitude: 0.05 Vp-p to 1.25 Vp-p, max. into 50 Ω to GND.
- Resolution: 0.05 V.

**DC Accuracy** –
- Within ±0.1 V of 5% setting into 50 Ω.
- Maximum Output Current: ±60 mA.
- Rise/Fall Time (20% to 80%) – ≤130 ps into 50 Ω to GND (1.0 Vp-p, +1.0 V, Lo 0 V).

**Per Jitter (Typical)** – by1010 clock pattern.

**Phase Noise** –
- 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.

**Clock to cycle Jitter** (Typical) – by1010 clock pattern.

**Delay (between analog output and marker output)** –

**Phase Noise** –
- Attenuation: ±10% (at 1.0 Vp-p amplitude).
- Flatness: ±5% after 20 ns from rise/fall edge.

**Sine Wave Characteristics** – (4.2 GS/s clock, 32 waveform points, 131.25 MHz sinewave frequency, 1.0 V amplitude, 0 V offset, through filter).

**Harmonics:**
- Harmonics: ≤0.1%.
- at 1.0 Vp-p.
- Noise: ≤50 dBc, DC to 1000 MHz.
- ≤0.1 V ±5% of setting into 50 Ω.

**Phase noise:**
- 20 mVp-p to 1.0 Vp-p into 50 Ω.

**Resolution** – 1 mV.

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### Physical Characteristics

<table>
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<tr>
<th>Dimensions</th>
<th>mm</th>
<th>in.</th>
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<td>Height</td>
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<td>Depth</td>
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<td>Weight</td>
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<tr>
<td>With option 11</td>
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</tbody>
</table>

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

### Auxiliary Inputs

**Trigger In**
- **Trigger Mode** – Minimum Pulse Width: 10 ns, 0.2 V amplitude.
- Maximum Input: 0 V to +5 V (DC + peak AC).
- Threshold: TTL level.
- Connector: Rear-panel 9-Pin D-sub.

**External Clock IN**
- Input Voltage Range – 0.4 $V_{pp}$ to 2.0 $V_{pp}$
- Impedance – 50 Ω, AC coupled.
- Frequency Range – 125 MHz to 4.2 GHz
- Note: need >10 mW/s signal slew rate
- Connector – Rear-panel SMA.

**Reference 10 MHz Clock IN**
- Input Voltage Range – 0.2 $V_{pp}$ to 3.0 $V_{pp}$, ±10 V maximum.
- Impedance – 50 Ω, AC coupled.
- Frequency Range – 10 MHz ±0.1 MHz.
- Connector – Rear-panel SMA.

### C Out 1 and 2
- For 2 boxes synchronous usage.
- Connector: SMA, Rear.
- Output signal style: Complementary.

### T Out 1 and 2
- For 2 boxes synchronous usage.
- Connector: SMA, Rear.
- Output signal style: Complementary.

### 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 ºC to +40 ºC.
  Nonoperating: –20 ºC to +60 ºC.
- **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/s² RMS (0.27 Grms, 5 Hz to 500 Hz, 10 minutes.
  Nonoperating: 22.36 m/s² RMS (2.28 Grms, 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).


**Safety** – UL 61010B-1, CSA C22.2 No. 1010.1,
               EN61010-1 second edition.

**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.
**Arbitrary Waveform Generator**

**AWG710B**

- **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), AXX100-A ArbExpress Software Utility CD (063-3763-00), Certificate of Calibration, power cable, 50 Ω SMA Terminator two each (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. 07** – Flash disk and standby switch (alternative for standard hard disk drive).
    - **Note:** Option 10 is for ATE and system usage needing 7x24 hour operation. Also adds capability to power on/off by rear panel main switch.
    - **Opt. 11** – Removable Hard Drive.
    - **Opt. 1R** – Rack Mount Kit.
  - **Service**
    - **Opt. C3** – Calibration service 3 years.
    - **Opt. C5** – Calibration service 5 years.
    - **Opt. D1** – Calibration data report.
    - **Opt. D3** – 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. RS** – Repair service 5 years.

- **Recommended Accessories**
  - Protective Cover – 200-3696-01.
  - Spare Removable Hard Disk Kit – 650-4644-00 (Opt. 11 must be installed).

- **Power Plug Options**

- **Language Option**

- **Warranty**
  - One year parts and labor.
  - **Note:** Options 10 and 11 are mutually exclusive.

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4 Signal Sources • www.tektronix.com/signal_sources