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Find the *Tektronix AWG430* at our website: ***Click HERE***

Arbitrary Waveform Generators

▶ AWG400 Series



▶ AWG420.

The AWG400 Series performs a wide range of modulated (I&Q) and mixed signal simulations (analog and digital) for wireless and wired data communication, in addition to semiconductor device characterization. The AWG400 Series is ideal for design or manufacturing test engineers who need to replicate marginal and erroneous analog and mixed signal conditions. The only product in its class offering 200 MS/s, 16-Bit vertical resolution, 2 or 3 channel configurations and optional digital outputs (32 or 48). The AWG400 Series is a superior choice for those who need an additional channel, longer memory or higher vertical resolution. The color display, graphical user interface and stand-alone Microsoft Windows-based waveform creating utility (ArbExpress™) supports quick creation, editing and output of custom or imported waveforms.

▶ Features & Benefits

2 or 3 Independent Waveform Channels

16-Bit Vertical Resolution

200 MS/s Sample Rate

Up to 16 M Point Record Length

Optional 32/48-Bit, 100 MHz (CMOS) Digital Data Generator for Mixed-signal Device Testing

4 or 6 Digital Marker Outputs

Independent Channel Internal Noise Generator

Independent Channel Skew Control

Independent Channel External Signal ADD-INPUT

External Clock and External Reference Inputs

▶ Applications

Designing, Testing and Deploying:

Quadrature Digitally Modulated I&Q Signals and Displays

Mixed (Analog/Digital) Signals

Stimulus Signals for Imaging Display and Recording Devices (CCD, LCD)

Enhanced/Corrupted Playback of DSO Captured Signals

Simulation Waveform Vectors Imported from Mathcad, Matlab, Excel and others

Network Communications Physical Layer Testing:

ITU-T (E1, E2, E3)

TI.102 (DS1, DS1A, DS1C)

Fibre Channel (FCl33E)

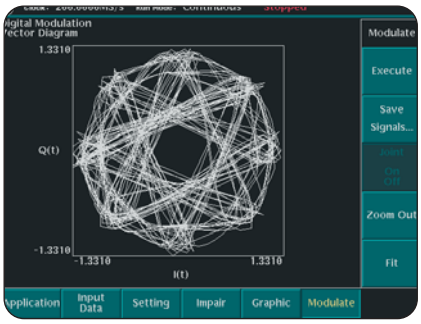
SDH/SONET (OC1/STM0, OC3/STM1)

D2

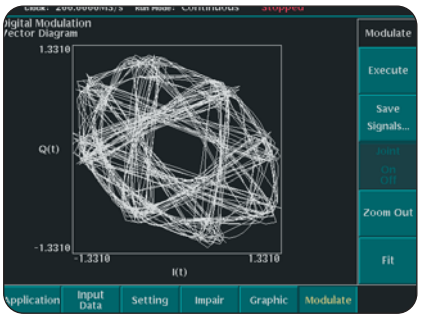
100Base-TX

Tektronix

Enabling Innovation



► π/4DQPSK vector diagram.



► π/4DQPSK with 20% quadrature error.

► Characteristics

Modulation Standards and Display Types

Modulation Types –

► BPSK

► QPSK

► OQPSK

► π/4DQPSK

► 8PSK

► 16QAM

► 64QAM

► 256QAM

► User defined

Modulation Displays –

► I(t), Q(t)

► R(t), φ(t)

► Eye Diagram I

► Eye Diagram Q

► Vector Diagram

► Constellation

► Magnitude Spectrum

► Phase Spectrum

Arbitrary Waveforms

Waveform Length – 64 to 4,050,000 points (64 to 16,200,000 points with Opt. 01).
Waveform Segment Length – ≥64 points, in multiple of 1.
Sequence Steps – One to 8,000 steps (All channels operate the same sequence).
Repeat Counter – One to 65,536 or infinite.

Function Generator Waveforms

Operation Mode – Continuous mode only.
Waveform Shape – Sine, Triangle, Square, Ramp, Pulse or DC.
Frequency – 1.000 Hz to 10.00 MHz.
Amplitude (Standard) –
Range: 0.020 V_{p-p} to 2 V_{p-p} into 50 Ω.
Resolution: 1 mV.
Amplitude (Option 05) –
Range: 0.020 V_{p-p} to 5V_{p-p} into 50 Ω.
Resolution: 1 mV.
Offset (Standard) –
Range: –1.000 V to +1.000 V into 50 Ω.
Resolution: 1 mV.
Offset (Option 05) –
Range: –2.500 V to +2.500 V into 50 Ω.
Resolution: 1 mV.
DC Level (Standard) –
DC waveform only.
Range: -1.000 V to +1.000 V into 50 Ω.
Resolution: 1 mV.
DC Level (Option 05) –
DC waveform only.
Range: –2.500 V to +2.500 V into 50 Ω.
Resolution: 1 mV.
Phase –
Range: –360º to +360º.
Resolution:
- 1.000 Hz to 20 kHz: 0.036º step.
- 20.01 kHz to 200 kHz: 0.36º step.
- 200.1 kHz to 2.000 MHz: 3.6º step.
- 2.001 MHz to 4.000 MHz: 7.2º step.
- 4.001 MHz to 5.000 MHz: 9º step.
- 5.001 MHz to 8.000 MHz: 14.4º step.
- 8.001 MHz to 10.00 MHz: 18º step.

Polarity – Normal, Invert.
Duty Cycle – Range: 0.1% to 99.9%, Pulse waveform only.
Resolution:
- 1.000 Hz to 200 kHz: 0.1% step.
- 200.1 kHz to 2.000 MHz: 1% step.
- 2.001 MHz to 4.000 MHz: 2% step.
- 4.001 MHz to 5.000 MHz: 2.5% step.
- 5.001 MHz to 8.000 MHz: 4% step.
- 8.001 MHz to 10.00 MHz: 5% step.

Marker Out –
Marker1 Pulse Width:
Hi/Lo: 20%/80% of Period.
Marker2 Pulse Width:
- Hi/Lo: 50%/50% of Period, except 5.001 MHz to 8.000 MHz.
- Hi/Lo: 52%/48% of Period, at 5.001 MHz to 8.000 MHz.
- Marker Level: TTL level.

Clock Generator

Sample Frequency – 10.00000 kS/s to 200.0000 MS/s.
Resolution Accuracy – 7 digits/±2 ppm (±0.0002%).
Period Jitter (rms) – 7 ps at 200 MHz (typical).
Cycle Jitter (rms) – 12 ps at 200 MHz (typical).

Main Analog Output

Number of Outputs – AWG430: 3, AWG420: 2.
Output Style – Complementary (standard), Single-ended (Opt. 05).
Output Connector/Impedance –
BNC front panel (50 Ω).
Vertical Resolution – 16-Bit.
D/A Converter (DNL/INL) –
±3 LSB at 25 ºC /±4 LSB at 25 ºC.
Skew Time Between Channels –
≤±100 ps (Relative to Ch 1).
Variable Delay (Range/Resolution/Accuracy) –
–2.52 ns to +2.52 ns/70 ps /±70 ps at 25 ºC.

Complementary Output

Amplitude/Range – –2.0 V to +2.0 V (into 50 Ω)/20 mV to 2.0 V_{p-p} (into 50 Ω).
Resolution/DC Accuracy –
1 mV/±(1.5% of setting + 2 mV) (Offset = 0 V).
Step Response (10% to 90%) – (–1 and 1 waveform data, 0 V offset, filter "Through").
Rise Time: ≤4.0 ns.
Fall Time: ≤4.0 ns.
Settling Time: ±3% (after 50 ns from rise/fall edges).
Aberration: ±10% (amplitude >1.0 V), ±7% (amplitude ≤1.0 V).
SFDR – (Signal frequency: 1.0 MHz, amplitude: 1.0 V, offset: 0 V, filter "Through") –74 dB (at 50 MS/s), –74 dB (at 100 MS/s), –62 db (at 150 MS/s).

Offset

Range/Resolution –
–1.00 V to +1.00 V (into 50 Ω)/1 mV.
Accuracy – ±(1% of offset + 10 mV)(amplitude = 20 mV, waveform data 0).

Filter

Type – Bessel low pass filter 1 MHz, 5 MHz, 20 MHz, 50 MHz.
Rise Time (10% to 90%) –
350 ns, 70 ns, 18 ns, 7 ns.
Delay From Trigger –
350 ns, 70 ns, 18 ns, 7 ns (group delay).

Direct Output (Standard)

Range/Amplitude – –0.25 V to +0.25 V (into 50 Ω)/20 mV to 0.5 V (into 50 Ω).
Resolution/DC Accuracy/Offset –
1 mV/± (1.5% of setting + 2 mV)/≤10 mV.
Step Response (10% to 90%) – (filter "Through").
Rise/Fall Time: ≤3.0 ns/≤3.0 ns.

Single-ended Output (Opt. 05)

Range/Amplitude – –5.0 V to +5.0 V (into 50 Ω)/20 mV to 5.0 V_{p-p} (into 50 Ω).
Resolution/DC Accuracy – 1 mV/ ± (1.5% of amplitude + 2 mV)(Offset = 0 V).
Range / Resolution – –2.500 V to +2.500 V (into 50 Ω)/1 mV.
Accuracy – ± (1% of offset + 10 mV)(amplitude = 20 mV, waveform data 0).
Step Response (10% to 90%) – (–1 and 1 waveform data, 0 V Offset, Filter "Through").
Rise Time: ≤5.0 ns; Fall Time: ≤5.0 ns.
Settling Time: ±3% (after 50 ns from rise/fall edges).
Aberration: ±10% (amplitude >1.0 V), ±7% (amplitude ≤1.0 V).
SFDR – (Signal frequency: 1.0 MHz, amplitude: 1.0 V_{p-p}, offset: 0 V, filter "Through") –72 dB (at 50 MS/s), –70 dB (at 100 MS/s), –60 dB (at 150 MS/s).

Filter

Type – Bessel low pass filter 1 MHz, 5 MHz, 20 MHz, 50 MHz.
Rise Time (10% to 90%) –
350 ns, 70 ns, 18 ns, 7 ns.
Delay From Trigger –
350 ns, 70 ns, 18 ns, 7 ns (Group Delay).

Noise (All channels independent).

Range/Resolution –
–130 dBm/Hz to –95 dBm/Hz/1 dBm/Hz.
Accuracy/Type – ±2.5 dB at (–95 dBm/Hz to –130 dBm/Hz at 10 MHz)/Gaussian.
Flatness – ±2.5 dB (1 MHz to 100 MHz (at –95 dBm/Hz reference 50 MHz).
Output Connector – Part of analog front panel BNC.

Internal Trigger Generator

Range/Resolution/Accuracy – 1.0 µs to 10.0 s/ 3 digits, minimum 0.1µs/±0.1%.

Auxiliary Outputs

Marker

Maximum Data Rate – 200 Mb/s.
Number of Outputs – AWG430: 6.
AWG420: 4 (2 per channel).
Level/Impedance – Hi: ≥2.4 V, Lo: ≤0.1 V (into 50 Ω) 74LVC54A output driver/50 Ω.
Rise/Fall Time (10% to 90%) – 4 ns maximum.
Output Skew – ≤±100 ps.
Output Connector – BNC rear panel.

Master Clock Out

Level/Impedance –
1 V_{p-p} (into 50 Ω) ±0.3 V/50 Ω.
Frequency/Output Connector –
100 MHz to 200 MHz/BNC rear panel.

Digital Data (Output from P4116, Opt. 03).

Number of Outputs –
Ch 1 = 16, Ch 1+2 = 32, Ch 1+2+3 = 48. Each channel D0-D15 = 16 Bits + clock.
Output Connector – Each channel 34-Pin (header pin connector), P4116 CMOS Pod.
Maximum Data Rate – 10 kb/s to 100 Mb/s.
Level/Impedance – Hi: ≥2.3 V, Lo: ≤0.1 V (into 50 Ω) 74LVC541A output driver/50 Ω.
Rise Time (10% to 90%) – 3 ns Maximum.
Skew Time –
1 ns (typical) (between clock signals and data).
Data Invalid Time – 4 ns.

10 MHz Reference

Amplitude / Impedance – 1 V_{p-p}min (into 50 Ω), 3 V_{p-p}max (into 1 MΩ) / Impedance: 50 Ω AC coupled.
Output Connector – BNC rear panel.

Display Monitor

Format/Connector –
VGA/D-sub 9-Pin, rear panel.

Auxiliary External Input

Trigger In

Impedance/Polarity –
1 kΩ or 50 Ω/positive or negative.
Input Voltage Range/Threshold –
1 kΩ ±10 V or 50 Ω ±5 V/–5.0 V to 5.0 V.
Accuracy/Resolution –
± (5% of setting level + 0.1 V)/0.1 V.
Minimum Pulse Width/Dead Time – 10 ns (0.2 V Amplitude)/≤65 clock + 200 ns maximum.
Delay to Analog Out – 50 ns + 1 clock.
Connector – BNC rear panel.

Event In

Number of Events In/Input Signal –
4-Bits/4 event bits + strobe.
Threshold/Pulse Width –
TTL level/≥100 ns.
Maximum Input Level/Impedance – 0 V to +5 V (DC + peak AC)/2.2 kΩ, pulled-up to +5 V.
Delay to Analog Out – ≤130 Clock + 400 ns.
Connector – 9-Pin D-sub rear panel.

ADD In

Number of ADD In – Ch1, Ch 2, Ch 3 Independent.
Input Range/Impedance –
–1 V to 1 V (DC + peak AC)/50 Ω.
Band Width (–3 dB)/Amplitude Accuracy –
≥50 MHz at 1 V_{p-p} input/±5%.
Connector – BNC rear panel.

10 MHz Reference In

Input Range/Impedance – 0.2 V_{p-p} to 3 V_{p-p}, maximum ±10 V/50 Ω, AC coupled.
Frequency Range/Connector –
10 MHz ±0.1 MHz/BNC rear panel.

Master Clock In

Sensitive Voltage/Threshold – ≥0.4 V_{p-p}/0.5 Vdc.
Minimum Pulse Width/Maximum Input Voltage – 2 ns/± 2 VDC.
Frequency Range/Impedance – DC to 200 MHz/50 Ω.
Connector – BNC rear panel.

Environment/Other

Operation Mode –
Continuous, Triggered, Gated, Enhanced.
Display – Color TFT LCD.
Display Area/Resolution – Horizontal: 13.06 cm (5.14 in.), Vertical: 9.70 cm (3.81 in.)/640x480.

Data Storage

Internal Hard Disk – 10.0 GB.
Flash Disk (Option 10) – 128 MB.
Floppy Disk – 3.5", 1.44 MB.

Environment

Temperature – Operating/Nonoperating: +10 ºC to +40 ºC/–20 ºC to +60 ºC.
Humidity – Operating/Nonoperating: 20% to 80%/5% to 90%.
Altitude – Operating/Nonoperating: Up to 3,000 m (10,000 ft.)/up to 12,000 m (40,000 ft.).
Vibration – Operating / Nonoperating: 0.27 G_{RMS}, 5 Hz to 500 Hz/2.28 G_{RMS}, 5 Hz to 500 Hz.
Shock – Nonoperating: 294 m/s^2 (30 G), half-sine, 11 ms duration (three time each axis).
EMC – EC Council Directive 89/336/EEC (EC-92), AD/NZS 2064.1/2.
Safety – UL 3111-1, CSA C22.2 No. 1010.1, EN61010-1, IEC61010-1.

Power Supply

Rating/Range – 100 to 240 VAC/90 to 250 VAC.
Maximum Power and Current/Frequency – 380 VA/48 to 63 Hz.

Physical Characteristics

AWG420

Dimensions	**mm**	**in.**
Height	193	7.6
Width	433	17.05
Depth	508	20
Weight	**kg**	**lb.**
Net 14.1	31.1	

AWG430

Dimensions	**mm**	**in.**
Height	193	7.6
Width	433	17.05
Depth	508	20
Weight	**kg**	**lb.**
Net 14.4	31.7	
With Packaging	22.3	49.12

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

► Ordering Information

AWG420

200 MS/s, 16-Bit, Two-channel Arbitrary Waveform Generator.

AWG430

200 MS/s, 16-Bit, Three-channel Arbitrary Waveform Generator.

All Include: User/Programmer manual 070-A809-00, GPIB programming examples 062-A258-00, sample waveform library disk 062-A257-00, performance verification 062-A270-00, Cal. Certificate no charge, AXW100 ArbExpress™ Software Utility CD (063-3763-00), power cord.

Please specify power plug when ordering.

Recommended Accessories

Service Manual – Order 070-A811-00.

Protective Cover – Order 200-3696-01.

ArbExpress™ – PC-based stand-alone waveform creation utility.

Options

Opt. 01 – 16 M point waveform memory.

Opt. 03 – CMOS Digital Data Outputs – 32/48-Bit (number of digital output bits depends on AWG400 model).

Opt. 05 – Single-ended output (alternative for standard complementary output).

Opt. 10 – 128 MB Flash disk and standby switch (alternative for standard hard disk drive).

Note: Option 10 is for ATE and system usage needing 24x7 hour operation. Also adds capability to power on/off by rear panel main switch.

Opt. 1R – Rackmount.

Power Plug Options

Opt. A0 – North America Power.

Opt. A1 – Universal EURO Power.

Opt. A2 – United Kingdom Power.

Opt. A3 – Australia Power.

Opt. A5 – Switzerland Power.

Opt. A99 – No Power Cord or AC Adapter.

Opt. AC – China Power.

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 Opt. C3).

Opt. D5 – Calibration Data Report 5 Years (with Opt. C5).

Opt. R3 – Repair Service 3 Years.

Opt. R5 – Repair Service 5 Years.

Warranty

One year parts and labor.

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Our most up-to-date product information is available at:
www.tektronix.com

Product Area Assessed: The planning, design/development and manufacture of electronic Test and Measurement instruments.

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