RIDER

Time to Reinvent advance signal generation

ARB Rider 5062(D)/5064(D)/5068(D) *Technical Datasheet*

2 / 4 / 8 CHANNELS – ALL IN ONE: Function Generator, Arb Generator, Serial Pattern Generator and Digital Pattern Generator.

- 2, 4 or 8 Analog Channels
- 6.16 GS/s (12.32 GS/s in RF mode)
- 16 Bit Vertical Resolution
- Up to 6 GHz output frequency
- < 110ps Rise/fall time
- 230ps minimum pulse width
- Single ended output with up to 5 V_{p-p} into 50 Ω with hardware offset of ±2.5V into 50 Ω. Total Output Voltage Window ±5 V (10 V_{p-p}) into 50 Ohm
- Differential output with up to 3 V_{p-p} into 100 Ω with common mode voltage of ±2 V into 50 Ω
- Up to 4 Gpts Waveform Memory per Channel
- Up to 32 Digital Channels in synchronous with analog Generation
- Multi-Instrument Synchronization: **up to 32 analog** and **128 digital channels**

Key performance specifications

- ***AWG Mode***
  - 16-bit vertical resolution
  - 6.16 GS/s Variable Clock (12.32 GS/s in RF mode)
  - Up to 6 GHz output frequency
  - < 110ps Rise/fall time
  - 8bit,16bit or 32bit digital channels
  - Up to 4 Gpts Waveform Memory per Channel
  - Single ended amplitude up to 5 V_{p-p} into 50 Ω with hardware offset of ±2.5 V into 50 Ω
  - Differential amplitude up to 3 V_{p-p} into 100 Ω load with common mode voltage of ±2 V into 50 Ω
- ***AFG Mode***
  - 2 GHz Sine Waveforms
  - 6.16 GS/s fixed, 16-bit vertical resolution
  - Single ended amplitude up to 5 V_{p-p} into 50 Ω with hardware offset of ±2.5 V into 50 Ω
  - Differential amplitude up to 3 V_{p-p} into 100 Ω load with common mode voltage of ±2 V into 50 Ω
  - Improved proprietary DDS based technology
- ***Serial Pattern Generator (SPG) Mode***
  - Up to 1.5Gbit/s NRZ bit stream generation
  - 2,3 or 4 levels pattern
  - 64 points arbitrary shape per transition
  - Programmable duration for any transition
  - Up to 2Mbit (2 levels) or up to 1Msymbols (3 or 4 levels) pattern memory for channel
  - Single ended amplitude up to 5 V_{p-p} into 50 Ω with hardware offset of ±2.5 V into 50 Ω
  - Differential amplitude up to 3V_{p-p} into 100 Ω load with common mode voltage of ±2V into 50 Ω

Features & Benefits

- Sample rate can be programmed in from 1 S/s to 6.16 GS/s (12.32 GS/s in RF mode), with 16-bit vertical resolution, ensures exceptional signal integrity
- Arbitrary waveform memory up to 4 Gpts for each analog channel
- Mixed Signal Generation – 2, 4 or 8 Analog channels with 8, 16 or 32 synchronized Digital Channels for debugging and validating digital design.
- Three operation modes – Simple Rider AFG (DDS AFG mode), True Arb (variable clock Arbitrary AWG mode) and SPG (Serial Pattern Generator).
- Digital outputs provide up to 1.54 Gb/s data rate in LVDS format. LVDS to LVTTL adapter is available
- Advance sequencer with up to 16384 user defined waveforms provides the possibility of generating complex signal scenarios with the most efficient memory usage
- Windows based platform with 7in touch screen, front panel buttons and knob
- Compact form factor, convenient for bench top and fully fit with 3U – 19" rackmount standard
- LAN, USB-TMC and GPIB interfaces for remote control

Applications areas

Automotive

Today's cars are including a lot of highly sophisticated electronic control unit with very sensitive electronic components.
The Arb Rider 5062/5064/5068 combining 6.16 GS/s with 16 vertical resolution, represents an ideal tool for successfully addressing the new testing challenges in automotive.

- EMI debugging, troubleshooting and testing
- Electrical standards emulation up to 5V

IoT and Ind 4.0 perfect RF Modulator

Arb and Function Riders will be the iconic instrument for this applications. The possibility to emulate complex RF I/Q modulation for simulation and Test vs wireless devices or working on Internet of things of industry 4.0 applications. Each engineer may use the possibility to import waveform to emulate devices under test, impose distortion on waveform (such noise) to test the ability of devices to be compliant to the standards.

Research Applications

Research centers and Universities, are key users of Arb Rider generator's series.
Complex waveform and/or sophisticated Pulses emulation based on variable edges or multilevel could be perfectly created. The combination of fast edge generation, excellent dynamic range and easy to use user interface meet perfectly scientists and engineers working on Quantum Research or on large experiments such Accelerators, Tokamak or synchrotrons to emulate signals without creating specifics test boards.

- Emulation of detectors
- Emulation of signal sources adding noise
- Generation/playback of real-world signals
- Emulation of long PRBS sequences
- Modulating and driving laser diode

Aerospace and Defense applications

Electronic warfare signals driven by Radar or Sonar systems perfectly match with these generators. Large BW Riders can be used on digital modulation systems for Radio Applications or others I/Q signal modulation.
Pulses may be easily generated for applications such Pulse Electron Beam or X Ray Sources, Flash X-ray Radiography, Lighting pulse simulators, high Power Microwave modulators.

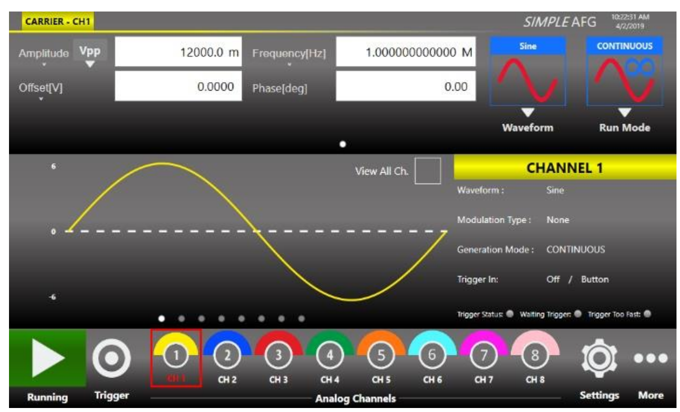
- Frequency response, intermodulation distortion and noise-figure measurements
- Phase Locked Loop (PLL) pull-in and hold range characterization
- Radar base-band signals emulation

Semiconductors Test

Emulation of complex signals generated with inclusion of noise or distortions may became an excellent way to provide Compliance Components Test to help semiconductors engineers. The fast edges and pulse generation can be used to provide characterization in fast power devices.

Simple Rider AFG: Function Generator Mode Interface

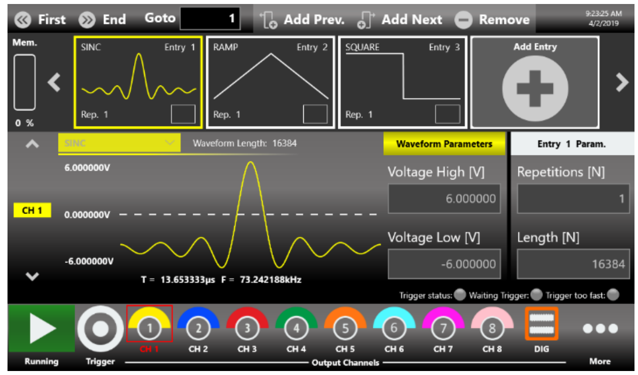
Simple Rider AFG UI is designed for touch and it has been developed to put all the capabilities of modern Waveform Generators right at your fingertips. All instrument controls and parameters are accessed through an intuitive UI that recalls the simplicity of Tablets and modern smart phones: touch features and gestures are available to engineers and scientists to create advanced waveforms or digital patterns in few touches.



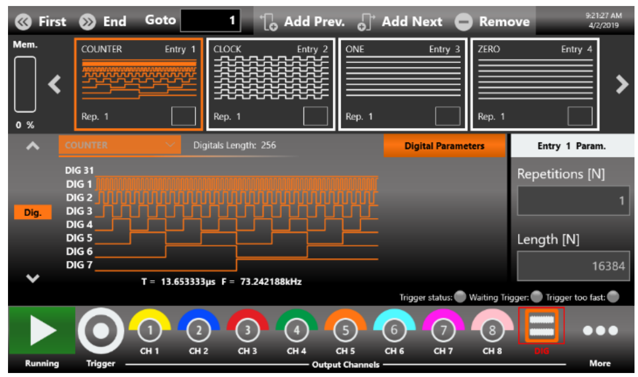
- The swipe gesture gives easy access to the output waveform parameters
- A touch-friendly virtual numeric keypad has been designed to improve the user experience on entering the data.
- Time saving shortcuts and intuitive icons simplify the instrument setup.

Simple Rider TrueArb: AWG Mode Interface

In **Simple Rider True-Arb** interface, the users can define complex waveforms with up to 16,384 sequence entries of analog waveforms and digital patterns, define their execution flow by means of loops, jumps and conditional branches.



Digital output combined and synchronized with analog output signals represent an ideal tool to troubleshoot and validate digital design.
The waveform memory length of up to 4 GSamples on each channel combined with up to 16,384 and up to 4,294,967,294 repetitions, make the Arb-Rider 5062/5064/5068 the ideal generator for the most demanding technical applications.



Thanks to the intuitive and easy waveform sequencer user interface, the most complex waveform scenarios can be created with just few screen touches.

Up to 4 instrument can be synchronized together in order to obtain a 32 analog – 128 digital channel generator. A dedicated synchronization bus guarantees the intra-chassis synchronization.

Arb Rider supports the standard Ethernet interface for remote control and easy customized instrument programming.

Simple Rider SPG: Serial Pattern Generator (SPG) Mode Interface

The easiest touch screen display interface allows to create patterns scenarios, only in a few screen touches.
In summary the Data Pattern Generator provides the capability to generate PRBS patterns and up to 2MSymbols custom patterns where bit transitions can have arbitrarily user defined shapes. The ARB-RIDER-AWG5000 Serial Pattern Generator can generate patterns up to 1.5Gbaud.

The software architecture provides the possibility to easily generate the patterns in different generation modality and also gives the opportunity to modulate the patterns with internal or external signals with the purpose to generate also different effects of noise (jitter, ripple, …).

Document name **AWG-5062/5064/5068 - Technical Specifications** Last Date Update: 09/12/2021

All specifications are typical unless noted otherwise. The guaranteed performances are referred to a calibrated instrument that has been stored for a minimum of 2 hours within the operating temperature range of 5°C to 40°C and after a 45-minute warm up period. Within ±10°C after auto-calibration.
Some specifications on this document refer to the available options and accessories that can be found in the table at the end of this document.

General Specifications			
Operating Mode	AFG Mode True Arb Mode SPG Mode (Optional)		
	AWG-5062 AWG-5062D	**AWG-5064 AWG-5064D**	**AWG-5068 AWG-5068D**
Number of Channels			
Analog	2	4	8
Digital	0/8 opt.	0/8/16 opt.	0/8/16/24/32 opt.
Markers	1	2	4

	AWG-5062 AWG-5064 AWG-5068	**AWG-5062D AWG-5064D AWG-5068D**
Output Channels		
Output type	Single ended DC coupled	Differential DC coupled
Output impedance	Single ended: 50 Ω	Single ended: 50 Ω Differential: 100 Ω
Connectors	SMA on front panel	
DC Amplitude		
Amplitude range	±2.5 V (into 50 Ω)	±0.75 V Se. (into 50 Ω) ±1.5 V Diff. (into 100 Ω)
Resolution	100µV (nom), 5 digits	
Amplitude accuracy (guaranteed)	±(1% of |setting| + 5 mV)	±(1% of |setting| + 2 mV)
DC Baseline Hardware Offset (Common mode offset)		
Resolution	< 4 mV or 4 digits	

Range (50 Ω into 50 Ω)	-2.5 V to +2.5 V	-2 V to +2 V
Range (50 Ω into High Z load)	-2.5 V to +2.5 V	-4 V to +4 V
Accuracy (50 Ω into 50 Ω) (guaranteed)	± (1% of |setting| + 5 mV)	
AC Accuracy (1 kHz sine wave, 0 V offset, > 5 mV_{p-p} amplitude, 50 Ω load) (guaranteed)	± (1% of setting [Vpp] + 5mV)	

True Arb - Baseband mode specifications	AWG-5062 AWG-5064 AWG-5068	AWG-5062D AWG-5064D AWG-5068D
General specifications		
Operating Mode	Variable clock (True Arbitrary) – Baseband mode	
Sample Rate	1 S/s to 6.16 GS/s	
Sin(x)/x	2.72 GHz @ 6.16GS/S,	
Run Modes	Continuous, Triggered Continuous, Single/Burst, Stepped, Advanced	
Vertical Resolution	16 bit	
Waveform Length	128 to 2G samples per channel (up to 4G samples optional)	
Waveform Granularity	1 if the entry length is > 416 samples 32 if entry length is ≥ 128 and ≤ 416 samples	
Sequence Length	1 to 16384	
Sequence Repeat Counter	1 to 4294967294 or infinite	
Timer		
Range	20 ns to 1.39 seconds	
Resolution	± 1 sampling clock cycle	
Analog Channel to Channels skew		
Range	0 to 2.63 us	
Resolution	100 fs	
Accuracy	±(1% of setting + 20 ps)	
Initial skew	< 20 ps	
Calculated bandwidth (0.35 / rise or fall time)	≥ 2 GHz	≥ 2.2 GHz

SFDR @ 100 MHz (Fsa= 6 Gsa/s, measured across DC to Fs/2, excluding fsa - 2*fout and fsa- 3*fout and excluding harmonic)	< -80 dBc	< - 90 dBc
SFDR (Fsa= 6,16 Gsa/s, measured across DC to Fs/2, excluding fsa - 2*fout and fsa- 3*fout and excluding harmonic)[1]	1µHz to ≤ 600MHz: < -80dBc 600MHz to ≤ 1.5GHz: < -75dBc 1.5GHz to ≤ 2GHz: < -65dBc 2GHz to ≤ 3GHz: < -55dBc	1µHz to < 100MHz: < -90dBc 100MHz to ≤ 600MHz: < -82dBc 600MHz to ≤ 1.5GHz: < -75dBc 1.5GHz to ≤ 2GHz: < -70dBc 2GHz to ≤ 3GHz: < -62dBc
Rise/fall time (1 V_{p-p} single-ended 10% to 90%) **Rise/fall time (**1 V_{p-p} single-ended 20% to 80%)	≤ 175 ps ≤ 110 ps	≤ 155 ps ≤ 100 ps
Overshoot (1 V_{p-p} single-ended)	<5%	<6%
Random jitter on clock pattern (rms, typical)	< 2 ps	

True Arb - RF Mode specifications (optional)	**AWG-5062 AWG-5064 AWG-5068**	**AWG-5062D AWG-5064D AWG-5068D**
General specifications		
Operating Mode	Variable clock (True Arbitrary) – RF mode	
Output Sample Rate	8.5 GS/s to 12.32 GS/s	
Sin(x)/x	5.04 Ghz @ 12.32GS/S	
RF Modulation	I/Q quadrature	
RF Carrier count per output channel	Single Carrier (2 components I0,Q0 for channel) Double Carrier (4 components, I0,Q0 and I1,Q1 for channel)	
RF Carrier Frequency range	0 up to 6 GHz	
RF Carrier Frequency resolution	1 mHz	
RF Carrier Phase	Programmable	

[1] For AWG-5062/5064/5068 models the SFDR is evaluated @ 2.5Vpp single ended nominal output amplitude. For AWG-5062D/5064D/5068D models the SFDR is evaluated @ 1.5Vpp differential nominal output amplitude provided to the spectrum analyzer through a Minicircuit TC1-1-13M+ balun.

I/Q Component Data Rate	1/8 of the Output Sample rate
I/Q Component Prescaler	0 to 2^32
Run Modes	Continuous, Triggered Continuous, Single/Burst, Stepped, Advanced
I/Q Component Vertical Resolution	16 bit
I/Q Component Waveform Length	32M to 500M samples for component (up to 1G samples optional)
I/Q Component Waveform Granularity	1 if the entry length is > 104 samples 8 if entry length is ≥ 32 and ≤ 104 samples
Sequence Length	1 to 16384
Sequence Repeat Counter	1 to 4294967294 or infinite
Timer	
Range	20 ns to 1.39 seconds
Resolution	± 1 Component sampling clock cycle
I/Q Component to Component skew	
Range	0 to [16200 * 8/Output Sampling Clock] s
Resolution	[8/Output Sampling Clock] s
Accuracy	±(1% of setting + 20 ps)
Initial skew	< 20 ps

AFG Mode Specifications	AWG-5062 AWG-5064 AWG-5068	AWG-5062D AWG-5064D AWG-5068D
General Specifications		
Amplitude		
Range	0 to 5Vpp (into 50 Ω)	0 to 3Vpp Diff. (into 100 Ω) 0 to 1.5Vpp Se. (into 50 Ω)
Resolution	100µV (nom), 5 digits	
Operating mode	DDS mode	
Standard Waveforms	Sine, Square, Pulse, Ramp, more (Noise, DC, Sin(x)/x, Gaussian, Lorentz, Exponential Rise, Exponential Decay, Haversine	
Run Modes	Continuous, modulation, sweep, burst	
Arbitrary Waveforms	Vertical resolution: 16-bit Waveform length: 16,384 points	
Internal Trigger Timer		
Range	10.4 ns to 88 s	
Resolution	80 ps	
Accuracy	±(0.1% setting + 5 ps)	
Sine Waves		
Frequency Range Sine (50 Ω into 50 Ω)[2]	1 µHz to ≤ 1 GHz: 5Vpp 1 GHz to ≤ 2 GHz: 4Vpp	1 µHz to ≤ 2 GHz: 3Vpp Diff. 1 µHz to ≤ 2 GHz: 1.5Vpp Se.
Flatness	DC to 2 GHz: ±0.5 dB (1 Vpp, relative to 1 kHz)	DC to 2 GHz: ±0.5 dB (1 Vpp diff., relative to 1 kHz)
Harmonic Distortion (1 V_{p-p})	1µHz to ≤ 20kHz < -75dBc 20kHz to ≤ 400MHz < -70dBc 400MHz to ≤ 1GHz < -60dBc 1GHz to ≤ 2GHz < -55dBc	-
Total Harmonic Distortion (1 V_{p-p})	10 Hz to 20 kHz < 0.05%	-

[2] Amplitude doubles on HiZ load

Spurious (measured across DC to Fs/2)[3]	1μHz to ≤ 500MHz: < -75dBc 500MHz to ≤ 1.5GHz: < -70dBc 1.5 GHz to ≤ 2 GHz: < -55 dBc	1μHz to ≤ 250MHz: < -85dBc 250MHz to ≤ 500MHz: < -80dBc 500MHz to ≤ 1.5 GHz: < -70 dBc 1.5 GHz to ≤ 2 GHz: < -60 dBc
Phase Noise (1 V_{p-p}, 10 kHz offset)	20 MHz: < -127 dBc/Hz typ. 100 MHz: < -123 dBc/Hz typ. 1 GHz: < -105 dBc/Hz typ.	
Square Waves		
Frequency Range	1 μHz to ≤ 770 MHz	1 μHz to ≤ 770 MHz
Rise/fall time (10% to 90%)	400 ps	
Rise/fall time (20% to 80%)	300 ps	
Overshoot (1 V_{p-p})	<2%	
Jitter (rms)	<2 ps	
Pulse Waves		
Frequency Range	1μHz to ≤ 770 MHz	1 μHz to ≤ 770 MHz
Pulse width	500 ps to (Period – 500 ps)[4]	
Pulse width Resolution	20 ps or 15 digits	
Pulse duty	0.1% to 99.9% (limitations of pulse width apply)	
Leading/trailing edge transition time (10% to 90%)	400 ps to 1000 s	
Leading/trailing edge transition time (20% to 80%)	300 ps to 1000 s	
Transition time Resolution	2 ps or 15 digits	
Overshoot (1 V_{p-p})	< 2%	

[3] For AWG-5062/5064/5068 models the spurious are evaluated @ 1Vpp single ended nominal output amplitude. For AWG-5062D/5064D/5068D models the SFDR is evaluated @ 1Vpp differential nominal output amplitude provided to the spectrum analyzer through a Minicircuit TC1-1-13M+ balun.
[4] Below 500 ps width, the pulse amplitude will have some reduction respect to the set value

Jitter (rms, with rise and fall time ≥ 400ps)	<2 ps	
Double Pulse Waves		
Frequency Range	1μHz to ≤ 385 MHz: 10Vpp where Vpp= |Vpp1| + |Vpp2|	1 μHz to ≤ 385 MHz: 6Vpp Diff. (1 μHz to ≤ 385 MHz: 3Vpp Se) where Vpp= |Vpp1| + |Vpp2|
Other Pulse Parameters	Same as Pulse Waves	
Ramp Waves		
Frequency Range	1 μHz to 75 MHz	
Linearity (< 10 kHz, 1 V_{p-p}, 100%)	≤ 0.1%	
Symmetry	0% to 100%	
Other Waves		
Frequency Range		
Exponential Rise, Exponential Decay	1 μHz to 75 MHz	
Sin(x)/x, Gaussian, Lorentz, Haversine	1 μHz to 150 MHz	
Additive Noise		
Bandwidth (-3 dB)	2 GHz	
Level	0 V to 2.5 V - abs(carrier max value [V_{pk}])	0 V to 0.75 V Single Ended - abs(carrier max value [V_{pk}]) 0 V to 1.5 V Differential - abs(carrier max value [V_{pk}])
Resolution	1 mV	
Arbitrary		
Number of Samples	2 to 16384	
Frequency range	1 μHz to ≤ 770 MHz	
Analog Bandwidth (-3 dB)		

	950 MHz
Rise/fall time (10% to 90%) Rise/fall time (20% to 80%) Jitter (rms)	400 ps 300 ps < 2 ps
Frequency Resolution Sine, square, pulse, arbitrary, Sin(x)/X Gaussian, Lorentz, Exponential Rise, Exponential Decay, Haversine	 1 µHz or 15 digits 1 µHz or 14 digits
Frequency Accuracy Non-ARB ARB	 ± 2.0 ppm of setting | ± 500 ppb of setting (Opt.) ± 2.0 ppm of setting ±1 µHz | ± 500 ppb of setting ±1 µHz(Opt.)
Modulations	
Amplitude Modulation (AM) Carrier waveforms Modulation source Internal modulating waveforms Modulating frequency Depth	 Standard waveforms (except Pulse, DC and Noise), ARB Internal or external Sine, Square, Ramp, Noise, ARB Internal: 500 µHz to 61 MHz, External: 10 MHz max. 0.00% to 120.00%
Frequency Modulation (FM) Carrier waveforms Modulation source Internal modulating waveforms Modulating frequency Peak deviation	Standard waveforms (except Pulse, DC and Noise), ARB Internal or external Sine, Square, Ramp, Noise, ARB Internal: 500 µHz to 61 MHz, External: 10 MHz max. DC to 2 GHz
Phase Modulation (PM) Carrier waveforms Modulation source Internal modulating waveforms Modulating frequency Phase deviation range	Standard waveforms (except Pulse, DC and Noise), ARB Internal or external Sine, Square, Ramp, Noise, ARB Internal: 500 µHz to 61 MHz, External: 10 MHz max. 0° to 360°

Frequency Shift Keying (FSK)	
Carrier waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Modulation source	Internal or external
Internal modulating waveforms	Square
Key rate	Internal: 500 µHz to 61 MHz, External: 10 MHz max.
Hop frequency	1 µHz to 2 GHz
Number of keys	2
Phase Shift Keying (PSK)	
Carrier waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Modulation source	Internal or external
Internal modulating waveforms	Square
Key rate	Internal: 500 µHz to 61 MHz, External: 10 MHz max.
Hop phase	0° to +360°
Number of keys	2
Pulse Width Modulation (PWM)	
Carrier waveforms	Pulse
Modulation source	Internal or external
Internal modulating waveforms	Sine, Square, Ramp, Noise, ARB
Modulating frequency	Internal: 500 µHz to 61 MHz, External: 10 MHz max.
Deviation range	0% to 50% of pulse period
Sweep	
Type	Linear, Logarithmic, staircase, and user defined
Waveforms	Standard waveforms (except Pulse, DC and Noise), ARB
Sweep time	30 ns to 2000 s
Hold/return times	0 to (2000 s – 30 ns)
Sweep/hold/return time resolution	15 ns or 12 digits
Total sweep time accuracy	≤ 0.4%
Start/stop frequency range	Sine: 1 µHz to 2 GHz, Square: 1 µHz to 770 MHz
Trigger source	Internal/External/Manual
Burst	
Waveforms	Standard waveforms (except DC and Noise), ARB

Type	Trigger or gated
Burst count	1 to 4,294,967,295 cycles or Infinite

Timing and Clock	
Sampling Rate	
Range	1 S/s to 6.16 GS/s (1 S/s to 12.32 GS/S in RF mode)
Resolution	32 Hz
Accuracy	± 2.0 ppm | ± 500 ppb (Opt.)
Digital outputs (Optional)	
Output Channels	
Connectors	Mini-SAS HD connector on rear panel (custom pin-out)
Number of connectors	1,2,4
Number of outputs	8-bits,16-bits,32-bits
Output impedance	100 Ω differential
Output type	LVDS
Rise/fall time (10% to 90%)	< 1 ns
Jitter (rms)	20 ps
Maximum update rate	1.54 Gbps per channel
Memory depth	512M Samples per digital channel (up to 1G optional)

8 bit LVDS to LVTTL Converter Probe (Optional AT-DTLL8)	
Output connector	20 position 2.54 mm 2 Row IDC Header
Output type	LVTTL
Output impedance	50 Ω nominal
Output voltage	0.8V to 3.8V programmable in group of 8 bits
Maximum Update Rate	125 Mbps@0.8V and 400 Mbps@3.6V
Dimensions	W 52 mm – H 22 mm – D 76 mm
Input Connector	Proprietary standard
Cable Length	1 meter
Cable Type	Proprietary standard
Proprietary Mini SAS HD to SMA cable (Optional)	
Output connector	SMA
Output type	LVDS
Number of SMA	16 (8 bits)
Cable type	Proprietary standard
Cable Length	1 meter
Auxiliary input and output characteristics	
Sync in/out	
Connector type Master to Slave delay (typical)	Infiniband 4X connector on rear panel (custom pinout) TBD

Marker Output	
Connector type	SMA on front panel
Number of connectors	1/2/4
Output impedance	50 Ω
Output level (into 50 Ω)	
Voltage Window	-0.5V to 1.65V
Amplitude	100 mVpp to 2.15 Vpp
Resolution	1 mV
Accuracy	±(5% setting + 25 mV)
Switching characteristics	
Max Update Rate (True Arb Mode)	6.16 Gbps
Max Data Rate (True Arb Mode)	>4 Gbps @ 1Vpp swing
Max Frequency (AFG Mode)	96.5 MHz (continuous mode)
Rise/fall time (10% to 90%, 2 Vpp)	<150 ps
Jitter (rms)	<10 ps
Marker out to analog channel skew	
Range	True Arb Mode:0 to 2.3µs AFG Mode:0 to 100 sec. in Contin. Mode, 0 to 2.25 µs in Trig. Mode
Resolution	True Arb Mode:1/64 of DAC sampling period, AFG Mode:5 ps
Accuracy	±(1% of setting + 5 ps)
Initial skew	< 20 ps
Trigger/Event Inputs	
Connector	SMA on the Front Panel
Number of Trigger Inputs	2 (Trig.in 1, Trig.in 2)
Input impedance	50Ω / 1kΩ
Slope/Polarity	Positive or negative or both
Input damage level	< -15 V or > +15 V

Threshold control level	-10 V to 10 V
Resolution	50 mV
Threshold control accuracy	±(10% of |setting| + 0.2 V)
Input voltage swing	0.5 V_{p-p} minimum
Minimum pulse width (1 V_{p-p}**)**	3 ns
Trigger/gate input to Analog Output delay	**Slow (synchronous) trigger** AFG mode: < 355 ns (< 405 ns in triggered sweep mode) True Arb mode: <1550 * DAC clock period(ns) + 10 ns **Fast (asynchronous) trigger** AFG mode: < 335 ns (< 385 ns in triggered sweep mode) True Arb mode: <1360 * DAC clock period(ns) + 27 ns
Trigger In to output jitter (rms)	AFG mode: < 20 ps True Arb mode: 0.29*Dac clock period
Trigger In programmable delay range	0ps to 2418ps
Trigger In programmable delay resolution	78ps
Maximum Frequency	AFG: 65 MTps on Rising/Falling Edge, 80 MTps on Both Edges True Arb mode: 1/ (Period of the Analog Waveform + 48 DAC Clock period) MTps = Mega Transitions per second
Reference clock input	
Connector type Input impedance Input voltage range Damage level Frequency range Frequency Resolution	SMA on rear panel 50 Ω, AC coupled 0.2Vpp to 2Vpp Maximum Input voltage: -0.3V to 3.6V Maximum input power: 30 dBm (50 Ω) 5 MHz to 200 MHz 1 Hz
Reference clock output	

Connector type	SMA on rear panel
Output impedance	50 Ω, AC coupled
Frequency	10 MHz TCXO | 100 MHz VCOCXO (Optional)
Initial accuracy @ 25 °C	± 1.0 ppm | ± 500 ppb (Opt.)
Aging	± 1.0 ppm/year | ± 500 ppb/year (Opt.)
Stability vs. temperature	± 1 ppm | ± 50 ppb(Opt.)
Amplitude	1.65 Vpp
Phase Noise @ 20 MHz carrier	-120 dBc/Hz at 100 Hz ; -140 dBc/Hz at 1KHz;-150 dBc/Hz at 10 KHz
Phase Noise @ 100 MHz carrier(Opt.)	-120 dBc/Hz at 100 Hz ; -145 dBc/Hz at 1KHz;-150 dBc/Hz at 10 KHz
External Clock Input	
Connector type	SMA on rear panel
Input impedance	50 Ω, AC coupled
Frequency[5]	True Arb: SampleRate / N where: N = 4, 8, 16, 32 for SampleRate = 5.0÷6.16 GHz N = 2, 4, 8, 16, 32 for SampleRate = 3.08÷5.0 GHz AFG: 192.5 MHz, 385 MHz, 770 MHz or 1540 MHz (selectable)
Input Power Range	+0 dBm to +10 dBm
Damage Level	15 dBm
Sync Clk Out	
Connector type	SMA on rear panel
Output impedance	50 Ω, AC coupled
Frequency	AFG Mode: 6.16Ghz / N where N=16, 32, 64, …, 2048 AWG Mode: 6.16Ghz/16 to 6.16Ghz/4096
Amplitude	1Vpp into 50 Ohm
External Modulation input	
Connector type	SMA on rear panel

[5] When using the External Clock Input the SampleRate must be in the range 3.08÷6.16 GHz

Input impedance	10 KΩ
Number of inputs	1
Bandwidth	10 MHz with 50 MS/s sampling rate
Input voltage range	-1 V to +1 V (except FSK, PSK). FSK, PSK: 0V÷3.3V with 1.65V fixed threshold
Vertical resolution	12-bit
Pattern Jump In (optional)	
Connector type	DSUB15
Input signals	DATA[0..7] + Data_Select + Load
Internal Data Width	14 bit, multiplexed using Data_Select
Number of addressable entries	16384
Data Rate	DC to 1 MHz
Input Range	VIL = 0V to 0.8V / VIH= 2V to 3.3V
Impedance	Internal 1kΩ pull-up resistor to Vcc (3.3V)

Power	
Source Voltage and Frequency **Max. power consumption**	100 to 240 VAC ±10% @ 45-66 Hz Max. 100W (AWG 5062 /5062D) Max. 200W (AWG 5064 /5064D) Max. 300W (AWG 5068 /5068D)
Environmental characteristics	
Temperature (operating)	+5 °C to +40 °C (+41 °F to 104 °F)
Temperature (non-operating)	-20 °C to +60 °C (-4 °F to 140 °F)
Humidity (operating)	5% to 80% relative humidity with a maximum wet bulb temperature of 29°C at or below +40°C, (upper limit de–rates to 20.6% relative humidity at +40°C). Non-condensing.
Humidity (non-operating)	5% to 95% relative humidity with a maximum wet bulb temperature of 40°C at or below +60°C, upper limit de–rates to 29.8% relative humidity at +60°C. Non-condensing.
Altitude (operating)	3,000 meters (9,842 feet) maximum at or below 25°C
Altitude (non-operating)	12,000 meters (39,370 feet) maximum
EMC and safety	CE compliant
Safety	EN61010-1
Main Standards	EN 61326-1:2013 – Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
Immunity	EN 61326-1:2013

System specifications	
Display	7 inch, 1024x600, capacitive touch LCD
Operative System	Windows 10
External Dimensions	W 445 mm – H 135 mm – D 320 mm (3U 19” rackmount)
Weight	Max. 26.45 lbs (12 Kg)
Front panel connectors	CH N OUTPUT (SMA) where N=2,4,8 depending on the model MARKER N OUT (SMA) where N=1,2,4 depending on the model TRG IN N(SMA) where N =1,2 2 USB 3.0 ports
Rear panel connectors	Ref. Clk. IN (SMA) Ref. Clk. Out (SMA) Ext. Mod. IN (SMA) Sync Clk Out (SMA) Ext Clk IN(SMA) Sync IN (Infiniband 4X) Sync OUT (Infiniband 4X) Pattern Jump In (DSUB15) (AWG-5000-FSS opt. only) POD X[7..0] where X=A,B,C,D depending on the model (Customized Mini SAS HD) External Monitor ports (one or more) 2 USB 2.0 ports or more 4 USB 3.0 ports Ethernet port (10/100/1000BaseT Ethernet, RJ45 port) 2 PS/2 keyboard and mouse ports 2 DPI ports 1 DVI port
Hard Disk	1 TB SSD or better
Processor	Intel® Pentium 3.7 GHz (or better)
Processor Memory	32 GB or better

Table of Available Models

Item	Description
AWG5062	2 CH **|** 6.16 GS/s **|** 2048Mpts per CH **|** 5Vpp on 50 Ohm Single Ended Output
AWG5062D	2 CH **|** 6.16 GS/s **|** 2048Mpts per CH **|** 1.5Vpp on 50 Ohm Differential Output
AWG5064	4 CH **|** 6.16 GS/s **|** 2048Mpts per CH **|** 5Vpp on 50 Ohm Single Ended Output
AWG5064D	4 CH **|** 6.16 GS/s **|** 2048Mpts per CH **|** 1.5Vpp on 50 Ohm Differential Output
AWG5068	8 CH **|** 6.16 GS/s **|** 2048Mpts per CH **|** 5Vpp on 50 Ohm Single Ended Output
AWG5068D	8 CH **|** 6.16 GS/s **|** 2048Mpts per CH **|** 1.5Vpp on 50 Ohm Differential Output

Table of Available Options and Accessories

Item	Description
	Options
AWG-5000-DIG8	8 channel Digital license (Mini SAS cable included)
AWG5062-4G	4G Memory license for AWG5062 or AWG5062D
AWG5064-4G	4G Memory license for AWG5064 or AWG5064D
AWG5068-4G	4G Memory license for AWG5068 or AWG5068D
AWG506x-8 DIG	AWG506x-8DIG 8CH Dig license for AWG506x
AWG5062-WAR	3 years warranty extension for AWG5062 or AWG5062D
AWG5064-WAR	3 years warranty extension for AWG5064 or AWG5064D
AWG5068-WAR	3 years warranty extension for AWG5068 or AWG5068D
RIDER-AWG-SYNC	Synchronization cable
AWG-5062-PAT	Serial Pattern Generator (SPG) for AWG5062 or AWG5062D
AWG-5064-PAT	Serial Pattern Generator (SPG) for AWG5064 or AWG5064D
AWG-5068-PAT	Serial Pattern Generator (SPG) for AWG5068 or AWG5068D
AWG-5000-FSS	AWG-5000 Fast Sequence Switch
AWG-5062-RF	12.32 GS/s RF mode for AWG5062 or AWG5062D
AWG-5064-RF	12.32 GS/s RF mode for AWG5064 or AWG5064D
AWG-5068-RF	12.32 GS/s RF mode for AWG5068 or AWG5068D
	Accessories
RIDER-AWG-SYNC	Synchronization cable
AT-DTTL8	LVDS to LVTTL digital adapter probe
AT-LVDS-SMA8	LVDS to SMA digital adapter cable
GPIB / USB-TMC	GPIB and USBTMC Ports for Remote Control
RIDER-RACK	Rackmount kit for Rider series instruments (Pulse, Func., Arb.)
SSD-250	Additional 250GB Solid State Disk for RIDER series
SSD-500	Additional 500GB Solid State Disk for RIDER series
SSD-1000	Additional 1TB Solid State Disk for RIDER series