TELEDYNE LECROY
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ArbStudio
Arbitrary Waveform Generators

Key Features

- **Outstanding performance with 16-bit, 1 GS/s sample rate and 2 Mpts/Ch**
- **2 and 4 channel models**
- **Digital pattern generator**
- **PWM mode**
- **Sweep and burst modes**
- **Modulation – AM, FM, PM, ASK, SK, PSK**
- **Synchronize multiple devices for up to 32 channels**
- **Easy access to basic function generator mode**

ArbStudio waveform generators meet the needs of today's engineers and technicians with uncompromised performance, a wide variety of signal types, modulation schemes and generation modes all controlled through an intuitive, easy to use software interface.

Unmatched Performance

ArbStudio combines 125 MHz bandwidth with long 2 Mpts/Ch memory, fast 1 GS/s sample rate and high 16-bit resolution to provide performance unmatched by other generators. Other instruments make trade-offs between these specifications, only ArbStudio provides leading specification in every category. Along with this unmatched performance is the variety of models providing both 2 and 4 channel configurations as well as a digital pattern generator of up to 36 channels.

Flexibility

With both Arbitrary and Direct Digital Synthesis (DDS) ArbStudio offers extremely flexible generation capabilities. Math and noise functions are built-in and can be combined with waveforms. Up to 8 total 4 channel models can be synchronized with the AS-SYNC cable.

Pulse-Width Modulation

Creating PWM signals has never been easier thanks to a dedicated control panel designed just for PWM waveforms. Easily set modulation shape, duty cycle and all other aspects of the PWM plus configure different settings for each channel.

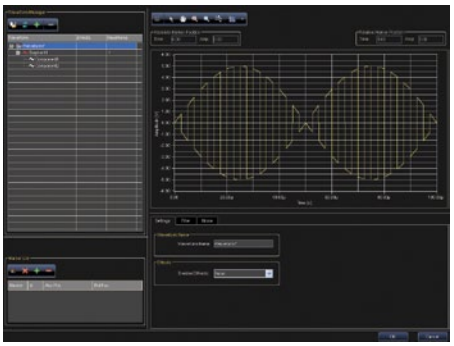
UNMATCHED WAVEFORM GENERATION

Intuitive User Interface

The ArbStudio software provides an intuitive interface for creating, editing and sequencing waveforms. All channels, settings and controls can be accessed from the main screen and waveforms can be previewed in the graph display.

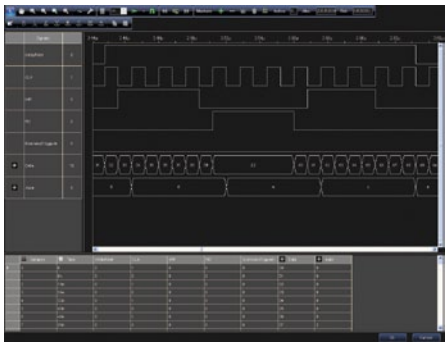
Function Generator

All basic Sine, Square and Triangle waveforms can be created from a simple screen with controls that replicate a traditional bench top generator.



Modulation

Built-in modulation capabilities include AM, PM, FM, ASK, PSK and FSK. The modulation editor provides easy-to-use tools to configure the modulation scheme for any application.



Digital Pattern Generator

Many systems have a variety of analog and digital signals yet most waveform generators provide only analog outputs. The ArbStudio 1102D and 1104D models provide analog and digital pattern generation with 18 or 36 channels respectively.

EASY ACCESS TO ALL WAVEFORM CREATION TOOLS

ArbStudio has an intuitive software interface that brings all the important controls to the main screen providing easy access to all channels, output controls, trigger controls and waveform creation screens.

1. Channel Controls

Access to all controls, waveforms and modulation capabilities of all channels.

2. Channel Status

Set or update the status and configuration of each channel or digital pod.

3. Output Controls

Enable the waveform output and control ArbStudio triggering.

4. Waveform List

Displays all waveforms that have been created during the current session or any waveform saved in the library.

5. Waveform Display

See the waveforms as they are created or view the waveforms loaded in the sequencer.

6. Waveform Sequencer

Configure the waveform sequence with only a few mouse clicks and view the output below.

7. BNC Outputs

ArbStudio is available in 2 and 4 channel configurations with a maximum output of 12 $V_{p\text{-}p}$.

8. Clock and Trigger Input/Output

Trigger in and trigger out connections for working with other equipment are provided as well as an external clock input.

SPECIFICATIONS

	ArbStudio 1102	ArbStudio 1102D	Arb Studio 1104	ArbStudio 1104D
Channels	2	2	4	4
Digital Pattern Generator	NA	18 Channels	NA	36 Channels
Waveforms	Sine, Cosine, Triangle, Rectangle, Sawtooth, Ramp, Pulse, Sinc, Exponential, Sweep, DC, Noise, From File, Arbitrary			

Waveform Characteristics

Sine	
Frequency Range (Arbitrary)	2 µHz to 125 MHz
Frequency Range @ Max Sample Rate (DDS)	3.7 mHz to 110 MHz
Amplitude Flatness (1 V_{p-p}, Typical)	
DC to 110 MHz (DDS)	< ±0.1 dB
DC to 125 MHz (Arbitrary)	< ±0.1 dB
Harmonics Distortion (1 V_{p-p}, Typical)	
≤ 1 MHz	< -66 dBc
1 MHz to 5 MHz	< -63 dBc
5 MHz to 10 MHz	< -59 dBc
10 MHz to 25 MHz	< -53 dBc
25 MHz to 75 MHz	< -38 dBc
75 MHz to 110 MHz (DDS)	< -31 dBc
75 MHz to 125 MHz (Arbitrary)	< -28 dBc
Non Harmonic Distortion (1 V_{p-p}, Typical)	
≤ 1 MHz to 10 MHz	< -71 dBc
10 MHz to 25 MHz	< -66 dBc
25 MHz to 75 MHz	< -53 dBc
75 MHz to 125 MHz (Arbitrary)	< -47 dBc
75 MHz to 100 MHz (DDS)	< -61 dBc
100 MHz to 110MHz (DDS)	< -30 dBc
THD	
(100 kHz, 1 V_{p-p}, Typical)	< 0.15%
Phase Noise (20 MHz, 1 V_{p-p}, Typical)	
10 kHz Offset	-106 dBc / Hz
100 kHz Offset	-113 dBc / Hz
1 MHz Offset	-128 dBc / Hz
Analog Bandwidth	
Arbitrary / DDS	125 MHz / 110 MHz
Square Wave, Pulse (1 V_{p-p})	
Frequency Range	2 µHz to 62.5 MHz
Duty Cycle Range	1% to 99%
Rise / Fall Time (Typical)	< 3.5 ns
Overshoot (Typical)	< 5.5%
Random Jitter (rms, Typical)	< 20 ps
Triangle / Ramp	
Frequency Range	2 µHz to 31.25 MHz
Start Phase Range	0 to 360°
Sinc (Sin(x)/x)	
Frequency Range	2 µHz to 15.5 MHz
Minimum Lobe Width	8 ns

SPECIFICATIONS

	ArbStudio 1102	ArbStudio 1102D	Arb Studio 1104	ArbStudio 1104D
Waveform Characteristics (cont'd)				
Waveform Sequencing				
Waveforms	All, From File, Arbitrary			
Waveform Repetitions	1 to (2^33 – 1)			
Start Source	Software, Internal, External			
No. of Waveforms	1 to 511			

Common Characteristics				
Arbitrary				
Sample Rate Real Time	4 S/s to 250 MS/s			
Vertical Resolution	16-bit			
Waveform Memory	2 Mpts / Ch			
Minimum Waveform Length	8 points			
Waveform Resolution	2 points			
Noise Bandwidth (-3 dB Gaussian Noise), Typical	100 MHz			
Run Modes	Single, Continuous, Stepped, Burst			
Direct Digital Synthesis (DDS)				
Sample Rate Real Time	125 MS/s to 250 MS/s			
Run Modes	Single, Continuous, Burst			
Carrier Waveform Memory	2048 Samples / Ch			
Amplitude, 50 Ω Load (1 kHz)	0 V to +12 V_{p-p}			
Amplitude, Open Circuit	0 V to +24 V_{p-p}			
Amplitude Resolution	< 1 mV			
DC Accuracy, Open Circuit (±12 V Range)	±0.25% of amplitude range (within ±10 °C of calibration temperature T=25 °C, Humidity ≤ 80%) ±0.3% of amplitude range (0 to 50 °C)			
DC Accuracy, 50 Ω Load (±6 V Range)	±0.25% of amplitude range (within ±10 °C of calibration temperature T=25 °C, Humidity ≤ 80%) ±0.3% of amplitude range (0 to 50 °C)			
AC Accuracy, Open circuit (0 V_{p-p} to +24 V_{p-p} range, 1 kHz Sine Wave)	±0.25% of amplitude range (within ±10 °C of calibration temperature T=25 °C, Humidity ≤ 80%) ±0.3% of amplitude range (0 to 50 °C)			
AC Accuracy, 50 Ω Load (0 V_{p-p} to +12 V_{p-p} range, 1 kHz Sine Wave)	±0.25% of amplitude range (within ±10 °C of calibration temperature T=25 °C, Humidity ≤ 80%) ±0.3% of amplitude range (0 to 50 °C)			
Output Impedance	Selectable: 50 Ω, Low or High Impedance			
Short Circuit Protection	Signal outputs are robust against permanent shorts against floating ground			
Frequency accuracy				
Stability	< ±5 ppm			
Aging	< ± 2 ppm / year			
Max Interpolated Sample Rate	1 GS/s (4x interpolation)			
Interpolation Factors	1x, 2x, 4x			
Sampling Frequency Resolution	15 digits limited by 1 nHz			
Multi Channel Specifications				
Sampling Rate Tuning	Programmable per channel couple (Ch 1-2)		Programmable per channel couple (Ch 1-2, Ch 3-4)	
Skew Between Channels (at Common Sample Rate)				
Average (Typical)	< 300 ps			
Standard Deviation (Typical)	< 35 ps			
Math	Sum, Difference, Multiply between the two channels (Ch 1-2)			

SPECIFICATIONS

	ArbStudio 1102	ArbStudio 1102D	Arb Studio 1104	ArbStudio 1104D
Modulation				
Amplitude Modulation				
Modulation Type	Arbitrary AM, ASK			
Carrier Waveform	All, From File, Arbitrary			
Modulating Waveforms	All, From File, Arbitrary			
Modulating Source	Internal			
Modulating Waveform Sample Clock at Max. Sampling Rate	0.46 S/s to 125 MS/s			
Memory Size	2047 entries			
Phase / Frequency Modulation				
Modulation Type	Arbitrary FM/PM, FSK, PSK			
Carrier Waveform	All, From File, Arbitrary			
Modulating Waveforms	All, From File, Arbitrary			
Modulating Source	Internal			
Carrier Frequency at Max. Sample Rate				
Sine Wave	3.7mHz to 110 MHz			
Square	3.7mHz to 62.5 MHz			
Triangle / Ramp	3.7mHz to 31.25 MHz			
Modulating Waveform Sample Clock at Max. Sample Rate	From 119.2S/s to 125 MS/s (per sample programmable)			
Memory Size	511 entries			
Frequency Resolution at 125 MS/s Sample Rate	0.0019 Hz (FSK) 2.15E-5° (PSK)			
Frequency Resolution at 250 MS/s Sample Rate	0.0037 Hz (FSK) 4.30E-5° (PSK)			
Pulse Width Modulation				
Carrier Waveform	Pulse			
Carrier Frequency	100 mHz to 20 MHz			
Duty Cycle Modulating Waveform	Sine, Triangle, Ramp, Noise, Manual			
Duty Cycle Modulating Frequency	10 µHz to 6.67 MHz			
Source	Internal			
Duty Cycle Deviation	0 % to 100 % of pulse period			
Frequency Sweep				
Carrier Waveform	All, From File, Arbitrary			
Sweep Type	All waveforms			
Sweep Direction	Up or Down			
Sweep Range at Max. Sample Rate				
Sine Wave	3.7 mHz to 110 MHz			
Square	3.7 mHz to 62.5 MHz			
Triangle / Ramp	3.7 mHz to 31.25 MHz			
Sweep Time at Max. Sample Rate	100 ns to 4.2 s			

Pattern Generator Characteristics				
Number of Channels	N/A	18	N/A	18 / 36
Vector Memory Depth	N/A	1 Mpts / Ch (per Ch programmable direction)	N/A	1 Mpts / Ch (per Ch programmable direction)
Acquisition Memory Depth	N/A	2 Mpts / Ch	N/A	2 Mpts / Ch
Update Frequency	N/A	125 MS/s (per Ch programmable direction)	N/A	125 MS/s (per Ch programmable direction)
Sampling Frequency	N/A	250 MS/s	N/A	250 MS/s
Direction Control	N/A	Per Ch programmable	N/A	Per Ch programmable
Output Voltage Level	N/A	1.2 V to 3.6 V	N/A	1.2 V to 3.6 V
Trigger Levels	N/A	31	N/A	31
Operating Modes	N/A	18 Ch Digital or 2 Ch Analog	N/A	36 Ch Digital or 4 Ch Analog or 18 Ch Digital plus 2 Ch Analog

SPECIFICATIONS

	ArbStudio 1102	ArbStudio 1102D	Arb Studio 1104	ArbStudio 1104D
Multi-Instrument Synchronization				
Max Number of Instruments	N/A	N/A	Up to 8 units with AS-SYNC Cable	
Synchronization Accuracy	N/A	N/A	< 300 ps	
Auxiliary Inputs/Outputs				
Analog Outputs				
Output Connector	Front panel BNC			
Output Impedance	50 Ω, Low or High Impedance			
External Trigger Output				
Output Connector	Front panel BNC			
Output Level	TTL compatible into > 1 KΩ			
Output Impedance	50 Ω nominal			
External Trigger Input				
Input Connector	Front panel BNC			
Frequency Range	DC to 125 MHz			
Threshold Level	VILmax = 0.8 V, VIHmin = 2 V			
Voltage Range	-0.5 V to 4 V			
Damage Level	VINmax < 6 V, VINmin > -2 V			
Slope	Rising Edge or Falling			
External Clock				
Input Connector	Front panel BNC			
Frequency Range	0 MHz to 125 MHz			
Min. Input Voltage Swing	ΔVINmin > 2 V			
Damage Level	VINmax < 5 V, VINmin > -5 V			
Digital I/O				
Connector	50 pin high density (1.27 mm) SCSI connector			
Connector count	1		2	
General Characteristics				
Power Supply Voltage Range	100 ±10% to 240 ±10% VAC			
Power Consumption	35 W max.			
Power Frequency Range	50 / 60 Hz ± 5%			
PC Interface	USB 2.0			
Physical Characteristics				
External Dimensions (HWD)	2.4" x 12.8" x 7.2" (62 x 326 x 182 mm)			
Weight	2.8 lbs (1.3 kg)			
Environmental Characteristics				
Temperature (Operating)	Main equipment: 0 to 50 °C, Power adapter: 0 to 40 °C			
Temperature (Non-Operating)	Main equipment: -40 to 71°C, Power adapter: -25 to 71°C			
Humidity (Operating)	5% to 80% RH (non-condensing) at ≤ 30 °C, 50% max RH (non-condensing) at 40 °C			
Humidity (Non-Operating)	5% to 95% max RH (non-condensing)			
Altitude (Operating)	Up to 3,048 m (10,000 ft) at ≤ 30°C			
Altitude (Non-Operating)	Up to 12,192 m (40,000 ft)			
Minimum PC Requirements				
Operative System	Microsoft Windows® 2000 / XP SP2 / Vista / 7 32-bit Editions			
Processor	Intel® Pentium® III processor, or better			
Memory	512 MB RAM			
Hard Disk	150 MB available free space			
Display Resolution	800 x 600 or better			
Connectivity	USB 2.0 or 1.1			

ORDERING INFORMATION

Product Description	Product Code
2 Ch 16-bit 1 GS/s Arbitrary Waveform Generator	ArbStudio 1102
2 Ch 16-bit 1 GS/s Arbitrary Waveform Generator and Digital Pattern Generator	ArbStudio 1102D
4 Ch 16-bit 1 GS/s Arbitrary Waveform Generator	ArbStudio 1104
4 Ch 16-bit 1 GS/s Arbitrary Waveform and Digital Pattern Generator	ArbStudio 1104D
ArbStudio Sync Cable for ArbStudio 1104 and 1104D	AS-SYNC

Customer Service

Teledyne LeCroy oscilloscopes and probes are designed, built, and tested to ensure high reliability. In the unlikely event you experience difficulties, our digital oscilloscopes are fully warranted for three years and our probes are warranted for one year.

This warranty includes:

- No charge for return shipping
- Long-term 7-year support
- Upgrade to latest software at no charge

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