

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



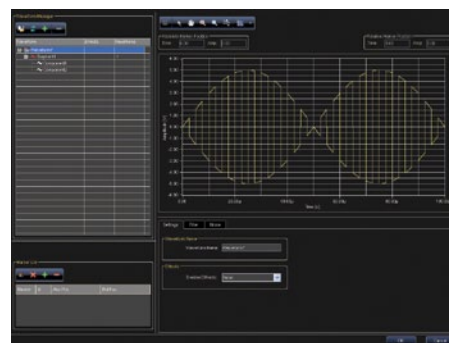
Intuitive User Interface

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.



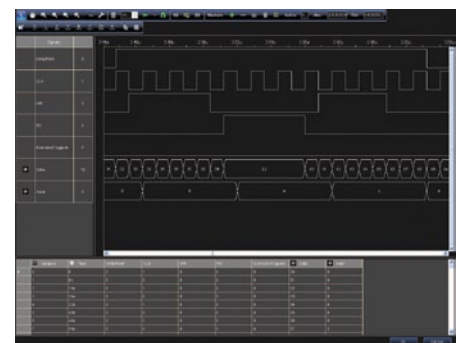
Function Generator

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-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 μ Hz 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 μ Hz 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 μ Hz to 31.25 MHz |
| Start Phase Range | 0 to 360° |
| Sinc (Sin(x)/x) | |
| Frequency Range | 2 μ Hz 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) | $\pm 0.25\%$ of amplitude range (within ± 10 °C of calibration temperature T=25 °C, Humidity $\leq 80\%$) $\pm 0.3\%$ of amplitude range (0 to 50 °C) |
| DC Accuracy, 50 Ω Load (± 6 V Range) | $\pm 0.25\%$ of amplitude range (within ± 10 °C of calibration temperature T=25 °C, Humidity $\leq 80\%$) $\pm 0.3\%$ 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) | $\pm 0.25\%$ of amplitude range (within ± 10 °C of calibration temperature T=25 °C, Humidity $\leq 80\%$) $\pm 0.3\%$ 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) | $\pm 0.25\%$ of amplitude range (within ± 10 °C of calibration temperature T=25 °C, Humidity $\leq 80\%$) $\pm 0.3\%$ 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 K Ω | | | |
| 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 | Δ VINmin > 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 \pm 10% to 240 \pm 10% VAC | | | |
| Power Consumption | 35 W max. | | | |
| Power Frequency Range | 50 / 60 Hz \pm 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 \leq 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 \leq 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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