

WaveStation™ Function/Arbitrary Waveform Generators

Key Features

- High performance with 14-bit waveform generation, up to 500 MS/s sample rate and up to 512 kpts memory
- 2 channels on all models
- Large color display for easy waveform preview
- Over 40 built-in arbitrary waveforms
- Linear & Logarithmic sweeps and burst operation
- USB and GPIB connectivity
- Graphical waveform editing software for PC



With 5 basic signal types, and over 40 built-in arbitrary waveforms the WaveStation is a versatile waveform generator. A variety of modulation schemes, intuitive waveform editing software and remote control capabilities, enable versatile waveform generation of waveforms up to 160 MHz. The large color display and simple user interface make it easy to generate a wide range of waveforms.

High Performance and Signal Fidelity

High performance hardware enables WaveStation to create accurate stable waveforms. High sample rate and resolution combined with low jitter and harmonic distortion means waveforms seen on the display are accurately created and outputted by the hardware.

Extensive Waveform Library

Easily create basic sine, square, ramp, pulse, and noise waveforms. In addition, access over 40 advanced arbitrary waveforms preloaded on WaveStation. Edit waveforms using the WaveStation PC software with point-by-point manual waveform design or waveform drawing tools. Use digital filtering tools for advanced waveform creation.

Connectivity and Communication

With standard USB and GPIB connectivity it is easy to control WaveStation remotely or integrate it in to a test system. All necessary I/O for synchronization can be accessed on the rear panel. A front panel USB port provides an easy way to save waveforms.

Simple, Fast Waveform Creation

The intuitive front panel provides easy access to waveforms, modulation and operating modes. The large display shows all relevant waveform parameters and waveform shape. Included PC software provides a graphical interface for quickly modifying waveforms with point-by-point editing, digital filtering and waveform drawing tools.

POWERFUL COMBINATION OF PERFORMANCE AND FLEXIBILITY

1. Dual Output

Two synchronous outputs for additional waveform flexibility and ability to create differential waveforms.

2. Color Display

Large display provides a single view to see waveform preview, parameters and menus with a single glance.

3. Waveform Preview

Helpful display provides preview of the waveform to be generated.

4. USB Connectivity

Front panel USB port to quickly save and transfer waveforms.

5. Display Menu

Quick access to various parameters with one touch to soft button on the front panel.



Variety of Modulation Schemes

Built-in modulation capabilities include AM, PM, FM, ASK, PSK and FSK. View the modulated waveform on the display and see how it changes when varying output frequency, carrier waveform or modulation type.





6. On-Screen Parameter Readout

View all relevant parameters at the same time on a single screen.

7. Quick Waveform Access

Dedicated, backlit buttons for quick access to the most common waveforms.

8. Easy to Use Front Panel

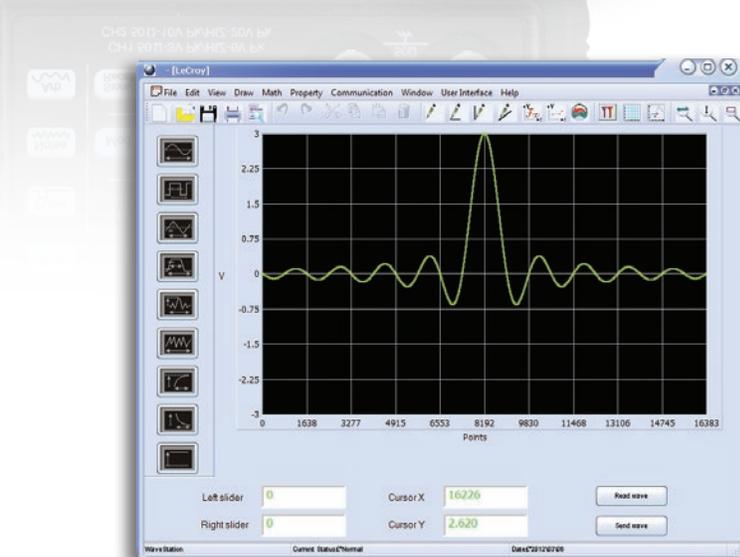
Intuitive front panel allows for quick waveform parameter entry and editing.

9. Adjustable Handle

Easily adjust handle for easy transport, optimal viewing and comfortable use.

10. Connectivity

All necessary I/O for synchronization can be accessed from rear panel.



Graphical Waveform Creation

Easily create and edit waveforms on the PC with mathematical operations, filters, and point-by-point editing or draw a waveform with a mouse. Transfer waveforms to WaveStation over USB and view it on the large display. Additionally, connecting a WaveAce oscilloscope to the same PC enables seamless transfer of real world signals from oscilloscope to the WaveStation.

SPECIFICATIONS

| | WaveStation 2012 | WaveStation 2022 | WaveStation 2052 | WaveStation 3082 | WaveStation 3122 | WaveStation 3162 |
|------------------------------------|---|--|---------------------|---|----------------------|----------------------|
| Bandwidth | 10 MHz | 25 MHz | 50 MHz | 80 MHz | 120 MHz | 160 MHz |
| Channels | 2 | | | | | |
| Waveforms | Sine, Square, Ramp, Pulse, Noise, Arbitrary: Stairup, Stairdown, Positive Pulse, Negative Pulse, Up Ramp, Down Ramp, Sinc, Gaussian, LogFall, LogRise, Sqrt, TwoTone, etc | | | | | |
| Waveform Characteristics | | | | | | |
| Sine | | | | | | |
| Frequency Range | 1 μ Hz - 10 MHz | 1 μ Hz - 25 MHz | 1 μ Hz - 50 MHz | 1 μ Hz - 80 MHz | 1 μ Hz - 120 MHz | 1 μ Hz - 160 MHz |
| Harmonic Distortion | CH1 / CH2 | | | | | |
| DC - 1 MHz | -60 dBc | | | < -56 dBc | | |
| 1 MHz - 5 MHz | -53 dBc | | | < -46 dBc | | |
| 5 MHz - 10 MHz | NA | | | < -46 dBc | | |
| 10 MHz - 25 MHz | -35 dBc | | | < -35 dBc | | |
| 25 MHz - 50 MHz | -32 dBc | | | < -35 dBc | | |
| 50 MHz - 100 MHz | NA | | | < -35 dBc | | |
| 100 MHz - 160 MHz | NA | | | < -26 dBc | | |
| Total Harmonic Waveform Distortion | DC - 20 kHz, 1 V _{pp} < 0.2% | | | DC - 20 kHz, 1 V _{pp} < 0.2% | | |
| Spurious Signal (Non-harmonic) | DC - 1 MHz, < -70 dBc | | | DC - 160 MHz, < -70 dBc + 20 dB / decade | | |
| Spurious Signal (Non-harmonic) | 1 MHz - 10 MHz, < -70 dBc + 6 dB / spectrum phase | | | DC - 160 MHz, < -70 dBc + 20 dB / decade | | |
| Phase Noise | 10 kHz Offset, -108 dBc / Hz (typical value) | | | 100 kHz Offset, -116 dBc / Hz (typical value) | | |
| Square | | | | | | |
| Frequency Range | 1 μ Hz - 10 MHz | 1 μ Hz - 25 MHz | | 1 μ Hz - 50 MHz | | |
| Duty Cycle Range | 20% - 80% | 1 μ Hz - 10 MHz, 20% - 80% 10 MHz - 20 MHz, 40% - 60% 20 MHz - 25 MHz, 50% | | ≤10 MHz, 20% - 80% 10 MHz - 40 MHz, 40 - 60% 40 MHz - 50 MHz, 50% | | |
| Rise / Fall Time | <12 ns (10% - 90%) | | | < 6 ns (10% - 90%) | | |
| Overshoot | < 5% (typical, 1 kHz, 1 V _{pp}) | | | < 3% | | |
| Asymmetric (50% Duty Cycle) | 1% of period + 20 ns (typical, 1 kHz, 1 V _{pp}) | | | 1% of period + 5 ns (typical, 1 kHz, 1 V _{pp}) | | |
| Jitter | 0.4% of period (typical, 1 kHz, 1 V _{pp}) | | | DC - 1 MHz, ≤ 200 ps ± 2 ppm 1 MHz - 50 MHz, ≤ 500 ps | | |
| Pulse | | | | | | |
| Frequency Range | 500 μ Hz - 5 MHz | | | 1 μ Hz - 40 MHz | | |
| Duty Cycle Range | 0.1% resolution | | | 0.0001% resolution | | |
| Rise / Fall Time | 7 ns (10% - 90% typical 1 kHz, 1 V _{pp}) | | | 6 ns ~ 6 s, 100 ps resolution | | |
| Pulse Width | 1800 s max 16 ns min 1 ns resolution | | | 1,000,000 s max 25 ns min ≥ 12 ns, 100 ps resolution | | |
| Overshoot | < 5% | | | < 3% | | |
| Jitter | 8 ns (pk - pk) | | | DC - 1 MHz, ≤ 200 ps ± 2 ppm 1 MHz - 50 MHz, ≤ 500 ps | | |
| Triangle/Ramp | | | | | | |
| Frequency Range | 1 μ Hz - 300 kHz | | | 1 μ Hz - 4 MHz | | |
| Ramp Symmetry | 0% - 100% | | | | | |
| Linearity | < 0.1% of peak value output (typical, 1 kHz, 1 V _{pp} , 100% symmetric) | | | | | |
| Arbitrary Waveforms | | | | | | |
| Frequency Range | 1 μ Hz - 5 MHz | | | 1 μ Hz - 40 MHz | | |
| Waveform Length | 16 kpts / Ch | | | Ch1: 16 Kpts Ch2: 16 Kpts or 512 Kpts | | |
| Vertical Resolution | 14 bits | | | | | |
| Sample Rate | 125 MS/s | | | 500 MS/s | | |
| Min. Rise / Fall time | 7 ns (typical) | | | 6 ns | | |
| Jitter (pk - pk) | 8 ns (typical) | | | DC - 40 MHz, ≤ 2.1 ns ± 10 ppm | | |
| Storage in Non-volatile RAM memory | 10 waveforms | | | 8 waveforms @ 512 kpts; 24 waveforms @ 16 kpts | | |

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Modulation, Sweep, Burst Capabilities

| Amplitude Modulation | | |
|--|--|---|
| Source | Internal / External | |
| Carrier | Sine, Square, Ramp, Arbitrary (except DC) | |
| Modulation Waveform | Sine, Square, Ramp, Arbitrary (2 mHz - 20 kHz) | 50% duty-cycle square waveform (1 mHz - 50 kHz) |
| Modulation Depth | 0% - 120% | |
| Modulation Resolution | 0.1% | 1 mHz |
| Modulating Waveform Sample Clock @ Max Sampling Rate | 3.90625 MHz | |
| Memory Size | 4 k x 12 bit | |
| Frequency Modulation | | |
| Source | Internal / External | |
| Carrier | Sine, Square, Ramp, Arbitrary (except DC) | |
| Modulation Waveform | Sine, Square, Ramp, Arbitrary (2 mHz - 20 kHz) | 50% duty-cycle square waveform (1 mHz - 50 kHz) |
| Frequency Deviation | 0 - .5 * BW, 10 uHz resolution | 0 - .5* BW, 1 mHz resolution |
| Phase Deviation | 0 - 360 deg, .1 deg resolution | |
| Frequency Resolution | 1 mHz | |
| FSK Modulation | | |
| Source | Internal / External | |
| Carrier | Sine, Square, Ramp, Arbitrary (except DC) | |
| Modulation Waveform | 50% duty-cycle square waveform (2 mHz - 50 kHz) | 50% duty-cycle square waveform (1 mHz - 1 MHz) |
| ASK Modulation | | |
| Source | Internal / External | |
| Carrier | Sine, Square, Ramp, Arbitrary (except DC) | |
| Modulation Waveform | 50% duty-cycle square waveform (2 mHz - 50 kHz) | 50% duty-cycle square waveform (1 mHz - 1 MHz) |
| PWM Modulation | | |
| Source | Internal / External | |
| Frequency | 2 mHz - 20 MHz | 1 mHz - 50 kHz |
| Modulation Waveform | Sine, Square, Ramp, Arbitrary (except DC) | |
| External Modulation | -6 V to +6 V (max without deviation) | -4.5 V to +4.5 V max (max with deviation) |
| Duty Cycle Modulating Frequency | 2 mHz - 20 kHz | 2 mHz - 50 kHz |
| Duty Cycle Deviation | 0% to 100% of Pulse Width, 0.1% resolution | 100%*DutyCycle - 15 ns. |
| Sweep | | |
| Carrier | Sine, Square, Ramp, Arbitrary (except DC) | |
| Type | Linear / Logarithmic | |
| Direction | Up / Down | |
| Sweep Time | 1 ms - 500 s | 1 ms - 500 s ± 0.1% |
| Trigger Source | Manual, External, Internal | |
| Sweep Range @ Max Sample Rate | 1 uHz to Bandwidth frequency @ 125 MS/s | 1 uHz to Bandwidth frequency @ 500 MS/s |
| Burst | | |
| Waveform | Sine, Square, Ramp, Pulse and Noise, Arbitrary (except DC) | |
| Type | Count (1 - 50,000 Periods, Infinite, Gated) | Count (1 - 1,000,000 Periods) Infinite, Gated |
| Start / Stop Phase | 0° - 360° | |
| Internal Period | 1 μs - 500 s | 1 us - 1000 s |
| Gated Source | External Trigger | |
| Trigger Source | Manual, External or Internal | |

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Channel Characteristics

| | | |
|------------------|------------------------------|--|
| Output Connector | BNC | |
| Output Impedance | 50 Ω , High Impedance | |

External Clock

| | | |
|-------------------------|--|--------------------|
| Input Connector | BNC | |
| Frequency Range | 10 MHz \pm 100 Hz | 10 MHz \pm 1 kHz |
| Min Input Voltage Swing | Input voltage swing range: 3.3 Vpp - 5.5 Vpp | 2.3 V |

Sync Output

| | | |
|-------------------|-------------------------|--|
| Voltage Level | TTL compatible | VOH (min) > 4.5 V, VOL (max) < 0.5 V; (IOL / IOH = 8 mA) |
| Pulse Width | > 50 ns, not adjustable | |
| Output Impedance | 50 Ω (typical) | |
| Maximum Frequency | 2 MHz | 10 MHz |

Trigger Output

| | | |
|-------------------|---|-----------------|
| Voltage Level | TTL compatible | CMOS compatible |
| Pulse Width | > 400 ns | > 60 ns |
| Output Impedance | 50 Ω (typical) | |
| Maximum Frequency | 1 MHz | |
| Output Connector | Through Rear Panel Ext Trig / Gate / FSK / Burst | |

External Trigger

| | | |
|---|---|--|
| Trigger Input Level | TTL compatible <i>Note: The external input voltage can't be over ± 6 V, otherwise instrument gets damaged</i> | CMOS compatible |
| Trigger Slope | Up or down (optional) | |
| Trigger Pulse Width | > 100 ns | > 50 ns |
| Trigger Input Impedance | > 5 k Ω , DC coupling | |
| External Modulation | ± 6 V = 100% modulation > 5 k Ω input impedance | $\pm(4.5 \sim 5)$ V = 100% modulation |
| External Trigger | TTL compatible | > 10 k Ω input impedance |
| Max. Voltage Input | <i>Note: The external input voltage can't be over ± 6 V, otherwise instrument gets damaged</i> | Input: 0 - 5 V |
| Assignable to Both Channels 1 or 2, 1 AND 2 | Ext Trig in: Assignment Channel 1, Channel 2 or Both Ext Trig out: Assignment Channel 1 or Channel 2 | |
| Max Frequency | Ext Trig in: 1 MHz Ext Trig out: 1 MHz | External Trig out: 1 MHz |
| Input Latency | < 300 ns | Ch1 - 366 \pm 30 nS CH2 - 386 \pm 30 nS |
| Polarity Selectable | Selectable, rising edge and falling edge | |

General Characteristics

| | | |
|-------------------------|--|---|
| Standard Interface | USB Host, USB Device and GPIB (IEEE 488) | |
| Front Panel Connectors | Output BNC and USB host | |
| Rear Panel Connectors | BNC and USB device | |
| State on Power On/Off | Selectable factory default / last state | |
| Frequency Accuracy | Within 90 days ± 50 ppm within 1 year ± 100 ppm 18 $^{\circ}$ C ~ 28 $^{\circ}$ C | ± 1 ppm / year |
| Temperature Coefficient | < 5 ppm / $^{\circ}$ C | ± 1 ppm, 0 $^{\circ}$ C ~ 55 $^{\circ}$ C |

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General Characteristics (cont'd)

| Output | |
|---|--|
| Amplitude - CH1 | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>2 mVpp - 3 Vpp (50 Ω) 4 mVpp - 6 Vpp (high impedance)</p> </div> <div style="width: 45%;"> <p>DC - < 40 MHz: 1 mVpp - 10 Vpp (50 Ω) 40 MHz - < 100 MHz: 1 mVpp - 5 Vpp (50 Ω) 100 MHz - < 130 MHz: 1 mVpp - 1.5 Vpp (50 Ω) 130 MHz - 160 MHz: 1 mVpp - 1.5 Vpp (50 Ω)</p> <p>DC - < 40 MHz: 1 mVpp - 20 Vpp (Hi Z) 40 MHz - < 100 MHz: 1 mVpp - 10 Vpp (Hi Z) 100 MHz - < 130 MHz: 1 mVpp - 2.7 Vpp (Hi Z) 130 MHz - 160 MHz: 1 mVpp - 2.2 Vpp (Hi Z)</p> </div> </div> |
| Amplitude - CH2 | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>2 mVpp - 10 Vpp (50 Ω, ≤ 10 MHz) 2 mVpp - 5 Vpp (50 Ω, > 10 MHz) 4 mVpp - 20 Vpp (high impedance, ≤ 10 MHz) 4 mVpp - 10 Vpp (high impedance, > 10 MHz)</p> </div> <div style="width: 45%;"> <p>DC - < 40 MHz: 1 mVpp - 10 Vpp (50 Ω) 40 MHz - < 100 MHz: 1 mVpp - 5 Vpp (50 Ω) 100 MHz - < 130 MHz: 1 mVpp - 1.5 Vpp (50 Ω) 130 MHz - 160 MHz: 1 mVpp - 1.5 Vpp (50 Ω)</p> <p>DC - < 40 MHz: 1 mVpp - 20 Vpp (Hi Z) 40 MHz - < 100 MHz: 1 mVpp - 10 Vpp (Hi Z) 100 MHz - < 130 MHz: 1 mVpp - 2.7 Vpp (Hi Z) 130 MHz - 160 MHz: 1 mVpp - 2.2 Vpp (Hi Z)</p> </div> </div> |
| Amplitude Resolution | 1 mV |
| Vertical Accuracy (Compared to 100 kHz sine) | 15° C to 40° C, ≤ 40 MHz: ± (2 mV + 0.4 dB) Less than 15° C, > 40 MHz: ± (2 mV + 0.65 dB) |
| Amplitude Flatness (Compared to 100 kHz sine, 5 Vpp) | 10° C to 35° C: ± 0.45 dB All other cases: ± 0.9 dB |
| Cross Talk | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">< -70 dBc</div> <div style="width: 45%;">< -60 dB</div> </div> |
| Output Current Max - Ch 1 only | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">± 60 mA</div> <div style="width: 45%;">± 200 mA</div> </div> |
| Output Current Max - Ch 2 only | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">± 200 mA</div> <div style="width: 45%;">± 200 mA</div> </div> |
| Output Connector | BNC |
| DC Offset | |
| Range DC - CH1 | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">± 1.5 V (50 Ω) ± 3 V (high impedance)</div> <div style="width: 45%;">± 5 V (50 Ω) ± 10 V (high impedance)</div> </div> |
| Range (DC) - Ch2 | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">± 5 V (50 Ω) ± 10 V (high impedance)</div> <div style="width: 45%;">± 5 V (50 Ω) ± 10 V (high impedance)</div> </div> |
| Offset Accuracy | ±(setting offset value *1% + 3 mV) |
| Resolution | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">1 mV</div> <div style="width: 45%;">0.1 mV</div> </div> |
| Waveform Output | |
| Impedance | 50 Ω (typical), High Z |
| Protection | short-circuit protection |
| Display | |
| Characteristics | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">3.5 inch TFT-LCD, 320 x 240, RGB</div> <div style="width: 45%;">4.3 inch TFT-LCD, 480 x 272, RGB</div> </div> |
| Physical Characteristics | |
| Dimensions (H x W x D) | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">105 mm x 229 mm x 281 mm (4.1" x 9.0" x 11.1")</div> <div style="width: 45%;">105 mm x 261 mm x 344 mm (4.1" x 10.3" x 13.5")</div> </div> |
| Weight | <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">2.6 kg (5.7 lbs)</div> <div style="width: 45%;">2.8 kg (6.1 lbs)</div> </div> |
| Power | |
| Voltage | 100 - 240 V _{rms} (± 10%), 50 / 60 Hz 100 - 120 V _{rms} (± 10%), 400 Hz |
| Consumption (nominal) | 50 W Max |
| Environment | |
| Temperature - Operating | 0° C to 40° C |
| Temperature - Storage | -20° C to 60° C |
| Humidity Range - Operating | 5% to 90% relative humidity (non-condensing) up to +30° C Upper limit derates to 50% relative humidity (non-condensing) at +40° C |
| Humidity Range - Non-operating | 5% to 95% relative humidity (non-condensing) as tested per MIL-PRF-28800F |
| Altitude - Operating | 3,048 m (10,000 ft) max at ≤ 30° C |
| Altitude - Non-operating | Up to 15,000 meters (49,200 ft) |
| Compliance | |
| Certifications | CE Compliant, UL and cUL listed. Conforms to EN 61326-1, EN 61010-1, UL 61010-1 3rd edition, and CSA C22.2 No. 61010-1-12 |

ORDERING INFORMATION

Product Description

Product Code

| | |
|--|------------------|
| 10 MHz, 2 Ch, 14 bit, 125 MS/s Function/Arbitrary Waveform Generator | WaveStation 2012 |
| 25 MHz, 2 Ch, 14 bit, 125 MS/s Function/Arbitrary Waveform Generator | WaveStation 2022 |
| 50 MHz, 2 Ch, 14 bit, 125 MS/s Function/Arbitrary Waveform Generator | WaveStation 2052 |
| 80 MHz, 2 Ch, 14 bit, 500 MS/s Function/Arbitrary Waveform Generator | WaveStation 3082 |
| 120 MHz, 2 Ch, 14 bit, 500 MS/s Function/Arbitrary Waveform Generator | WaveStation 3122 |
| 160 MHz, 2 Ch, 14 bit, 500 MS/s Function/Arbitrary Waveform Generator | WaveStation 3162 |

Included with Standard Configuration

Power Cable for the Destination Country

USB 2.0 Cable Type A to B (Black, 1 m)

USB to GPIB Converter

Getting Started Manual

Performance Certificate

Declaration of Conformity

WaveStation PC Software CD

Product Registration Card

Customer Service

Teledyne LeCroy instruments are designed, built, and tested to ensure high reliability. In the unlikely event you experience difficulties, our waveform generators are fully warranted for three years.

This warranty includes:

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

For more information, please contact:



1-800-5-LeCroy
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