# LeCroy

# WaveStation™
# Function/Arbitrary Waveform Generators



## Key Features

- **High performance with 14-bit, 125 MS/s and 16 kpts**
- **2 channels on all models**
- **Large 3.5" 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 50 MHz. The 3.5" 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 see on the display are accurately created and outputted by the hardware.

## Extensive Waveform Library

Easily create basic sine, square, ramp, pulse, and noise waveforms plus over 40 advanced arbitrary waveforms. Edit waveforms using the WaveStation PC software with point-by-point manual waveform design as well as waveform drawing tools.

## 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 wave to save waveforms.

## Simple, Fast Waveform Creation

The intuitive front panel provides easy access to waveforms, modulation and operating modes. The large 3.5" display shows all relevant waveform parameters and preview. 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. 3.5" 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 the output frequency and carrier waveform.

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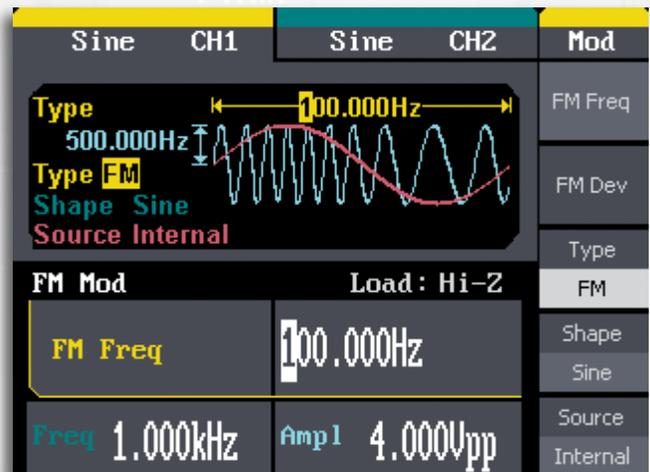
## 6. On-Screen Parameter Readout

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.

## WaveStation PC software

Easily create and edit waveforms on the PC with mathematical operations, filters, point-by-point editing or draw a waveform with a mouse. Transfer the waveforms to WaveStation over USB and view it on the 3.5" display. Additionally, connecting a LeCroy WaveAce oscilloscope to the same PC enables transferring real world signals from the oscilloscope to the PC and then to the WaveStation.

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# SPECIFICATIONS

| | WaveStation 2012 | WaveStation 2022 | WaveStation 2052 |
|---|---|---|---|
| Bandwidth | 10 MHz | 25 MHz | 50 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

| | WaveStation 2012 | WaveStation 2022 | WaveStation 2052 |
|---|---|---|---|
| Frequency Range | 1 µHz - 10 MHz | 1 µHz - 25 MHz | 1 µHz - 50 MHz |
| Harmonic Distortion | CH1 / CH2 | | |
| DC - 1 MHz | -60 dBc | | |
| 1 MHz - 5 MHz | -53 dBc | | |
| 5 MHz - 25 MHz | -35 dBc | | |
| 25 MHz - 50 MHz | -32 dBc | | |
| Total Harmonic Waveform Distortion | DC - 20 kHz, 1 Vpp < 0.2% | | |
| Spurious Signal (Non-harmonic) | DC - 1 MHz < -70 dBc | | |
| Spurious Signal (Non-harmonic) | 1 MHz - 10 MHz < -70 dBc + 6 dB / spectrum phase | | |
| Phase Noise | 10 kHz Offset, -108 dBc / Hz (typical value) | | |

### Square

| | WaveStation 2012 | WaveStation 2022 | WaveStation 2052 |
|---|---|---|---|
| Frequency Range | 1 µHz - 10 MHz | 1 µHz - 25 MHz | |
| Duty Cycle Range | 20% - 80% | 50% | |
| Rise / Fall Time | <12 ns (10% - 90%) | | |
| Overshoot | < 5% (typical, 1 kHz, 1 Vpp) | | |
| Asymmetric (50% Duty Cycle) | 1% of period + 20 ns (typical, 1 kHz, 1 Vpp) | | |
| Jitter | 0.1% of period (typical, 1 kHz, 1 Vpp) | | |

### Pulse

| | |
|---|---|
| Frequency Range | 500 µHz - 5 MHz |
| Duty Cycle Range | 0.1 % Resolution |
| Rise / Fall Time | 7 ns (10% - 90% typical 1 kHz, 1 Vpp) |
| Pulse Width | 1800 s max<br>16 ns min<br>8 ns resolution |
| Overshoot | < 5% |
| Jitter (pk - pk) | 8 ns |

### Triangle/Ramp

| | |
|---|---|
| Frequency Range | 1 µHz - 300 kHz |
| Ramp Symmetry | 0% - 100% |
| Linearity | < 0.1% of Peak value output (typical, 1 kHz, 1 Vpp, 100% symmetric) |

### Arbitary Waveforms

| | |
|---|---|
| Frequency Range | 1 µHz - 5 MHz |
| Waveform Length | 16 kpts / Ch |
| Vertical Resolution | 14 bits |
| Sample Rate | 125 MS/s |
| Min. Rise / Fall time | 7 ns (typical) |
| Jitter (pk - pk) | 8 ns (typical) |
| Storage in Non-volatile RAM memory | 10 waveforms |

| | WaveStation 2012 | WaveStation 2022 | WaveStation 2052 |
|---|---|---|---|
| **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) | | |
| Modulation Depth | 0% - 120% | | |
| Modulation Resolution | 0.1% | | |
| Modulating Waveform Sample Clock @ Max Sampling Rate | 3.90625 MHz | | |
| Memory Size | 4k 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) | | |
| Frequency Deviation | 0 - .5 * BW, 10 uHz 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) | | |
| **ASK Modulation** | | | |
| Source | Internal / External | | |
| Carrier | Sine, Square, Ramp, Arbitrary (except DC) | | |
| Modulation Waveform | 50% duty-cycle square waveform (2 mHz - 50 kHz) | | |
| **PWM Modulation** | | | |
| Source | Internal / External | | |
| Frequency | 500 μHz - 20 kHz | | |
| Modulation Waveform | Sine, Square, Ramp, Arbitrary (except DC) | | |
| External Modulation | -6V to +6V (max without deviation) | | |
| Duty Cycle Modulating Frequency | 2 mHz - 20 kHz | | |
| Duty Cycle Deviation | 0% to 100% of Pulse Width, 0.1% resolution | | |
| **Sweep** | | | |
| Carrier | Sine, Square, Ramp, Arbitrary (except DC) | | |
| Type | Linear / Logarithmic | | |
| Direction | Up / Down | | |
| Sweep Time | 1 ms - 500 s | | |
| Trigger Source | Manual, External, Internal | | |
| Sweep Range @ Max Sample Rate | 1 uHz to Bandwith frequency @ 125 MHz | | |
| **Burst** | | | |
| Waveform | Sine, Square, Ramp, Arbitrary (except DC) | | |
| Type | Count (1 - 50,000 Periods, Infinite, Gated) | | |
| Start / Stop Phrase | 0° - 360° | | |
| Internal Period | 1 μs - 500 s | | |
| Gated Source | External Trigger | | |
| Trigger Source | Manual, External or Internal | | |

# SPECIFICATIONS

| | WaveStation 2012 | WaveStation 2022 | WaveStation 2052 |
|---|---|---|---|
| **Channel Characteristics** | | | |
| Output Connector | | BNC | |
| Output Impedance | | 50 Ω, High Impedance | |
| **External Clock** | | | |
| Input Connector | | BNC | |
| Frequency Range | | 10 MHz ± 10 0Hz | |
| Min Input Voltage Swing | | Input voltage swing range: 3.3 Vpp - 5.5 Vpp | |
| **Sync Output** | | | |
| Voltage Level | | TTL compatible | |
| Pulse Width | | > 50 ns, not adjustable | |
| Output Impedance | | 50 Ω (typical) | |
| Maximum Frequency | | 2 MHz | |
| **Trigger Output** | | | |
| Voltage Level | | TTL compatible | |
| Pulse Width | | > 400 ns | |
| Output Impedance | | 50 Ω (typical) | |
| Maximum Frequency | | 1 MHz | |
| Output Connector | | Through Rear Panel<br>Ext Trig / Gate / FSK / Burst | |
| **External Trigger** | | | |
| Trigger Input Level | | TTL compatible | |
| Trigger Slope | | Up or down (optional) | |
| Trigger Pulse Width | | > 100 ns | |
| Trigger Input Impedance | | > 5 kΩ, DC coupling | |
| External Modulation | | ±6 V = 100% modulation > 5 kΩ input impedance | |
| External Trigger | | TTL compatible | |
| Max. Voltage Input | | Note: The external input voltage can't be over ±6 V, otherwise instrument gets damaged | |
| Assignable to Both Channels 1 or 2, 1 AND 2 | | Ext Trig in: Assignment Channel 1, Channel 2 or Both<br>Ext Trig out: Assignment Channel 1 or Channel 2 | |
| Max Frequency | | Ext Trig in: 1 MHz<br>Ext Trig out: 1 MHz | |
| Input Latency | | < 300 ns | |
| Polarity Selectable | | No | |
| **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 | |
| Accuracy | | Within 90 days ± 50 ppm within 1 year ±100 ppm 18° C ~ 28° C | |
| Temperature Coefficient | | < 5 ppm / °C | |

| | WaveStation 2012 | WaveStation 2022 | WaveStation 2052 |
|---|---|---|---|

### General Characteristics (cont'd)

**Output**

| | |
|---|---|
| Amplitude - CH1 | 2 mVpp - 3 Vpp (50 Ω)<br>4 mVpp - 6 Vpp (high impedance) |
| Amplitude - CH2 | 2 mVpp - 10 Vpp (50 Ω, ≤ 10 MHz)<br>2 mVpp - 5 Vpp (50 Ω, > 10 MHz)<br>4 mVpp - 20 Vpp (high impedance, ≤ 10 MHz)<br>4 mVpp - 10 Vpp (high impedance, > 10 MHz) |
| Amplitude Resolution | 1 mV |
| Vertical Accuracy<br>(Compared to 100 kHz sine) | ±(0.3 dB +1 mVpp of setting value) |
| Amplitude Flatness<br>(Compared to 100 kHz sine, 5 Vpp) | ± 0.3 dB |
| Cross Talk | < -70 dBc |
| Output Current Max - Ch 1 only | ± 200 mA |
| Output Current Max - Ch 2 only | ± 60 mA |
| Output Connector | BNC |

**DC Offset**

| | |
|---|---|
| Range DC - CH1 | ± 1.5 V (50 Ω)<br>± 3 V (high impedance) |
| Range (DC) - Ch2 | ± 5 V (50 Ω)<br>±10 V (high impedance) |
| Offset Accuracy | ±(\|setting offset value\|*1% + 3 mV) |
| Resolution | 1 mV |

**Waveform Output**

| | |
|---|---|
| Impedance | 50 Ω (typical), short-circuit protection |

### Display

| | |
|---|---|
| Characteristics | 3.5 inch TFT-LCD, 320 x 240, RGB |

### Physical Characteristics

| | |
|---|---|
| Dimensions (H x W x D) | 105 mm x 229 mm x 281 mm (4.1" x 9.0" x 11.1") |
| Weight | 2.6 kg (5.7 lbs) |

### Power

| | |
|---|---|
| Voltage | 100 – 240 VAC ±10% at 50 / 60 Hz or 100 – 120 VAC ± 10% at 400 Hz |
| Consumption | 50 W Max |

### Environment

| | |
|---|---|
| Temperature - Operating | 0° C to 40° C |
| Temperature - Storage | -40° C to +70° C |
| Humidity Range | 5% to 80% relative humidity (non-condensing) up to +31° C<br>Upper limit derates to 50% relative humidity (non-condensing) at +40° C |
| Altitude - Operation | Up to 10,000 ft. (3,048 m) |

### Compliance

CE Compliant, UL and cUL listed.
Conforms to EN 61326-1, EN 61010-1, UL 61010-1 2nd edition, and CSA C22.2 No. 61010-1-04.

# ORDERING INFORMATION

| Product Description | Product Code |
|---|---|
| 10 MHz, 2 Ch, 14 bit, 125 MS/s Function/Arbitrary Waveform Generator with 3.5″ Display | WaveStation 2012 |
| 25 MHz, 2 Ch, 14 bit, 125 MS/s Function/Arbitrary Waveform Generator with 3.5″ Display | WaveStation 2022 |
| 50 MHz, 2 Ch, 14 bit, 125 MS/s Function/Arbitrary Waveform Generator with 3.5″ Display | WaveStation 2052 |

## Customer Service

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:**

**LeCroy**

1-800-5-LeCroy
www.lecroy.com

**Local sales offices are located throughout the world.
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