

# WaveStation™ Function/Arbitrary Waveform Generators

## Key Features

- High performance with 14-bit resolution, 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.

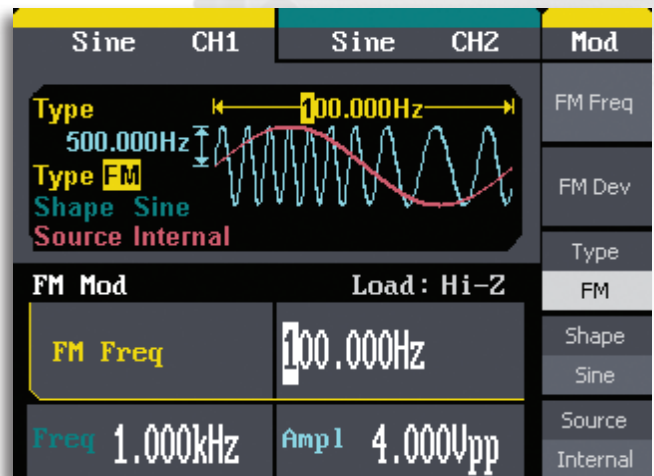
## 5. Display Menu

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

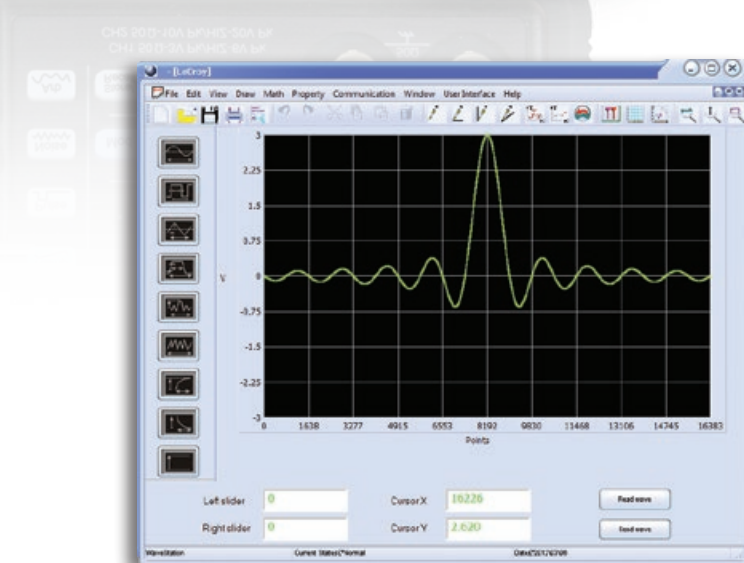
Intuitive front panel allows for quick waveform parameter entry and editing.

## 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					
<b>Waveform Characteristics</b>						
<b>Sine</b>						
Frequency Range	1 $\mu$ Hz - 10 MHz	1 $\mu$ Hz - 25 MHz	1 $\mu$ Hz - 50 MHz	1 $\mu$ Hz - 80 MHz	1 $\mu$ Hz - 120 MHz	1 $\mu$ 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 Vpp < 0.2%			DC - 20 kHz, 1 Vpp < 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)		
<b>Square</b>						
Frequency Range	1 $\mu$ Hz - 10 MHz	1 $\mu$ Hz - 25 MHz		1 $\mu$ Hz - 50 MHz		
Duty Cycle Range	20% - 80%	1 $\mu$ Hz - 10 MHz, 20% - 80% 10 MHz - 20 MHz, 40% - 60% 20 MHz - 25 MHz, 50%		$\leq$ 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 Vpp)			< 3%		
Asymmetric (50% Duty Cycle)	1% of period + 20 ns (typical, 1 kHz, 1 Vpp)			1% of period + 5 ns (typical, 1 kHz, 1 Vpp)		
Jitter	0.4% of period (typical, 1 kHz, 1 Vpp)			DC - 1 MHz, $\leq$ 200 ps $\pm$ 2 ppm 1 MHz - 50 MHz, $\leq$ 500 ps		
<b>Pulse</b>						
Frequency Range	500 $\mu$ Hz - 5 MHz			1 $\mu$ Hz - 40 MHz		
Duty Cycle Range	0.1 % resolution			0.0001% resolution		
Rise / Fall Time	7 ns (10% - 90% typical 1 kHz, 1 Vpp)			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 $\geq$ 12 ns, 100 ps resolution		
Overshoot	< 5%			< 3%		
Jitter	8 ns (pk - pk)			DC - 1 MHz, $\leq$ 200 ps $\pm$ 2 ppm 1 MHz - 50 MHz, $\leq$ 500 ps		
<b>Triangle/Ramp</b>						
Frequency Range	1 $\mu$ Hz - 300 kHz			1 $\mu$ Hz - 4 MHz		
Ramp Symmetry	0% - 100%					
Linearity	< 0.1% of peak value output (typical, 1 kHz, 1 Vpp, 100% symmetric)					
<b>Arbitrary Waveforms</b>						
Frequency Range	1 $\mu$ Hz - 5 MHz			1 $\mu$ 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, $\leq$ 2.1 ns $\pm$ 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 $\Omega$ , 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 $\Omega$ (typical)	
Maximum Frequency	2 MHz	10 MHz

## Trigger Output

Voltage Level	TTL compatible	CMOS compatible
Pulse Width	> 400 ns	> 60 ns
Output Impedance	50 $\Omega$ (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 <math>\pm</math>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 $\Omega$ , DC coupling	
External Modulation	$\pm$ 6 V = 100% modulation > 5 k $\Omega$ input impedance	$\pm$ (4.5 ~ 5)V = 100% modulation > 10 k $\Omega$ input impedance
External Trigger	TTL compatible	CMOS compatible
Max. Voltage Input	<i>Note: The external input voltage can't be over <math>\pm</math>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 $\pm$ 50 ppm within 1 year $\pm$ 100 ppm 18° C ~ 28° C	$\pm$ 1 ppm / year
Temperature Coefficient	< 5 ppm / °C	$\pm$ 1 ppm, 0° C ~ 55° C

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	WaveStation 2012	WaveStation 2022	WaveStation 2052	WaveStation 3082	WaveStation 3122	WaveStation 3162
<b>General Characteristics (cont'd)</b>						
<b>Output</b>						
Amplitude - CH1	2 mVpp - 3 Vpp (50 Ω) 4 mVpp - 6 Vpp (high impedance)		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)  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)			
Amplitude - CH2	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)		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)  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)			
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)		± (0.5 dB+1.5 mV)			
Amplitude Flatness (Compared to 100 kHz sine, 5 Vpp)	10° C to 35° C: ± 0.45 dB All other cases: ± 0.9 dB		≤ 10 MHz ± 0.1 dB ≤ 80 MHz ± 0.2 dB ≤ 160 MHz ± 0.3 dB			
Cross Talk	< -70 dBc		< -60 dB			
Output Current Max - Ch 1 only	± 60 mA		± 200 mA			
Output Current Max - Ch 2 only	± 200 mA		± 200 mA			
Output Connector			BNC			
<b>DC Offset</b>						
Range DC - CH1	± 1.5 V (50 Ω) ± 3 V (high impedance)		± 5 V (50 Ω) ± 10 V (high impedance)			
Range (DC) - Ch2			± 5 V (50 Ω) ± 10 V (high impedance)			
Offset Accuracy	± (setting offset value)*1% + 3 mV		± (setting offset value)*1% + 2 mV			
Resolution	1 mV		0.1 mV			
<b>Waveform Output</b>						
Impedance			50 Ω (typical), High Z			
Protection			short-circuit protection			
<b>Display</b>						
Characteristics	3.5 inch TFT-LCD, 320 x 240, RGB		4.3 inch TFT-LCD, 480 x 272, RGB			
<b>Physical Characteristics</b>						
Dimensions (H x W x D)	105 mm x 229 mm x 281 mm (4.1" x 9.0" x 11.1")		105 mm x 261 mm x 344 mm (4.1" x 10.3" x 13.5")			
Weight	2.6 kg (5.7 lbs)		2.8 kg (6.1 lbs)			
<b>Power</b>						
Voltage			100 - 240 V <sub>rms</sub> (± 10%), 50 / 60 Hz 100 - 120 V <sub>rms</sub> (± 10%), 400 Hz			
Consumption (nominal)			50 W Max			
<b>Environment</b>						
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)			
<b>Compliance</b>						
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	Product Description	Product Code
<b>WaveStation Function/Arbitrary Waveform Generators</b>		<b>Included with Standard Configuration</b>	
10 MHz, 2 Ch, 14 bit, 125 MS/s Function/Arbitrary Waveform Generator	WaveStation 2012	Power Cable for the Destination Country	
25 MHz, 2 Ch, 14 bit, 125 MS/s Function/Arbitrary Waveform Generator	WaveStation 2022	USB 2.0 Cable Type A to B (Black, 1 m)	
50 MHz, 2 Ch, 14 bit, 125 MS/s Function/Arbitrary Waveform Generator	WaveStation 2052	USB to GPIB Converter	
80 MHz, 2 Ch, 14 bit, 500 MS/s Function/Arbitrary Waveform Generator	WaveStation 3082	Getting Started Manual	
120 MHz, 2 Ch, 14 bit, 500 MS/s Function/Arbitrary Waveform Generator	WaveStation 3122	Performance Certificate	
160 MHz, 2 Ch, 14 bit, 500 MS/s Function/Arbitrary Waveform Generator	WaveStation 3162	Declaration of Conformity	
		WaveStation PC Software CD	
		Product Registration Card	
		<b>Accessories</b>	
		Rack Mount Kit for WaveStation 2000 / 3000	WSTA-RACK

## 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  
teledynelecroy.com

Local sales offices are located throughout the world.  
Visit our website to find the most convenient location.