

# 100MHz Dual-Channel Arbitrary / Function Generator



WAVE STANDARD SERIES

## MODEL WS8102



- Dual-channel Function Generator
- 100 MHz sine and 50 MHz square waves
- Triangle, ramp, sinc, Gaussian, exponential, noise, pulse generation with variable edge, and DC waveforms
- 16 Vp-p into 50Ω, 32Vp-p into open circuit
- 16 Bit, 250 MS/s, 512 Kpoint arbitrary waveforms
- Linear & logarithmic sweeps, triggered, gate and burst
- AM, FM, FSK, and PSK modulation
- High resolution 3.8" LCD, color display
- Ethernet, USB and GPIB interfaces
- ArbConnection software for easy waveform creation&control

The Tabor Wave Standard 8102 is a Dual Channel Arbitrary / Function Generator with a 100MHz bandwidth and the functionality of a Function generator, arbitrary generator and Pulse generator all in one easy to use high performance unit. It is a compact stand alone bench top unit that will satisfy all of the industry and education standard testing needs for years to come.

### Standard Waveforms

The 8102 has 10 built in functions for quick and easy wave generation. Front panel operations allows for easy selection of wave form and editing of all wave parameters. All of the standard waves can reach up to 15MHz with Sine and Square going as high as 100MHz.

### User Defined Waveforms

For more advanced users the 8102 with its 16 bit vertical resolution offers a standard 512Kb memory depth and a 250MS/s sample clock for designing waveforms. With the ability to control and edit the value of each and every point any wave is possible. The Memory can be divided into segments for storing all of the user defined waveforms.

### Modulated Waveforms

Agility and modulation capabilities open the door to diverse applications. In addition to the capability of generating any shape and style of waveform with the arbitrary waveform generation power, the products can also do standard modulation schemes such as FM, AM, FSK, sweep and PSK without sacrificing the power of the instrument control and output run modes.

### Accuracy and Stability

As standard, the instrument is equipped with an internal frequency reference that has 1ppm accuracy and stability over a period of 1 year. An external frequency reference is provided on the rear panel for applications requiring greater accuracy or stability, supported by the instrument's 14 digits resolution.

### Easy to Use

Large and user-friendly 3.8" back-lit color LCD display facilitates browsing through menus, updating parameters and displaying detailed and critical information for your waveform output. Combined with numeric keypad, cursor position control and a dial, the front panel controls simplifies the often complex operation of an arbitrary function generator.

### Remote Control

Model 8102 comes standard with a variety of interfaces: Ethernet, USB and GPIB allowing the user to freely select the interface best suited to his individual requirements. The included ArbConnection software is a powerful editorial tool for designing waveforms and provides the user with full control of instrument functions, modes and features.

### Multiple Environments to Write Your Code

Model 8102 comes with a complete set of drivers, allowing you to write your application in various environments such as: Labview, CVI, C++, VB, MATLAB. You may also link the supplied dll to other Windows based API's or, use low level SCPI commands (Standard Commands for Programmable Instruments) to program the instrument, regardless if your application is written for Windows, Linux or Macintosh operating systems.

### Automated External Self-Calibration

Leading-edge technology is implemented to allow calibration from any interface, USB, GPIB or LAN and calibration factors are stored in a flash memory thus eliminating the need to open instrument covers.

Visit our website at [www.taborelec.com](http://www.taborelec.com)

  
**TABOR ELECTRONICS Inc.**  
Since 1971

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### **Service and Support**

Beyond providing precision Test & Measurement instruments, Tabor Electronics provides unparalleled service and support, and is continuously finding new ways to bring added value to its customers.

Our after-sales services are comprehensive. They include all types of repair and calibration, and a single point of contact that you can turn to whenever you need assistance. As part of our extensive support, we offer individualized, personal attention Help Desk, both online and offline, via e-mail, phone or fax.

Tabor Electronics maintains a complete repair and calibration lab as well as a standards laboratory in Israel and USA. Service is also available at regional authorized repair/calibration facilities.

Contact Tabor Electronics for the address of service facilities nearest you.

### **Applications**

For expert technical assistance with your specific needs and objectives, contact your local sales representative or our in-house applications engineers.

### **Manuals, Drivers, and Software Support**

Every instrument comes equipped with a dedicated manual, developer libraries, I/O drivers, and software. However, if your specific manual is lost or outdated, Tabor Electronics makes it possible to log-on to its Download Center and get the latest data "in a click".

### **Product Demonstrations**

If your application requires that you evaluate an instrument before you purchase it, a hands-on demonstration can be arranged by contacting your local Tabor Electronics representative or the Sales Department at our Corporate Headquarters.

### **Three-year Warranty**

Every instrument from the Wave Standard series comes with a Three-year warranty. Each one has full test results, calibration certificate, and CD containing product's manual and complete software package. Our obligation under this warranty is to repair or replace any instrument or part thereof which, within Three years after shipment, proves defective upon examination. To exercise this warranty, write or call your local Tabor representative, or contact Tabor Headquarters and you will be given prompt assistance and shipping instructions.

# Specification 100MHz Dual-Channel Arbitrary / Function Generator

## Model WS8102



### STANDARD WAVEFORMS

#### SINE

**Frequency Range:** 1 $\mu$ Hz to 100MHz  
**Start Phase Range:** 0-360°  
**Start Phase Resolution:** 0.01°

#### Harmonics Distortion (1Vp-p):

DC to 5MHz	<-60dBc
5MHz to 25MHz	<-55dBc
25MHz to 50MHz	<-50dBc
50MHz to 100MHz	<-45dBc

#### Non-Harmonic Distortion (1Vp-p):

DC to 25MHz	<-70dBc
25MHz to 50MHz	<-65dBc
50MHz to 100MHz	<-60dBc

#### Total Harmonic Distortion:

DC to 1MHz	0.1%
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#### Flatness (1MHz, 1Vp-p):

DC to 50MHz	< 1dB
50MHz to 100MHz	< 2dB

#### Phase Noise

100Hz Offset	-70dBc/Hz
1kHz Offset	-85dBc/Hz
10kHz Offset	-92dBc/Hz
100kHz Offset	-112dBc/Hz
1MHz Offset	-140dBc/Hz

#### TRIANGLE

**Frequency Range:** 1 $\mu$ Hz to 12.5MHz  
**Start Phase Range:** 0-360°  
**Start Phase Resolution:** 0.01°

#### SQUARE

**Frequency Range:** 1 $\mu$ Hz to 50MHz (Typically 100MHz)  
**Duty Cycle Range:** 0% to 99.9%  
**Rise/Fall Time:** < 5ns (typically < 4ns)  
**Overshoot, typical:** < 5%  
**Jitter (rms):** < 100 ps

#### PULSE

**Frequency Range:** 500 $\mu$ Hz to 50MHz  
**Delay, Rise/Fall Time, High Time Ranges:** 0%-99.9% of period (each independently)  
**Rise/Fall Time:** < 5ns (typically < 4ns)  
**Overshoot, typical:** < 5%  
**Jitter (rms):** < 100 ps

### RAMP

**Frequency Range:** 1 $\mu$ Hz to 12.5MHz  
**Delay, Rise/Fall Time Ranges:** 0%-99.9% of period (each independently)

### SINC (Sine(x)/x)

**Frequency Range:** 1 $\mu$ Hz to 12.5MHz  
**"0 Crossings":** 4-100

### GAUSSIAN

**Frequency Range:** 1 $\mu$ Hz to 12.5MHz  
**Time Constant:** 10-200

### EXPONENTIAL PULSE

**Frequency Range:** 1 $\mu$ Hz to 12.5MHz  
**Time Constant:** -100 to 100

### REPETITIVE NOISE

**Bandwidth:** 50MHz

### DC

**Range:** -8V to 8V

### DIGITAL PULSE GENERATOR

**Pulse Mode:** Single or double, programmable  
**Polarity:** Normal, inverted or complemented  
**Period:** 8 ns minimum, programmed with 4 ns increments

**Delay, Rise/Fall Time, Double Pulse Delay, High Time Ranges:** 0 ns minimum, 2e3 Sec max  
**Amplitude Window:** 16mVp-p to 16Vp-p  
 Low Level -8V to +7.990V  
 High Level -7.990V to +8V

**Rise/Fall Time:** < 5ns (typically < 4ns)  
**Overshoot, typical:** < 5%  
**Jitter (rms):** 100 ps

### NOTES:

- All pulse parameters, except rise and fall times, may be freely programmed within the selected pulse period provided that the ratio between the period and the smallest incremental unit does not exceed the ratio of 512,000 to 1, hence the specifications above do not show maximum limit as each must be computed from the above relationship.
- Rise and fall times, may be freely programmed provided that the ratio between the rise/fall time and the smallest incremental unit does not exceed the ratio of 100,000 to 1.
- The sum of all pulse parameters must not exceed the pulse period setting.

### ARBITRARY WAVEFORMS

#### Sample Rate:

Continuous Mode 1.5S/s to 250MS/s (typically 300MS/s)  
 All Other Modes 1.5S/s to 225MS/s (typically 250MS/s)

**Vertical Resolution:** 16 bits

**Waveform Memory:** 512k points

**No. of Segments:** 1 to 1k

**Min. Segment Size:** 16 points

**Resolution:** 4 points

### COMMON CHARACTERISTICS

#### FREQUENCY

##### Resolution:

Front Panel 11 digits (limited by 1 $\mu$ Hz)  
 Remote 14 digits (limited by 1 $\mu$ Hz)

**Accuracy & Stability:** Same as reference

#### 10MHz REFERENCE CLOCK

Internal	0.0001% (1 ppm TCXO) 1ppm/year aging rate
External	10MHz TTL, 50% $\pm$ 2% duty cycle or 50 $\Omega$ $\pm$ 5% 0dBm

#### AMPLITUDE

**Range:** 10mV to 16Vp-p into 50 $\Omega$ ;  
 Double into open circuit

**Impedance Display:** Programmable from 50 $\Omega$  to 1M $\Omega$

**Resolution:** 4 digits

**Accuracy (1kHz):**

10mV to 159.9mVp-p	$\pm$ (1% + 5mV)
160mV to 1.599Vp-p	$\pm$ (1% + 10mV)
1.6V to 11.99Vp-p	$\pm$ (1% + 70mV)
12V to 16Vp-p	$\pm$ 2%

#### OFFSET

**Range:** 0 to  $\pm$ 7.992V, into 50 $\Omega$

**Resolution:** 1mV

**Accuracy:**  $\pm$ (1%+1% of Amplitude +5mV)

#### FILTERS

**Type:** 25MHz, 50MHz, 60MHz, 120MHz

#### MAIN OUTPUT

**Connector:** Front panel BNC

**Impedance:** 50 $\Omega$   $\pm$ 1%

**Protection:** Short Circuit to Ground, 10s max

**Standby:** Output On/Off (Output Disconnected)

#### SYNC OUTPUT

**Connector:** Front panel BNC

**Level:** TTL

**Position:** 0 to 512k

**Resolution:** 4 points

# Specification 100MHz Dual-Channel Arbitrary / Function Generator

## Model WS8102



### TRIGGER INPUT

<b>Connector:</b>	Rear panel BNC
<b>Impedance:</b>	10k $\Omega$
<b>Slope:</b>	Positive or Negative (selectable)
<b>Programmable Level:</b>	$\pm 5V$
<b>Sensitivity:</b>	100mV
<b>Damage Level:</b>	$\pm 12V$
<b>Pulse Width:</b>	>10ns minimum

### EXTERNAL REFERENCE INPUT

<b>Connector:</b>	Rear panel SMB
<b>Frequency:</b>	10MHz
<b>Impedance&amp;Level:</b>	
Default	10k $\Omega$ $\pm 5\%$ , TTL, 50% $\pm 2\%$
Option	50 $\Omega$ $\pm 5\%$ , 0dBm Sinewave

### MODULATION

#### FM

<b>Carrier Waveform:</b>	Sine wave
<b>Carrier Frequency:</b>	1 $\mu$ Hz to 100MHz
<b>Modulating Waveforms:</b>	Sine, square, triangle, ramp
<b>Modulating Frequency:</b>	1 $\mu$ Hz to 100kHz
<b>Peak Deviation:</b>	Up to 100MHz

#### AM

<b>Carrier Waveform:</b>	Sine wave
<b>Carrier Frequency:</b>	1 $\mu$ Hz to 100MHz
<b>Envelop Waveform:</b>	Sine, square, triangle, ramp
<b>Envelop Frequency:</b>	1mHz to 100kHz
<b>Modulation Depth:</b>	0% to 100%

#### FSK

<b>Carrier Waveform:</b>	Sine wave
<b>Carrier Frequency:</b>	1 $\mu$ Hz to 100MHz
<b>Baud Rate Range:</b>	1bits/sec to 10Mbits/sec
<b>FSK Data Bits Length:</b>	2 to 4,000

#### PSK

<b>Carrier Waveform:</b>	Sine wave
<b>Carrier Frequency:</b>	1 $\mu$ Hz to 100MHz
<b>Carrier phase:</b>	0 to 360 $^{\circ}$
<b>Baud Rate Range:</b>	1bits/sec to 10Mbits/sec
<b>FSK Data Bits Length:</b>	2 to 4,000

#### SWEEP

<b>Carrier Waveform:</b>	Sine wave
<b>Sweep Step:</b>	Linear or log
<b>Sweep Direction:</b>	Up or Down
<b>Sweep Range:</b>	1 $\mu$ Hz to 100MHz
<b>Sweep Time:</b>	1 $\mu$ s to 500s

### TRIGGER CHARACTERISTICS

#### RUN MODES

<b>Continuous:</b>	Free-run output of a waveform.
<b>Triggered:</b>	Upon trigger, outputs one waveform cycle. Last cycle always completed.
<b>Gated:</b>	External signal transition enables or disables generator output. Last cycle always completed.
<b>Burst:</b>	Upon trigger, outputs a Dual or multiple pre-programmed number of waveform cycles from 1 through 1M.
<b>Mixed:</b>	First output cycle is initiated by a software trigger. Consequent output requires external triggers through the rear panel TRIG IN

#### TRIGGER SOURCE

##### EXTERNAL

<b>Source:</b>	Rear panel BNC
<b>Trigger Level:</b>	$\pm 5V$
<b>Resolution:</b>	1mV
<b>Input Frequency:</b>	DC to 2.5MHz
<b>Min. Pulse Width:</b>	>10ns
<b>Slope:</b>	Positive/Negative transitions, selectable
<b>Trigger Jitter:</b>	$\pm 1$ sample clock period

##### DELAYS (Trigger input to waveform output)

<b>System Delay:</b>	6 sample clock cycles+150ns
<b>Trigger Delay:</b>	[[0; 200ns to 20s) + system delay]
<b>Trigger Resolution:</b>	20ns
<b>Trigger Delay Error:</b>	6 sample clock cycles+150ns

##### INTERNAL / RETRIGGER (BUS)

<b>Range:</b>	200ns to 20s
<b>Resolution:</b>	20ns
<b>Error:</b>	3 sample clock cycles+20ns

#### MANUAL

<b>Source:</b>	Soft trigger command through the front panel or external interface
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### CONFIGURATION

<b>Output Channels</b>	2, semi-independent
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### INTER-CHANNEL DEPENDENCY

<b>Separate controls:</b>	Output on/off, amplitude, offset, standard waveforms, user waveforms, user waveform size, sequence table
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**Common Controls:** Sample clock (Arb), frequency (Std), period (Pulse) reference source, trigger modes, trigger advance source, SYNC output

### LEADING EDGE OFFSET

<b>Description:</b>	Channel 1 edge start trails channel 2 edge by a programmable number of points.
<b>Range:</b>	0 to 512k
<b>Resolution&amp;Accuracy:</b>	1 point
<b>Initial Skew:</b>	< 1ns

### GENERAL

<b>Power Supply:</b>	85 to 265Vac, 48-63 Hz
<b>Power Consumption:</b>	60W
<b>Front Panel Display:</b>	Color LCD, 3.8" reflective, 320 x 240 pixels, back-lit
<b>Operating temperature:</b>	0 $^{\circ}$ C - 50 $^{\circ}$ C
<b>Humidity (non-condensing):</b>	11 $^{\circ}$ C - 30 $^{\circ}$ C 85% 31 $^{\circ}$ C - 40 $^{\circ}$ C 75% 41 $^{\circ}$ C - 50 $^{\circ}$ C 45%
<b>Storage temperature:</b>	-40 $^{\circ}$ C to + 70 $^{\circ}$ C.
<b>Interface:</b>	Ethernet 10/100, USB 2.0 and GPIB standard
<b>Language:</b>	IEEE-488.2 - SCPI - 1993.0
<b>Dimensions:</b>	212 x 88 x 415 mm (WxHxD)
<b>Weight:</b>	Approximately 7 lb
<b>Safety:</b>	EN61010-1, 2nd revision
<b>EMC:</b>	CE marked. Designed to meet VDE 0411/03.81 and UL 1244
<b>Reliability:</b>	MTBF per MIL-HDBK-217E, 25 $^{\circ}$ C, Ground Benign
<b>Workmanship Std:</b>	Conform to IPC-A-610D
<b>Supplied Accessories:</b>	Power Cord, USB cable, CD containing Operating Manual, ArbConnection software and developer libraries.
<b>Warranty:</b>	3 years standard

### ORDERING INFORMATION

<b>MODEL</b>	<b>WS8102</b>
100MHz Dual-Channel Arbitrary/Function Generator	

### ACCESSORIES

<b>S-Rack mount:</b>	19" Single Rack Mounting Kit
<b>D-Rack mount:</b>	19" Dual Rack Mounting Kit
<b>Case Kit:</b>	Professional Carrying Bag

**Note:** Options and Accessories must be specified at the time of your purchase.