WONDER WAVE SERIES

MODELS WW1071/2
100MS/s Single/Dual Channel
Arbitrary Waveform Generators

- Single / Dual Channel 100MS/s waveform generator
- 1M standard waveform memory (2M/4M option)
- Sine waves to 50MHz, Square to 30MHz
- SINE OUT to 100MHz, 1Vp-p
- 11 Built-in popular standard waveforms
- 10Vp-p into 50Ω, double into high impedance
- 14 Bit amplitude resolution
- 11 digits frequency resolution (limited by 1µHz)

- AM, FM, Arbitrary FM, FSK, Ramped FSK modulation
- Comprehensive memory management
- Linear and Logarithmic Sweep
- 1 ppm clock accuracy and stability
- User friendly and menu driven 3.8" color LCD display
- LAN, USB and GPIB interfaces
- Multi-Instrument synchronization
- ArbConnection software for easy waveform creation

The WW1071/2 represents a new dimension in arbitrary waveform generator design. With an unprecedented combination of arbitrary generator and synthesizer, versatility, high resolution and wide frequency range, and outstanding performance-to-price ratio, the WW1071/2 delivers diverse benefits that will facilitate tasks in many fields.

100MS/s Sample Rate
New technology requirements are driving communications systems to use increasingly narrow channel widths. A high sample rate of 100MS/s makes the WW1071/2 an ideal modulation source for troubleshooting new encoding schemes. The WW1071/2 also provides high-speed waveforms to simulate signal distortion, video signals, component failures, and power supply line cycle dropouts and transients.

High Performance
Each channel of the WW1071/2 delivers precise waveforms with 14 bits of amplitude resolution and up to 14 digits of frequency resolution from remote with extremely low phase noise. Exceptional electrical performance includes up to 10Vp-p into 50Ω over the full frequency range. Selectable filters ensure clean stimulus waveforms enabling the generator to simulate modulation waveforms.

14 Bit Resolution
The 14-bit resolution provides 16,384 output levels. This means that even audio waveforms can be generated with excellent fidelity. It also allows video-and other complex waveforms-to be generated with small details superimposed on large signals, in order to test the response of receiving systems.

Function Generator
When used as a simple function generator the instrument offers ten basic waveforms with adjustable parameters all of which are accessible from the front panel. These are sine, triangle, square, pulse, ramp, sinc, Gaussian, exponential (up and down), noise, as well as DC. Sine and square waves can be generated at up to 50MHz.

Up to 4M Waveform Memory
The WW1071/2 offers 1M word memory standard and 2M or 4M word optional for arbitrary waveforms. In addition, the memory can be divided into as many as 2048 segments, which can be looped and linked in many different ways. Using 4M word at 100MS/s to generate a video signal, for example, the duration is 0.04 seconds, 25Hz, even without any looping of repetitive elements.

Sequence Generator
When the sequencing facilities are employed, the WW1071/2's uniqueness is obvious. The memory segments can be linked and repeated in any combination both manually and under programmed control. This allows test software to switch between many different waveforms rapidly without the need to download multiple times, enhancing test throughput in a way that is unmatched

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by competing products. The sequence generator has four advanced modes: automatic, stepped, single and mixed, which make it even a more powerful tool.

High-Quality Modulation Signal Source
One of the many attractive features of the WW1071/2 is the sample clock modulation function. In ordinary arbitrary waveform generators, to make a frequency modulated sine wave you have to enter the complete mathematical function. Not so with the WW1071/2: all that is necessary is generating the carrier signal, and then modulating the clock to obtain the required result. The sample clock modulation can be done using internal waveforms such as sine, square, triangle, and ramp or using downloaded arbitrary modulating waveforms. This allows you to generate signals that would be difficult or impossible to define using an equation. AM, Linear and Logarithmic Sweeps, FSK and Ramped FSK are available as well.

Triggering Facilities
However versatile the waveform generation systems are made, the need for external control of generation is vital. The triggering facilities of the WW1071/2 match the generation functions in versatility. In the simplest mode, signals are output continuously. The WW1071/2 also offers the triggered mode, gated mode, external burst mode, and internal burst mode, all of which can use an external trigger signal or an internal trigger. The use of external sources to prompt the switching of segments has already been mentioned.

Inter-Channel Phase Control (WW1072)
In the WW1072, both channels share a common sample clock, and both channels are triggered from the same source assuring tightly synchronized channel-to-channel timing. Precise control over channel-to-

channel phase offset is achieved by allowing control over channel start phase with a resolution down to as small as 1 waveform point. This enables extremely accurate timing or phase dependencies to be studied, such as those found in high speed digital communication systems.
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 simplify the often complex operation of an arbitrary waveform generator.

High Speed Access
Access speed is an increasingly important requirement for test systems. Included with the instrument is a variety of interfaces: LAN, USB and GPIB so one may select the interface most compatible to individual requirements. Using any of the external interfaces, controlling instrument functions and features as well as downloading waveforms and sequences is fast, time saving and easily tailored to every system regardless if it is just a laptop to instrument or full-featured ATE system. IVI drivers and factory support will speed up system integration thus minimizing time-to-market and reduce system development costs significantly.

Multiple Environments to Write Your Code
Model WW1071/2 comes with a complete set of drivers, allowing you to write your application in various environments such as: Labview, CVI, C++, VB and 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.

Multi-Instrument Synchronization
Multiple WW1071/2s can be synchronized using a Master-Slave arrangement allowing users to benefit from the same high quality performance in their multi-channels needs.

ArbConnection
ArbConnection is a graphical tool that provides an unlimited source of Arbitrary Waveforms. With the ArbConnection software you can control instruments functions, modes and features. You can also create a virtually infinite amount of test waveforms. Freehand sketch allows you to draw your own custom waveform for quick analysis of analog signals. You can use the built-in equation editor to create your own exotic functions. Add or subtract components of a Fourier series to characterize digital or analog filters or inject random noise into a signal to test immunity to auxiliary noise.

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Arbitrary Waveform Generators

Specification

CHANNELS

No. of Channels:	1/2, semi-independent

STANDARD WAVEFORMS

Waveforms: Sine, Triangle, Square, Pulse, Ramp, Sine(x)/x, Gaussian, Exponential, Repetitive Noise, DC.

Frequency Range:

Sine	100µHz to 50MHz
Square, Pulse	100µHz to 30MHz
All others	100µHz to 15MHz

SINE

Start Phase:	0 to 360°
Phase Resolution:	0.1°

Harmonics Distortion, 3Vp-p (typ.):

DC to 2.5MHz	<-55dBc
2.5MHz to 25MHz	<-40dBc
25MHz to 40MHz	<-35dBc
40MHz to 50MHz	<-22dBc

Non-Harmonic Distortion (typ.):

DC to 15MHz	<-70dBc
15MHz to 50MHz	<-60dBc

Total Harmonic Distortion:

DC to 100kHz	0.1%

Flatness (1kHz)(typical):

DC to 1MHz	1%
1MHz to 25MHz	5%
25MHz to 50MHz	20%

Phase Noise (8 points Sine, Max. SCLK)

100Hz Offset	<-103dBc/Hz
1kHz Offset	<-110dBc/Hz
10kHz Offset	<-118dBc/Hz
100kHz Offset	<-124dBc/Hz
1MHz Offset	<-135dBc/Hz

TRIANGLE, RAMP

Start Phase:	0 to 360°
Phase Resolution:	0.1°
Timing Ranges:	0%-99.9% of period

SQUARE, PULSE

Duty cycle:	1% to 99%
Timing Ranges:	0%-99.9% of period
Rise/Fall time:	<8ns
Aberration:	<5%

SINC (SINE(x)/x)

"0" Crossing:	4 to 100 cycles

GAUSSIAN PULSE

Time Constant:	1 to 200

EXPONENTIAL FALL/RISING PULSE

Time Constant:	-100 to 100

DC

Range:	-5V to 5V

DIGITAL PULSE GENERATOR OPTION

Pulse Mode:	Single or double, programmable
Polarity:	Normal, inverted, complement
Period:	40ns to 1000s
Resolution:	10ns
Pulse Width:	20ns to 1000s

Rise/Fall Time:

Fast	<6ns (typ.)
Linear	10ns to 1000s

High Time, Delay & Double Pulse Delay: 10ns to 1000s

Amplitude Window: 10mVp-p to 10Vp-p(1)

Low Level	-5V to +4.995V(1)
High Level	-4.995V to +5V(1)

(1) Double into high impedance

NOTES:

1. 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 1,000,000 to 1. With the 2M option, the ratio is extended to 2,000,000 to 1, hence the specifications below do not show maximum limit as each must be computed from the above relationship.

2. 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.

3. The sum of all pulse parameters must not exceed the pulse period setting

ARBITRARY WAVEFORMS

Sample Rate:	100mS/s to 100MS/s
Vertical Resolution:	14 Bits
Waveform Memory:	1M points standard, 2M/4M option (per channel)
Min. Segment Size:	16 points
Resolution:	4 points
No. of Segments:	1 to 2k

SEQUENCED ARBITRARY WAVEFORMS

Operation:	Permits division of the memory bank into smaller segments. Segments may be linked, and repeated in user-selectable fashion to generate extremely long waveforms.
Sequencer steps:	1 to 2k
Min. Seg. Duration:	1µs
Segment loops:	1 to 1M

ADVANCE MODES

Automatic:	No triggers required to step from one segment to the next. Sequence is repeated continuously through a pre-programmed sequence table.
Stepped:	Current segment is sampled continuously, external trigger advances to next programmed segment.
Single:	Current segment is sampled to the end of the segment including repeats and idles there. Next trigger advances to next segment.
Mixed:	Each step of a sequence can be programmed to advance either: a) automatic (Automatic mode), or b) with a trigger (Stepped mode)
Advance Source:	External (TRIG IN), Internal or software

MODULATION

COMMON CHARACTERISTICS

Carrier Waveform:	Sine, Triangle, Square, Pulse, Ramp, Sine(x)/x, Gaussian, Exponential, Repetitive Noise, DC and Arb
Carrier SCLK:	100mS/s to 100MS/s
Carrier Frequency:	Waveform dependent
Resolution:	12 digits, limited by 1µHz
Accuracy:	0.1%
Freq. Distortion:	<0.1%

Modulation Source:

Internal	FM, Arbitrary FM, Sweep
External	AM, FSK

FM

Modulating Shape:	Sine, Square, Triangle / Ramp
Modulation Freq.:	1mHz to 100kHz
Deviation Range:	100mS/s to 50MS/s

ARBITRARY FM

Modulating Shape:	Arbitrary waveform, 10 to 20000 waveform points
Modulating SCLK:	1mS/s to 2MS/s
Deviation Range:	100mS/s to 50MS/s

AM

Envelope Freq.:	1µHz to 500kHz
Sensitivity:	0V to +5V (5Vp-p)
Modulation Depth:	0% to 100%

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Specification

FSK

Type:	Hop or Ramp
Low level:	Carrier sample clock
High level:	Hop frequency
Baud Rate Range:	1bits/sec to 10Mbits/sec
Min. FSK Delay:	1 waveform cycle + 50ns
Ramp FSK:	
Time	10µs to 1s
Resolution	3 digits

SWEEP

Sweep Time:	1ms to 1000s
Sweep Step:	Linear, Logarithmic or Arb
Sweep Direction:	Up or down

COMMON CHARACTERISTICS

FREQUENCY

Resolution:	
Display	11 digits (limited by 1µHz)
Remote	14 digits (limited by 1µHz)
Accuracy/Stability:	Same as reference

ACCURACY REFERENCE CLOCK

Internal	0.0001% (1ppm TCXO) initial tolerance over a 19°C to 29°C temperature range; 1ppm/°C below 19°C and above 29°C; 1ppm/year aging rate
External	10MHz TTL, 50% duty cycle

AMPLITUDE

Range:	10mV to 10Vp-p, into 50Ω; Double into open circuit
Resolution:	4 digits
Accuracy (1kHz):	
100mV to 1Vp-p	±(1% + 5mV)
1Vp-p to 10Vp-p	±(1% + 25mV)

OFFSET

Range:	0 to ±4.5V
Resolution:	2.2 mV
Accuracy:	1%

FILTERS

Type:	25MHz / 50MHz Elliptic

OUTPUTS

MAIN OUTPUTS

Coupling:	DC coupled
Connector:	Front panel BNC
Impedance:	50Ω, ±1%
Protection:	Protected against temporary short to case ground

SYNC/MARKER OUTPUT

Connector:	Front panel BNC
Impedance:	50Ω, ±1%
Level:	>2V into 50Ω, 4V into 10kΩ
Validators:	BIT, LCOM
Protection:	Protected against temporary short to case ground
Position:	Point 0 to n
Width:	4 to 100000 points
Resolution:	4 points
Source:	Channel 1

SAMPLE CLOCK OUTPUT

Connector:	Rear panel SMB
Level:	ECL
Impedance:	50Ω, terminated to −2V

SINEWAVE OUTPUT

Connector:	Rear panel BNC
Impedance:	50Ω, ±1%
Level:	1V into 50Ω
Protection:	Protected against temporary short to case ground
Source:	Sample clock frequency
Frequency Range:	100mHz to 100MHz
Resolution:	Same as Sample clock
THD:	0.05% to 100kHz
SFDR:	<-30dBc to 100MHz

INPUTS

TRIGGER INPUT

Connector:	Rear panel BNC
Input Impedance:	10kΩ, ±5%
Polarity:	Positive or negative
Threshold Level:	TTL
Min. Pulse Width:	20ns

EXTERNAL REFERENCE INPUT

Connector:	Rear panel BNC
Frequency:	10MHz
Impedance & Level:	10kΩ ±5%, TTL, 50% ±5%

AM INPUT

Modulation Input:	Rear panel BNC
Impedance:	1MΩ, ±5%
Max. Input Voltage:	12V

SAMPLE CLOCK INPUT

Connector:	Rear panel SMB
Input Level:	ECL
Impedance:	50Ω, terminated to −2V
Range:	100mHz to 100MHz
Min. Pulse Width:	4 ns

SYNCHRONIZATION CONNECTOR

Connector:	Rear panel 9-pin D-SUB
SYNC Cable:	Optional, consult factory at the time of purchase

RUN MODES

Continuous:	Free-run output of a waveform
Triggered:	Upon trigger, outputs one waveform cycle. Last cycle always completed
Gated:	External signal enables generator. First output cycle synchronous with the active slope of the triggering signal. Last cycle of output waveform always completed
Burst:	Upon trigger, outputs a single or multiple pre-programmed number of waveform cycles from 1 through 1M

TRIGGER CHARACTERISTICS

System Delay:	1 Sample Clock + 150ns
Trigger Start, Stop & Phase Control:	0 to 1M (2M/4M optional)
Resolution:	4 points
Breakpoint Error:	±4 points
Breakpoint Source:	External, Manual, or command

EXTERNAL

Connector:	Rear panel BNC
Level:	TTL
Slope:	Positive or negative
Frequency:	DC to 2MHz
Impedance:	10kΩ, DC coupled

INTERNAL

Range:	100mHz to 2MHz
Resolution:	14 digits, limited by 1µHz
Accuracy:	0.1%

MANUAL

Source:	Soft trigger command from the front panel or remote

INTER-CHANNEL DEPENDENCY (WW1072)

Separate controls:	Output on/off, amplitude, AM, offset, standard waveforms, user waveforms, waveform size, sequence table, channel 2 clock divider, trigger start phase, breakpoints
Common Controls:	SCLK, frequency, reference source, trigger and sequence advance mode, SYNC OUT, FM, FSK, sweep and arm

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PHASE OFFSET (LEADING EDGE)

Range:	0 to 1M points (2M/4M optional)
Resolution/Accuracy:	1 point, or 1 SCLK of CH. 2
Initial Skew:	<±2ns, with sclk divider = 1; <±3ns, with sclk divider > 1

CHANNEL 2 SAMPLE CLOCK DIVIDER

Range:	1 to 65,535 points
Resolution:	1 point

MULTI-INSTRUMENT SYNCHRONIZATION

PHASE OFFSET (LEADING EDGE)

Range:	0 to 1M points (2M/4M optional)
Resolution:	4 point
Initial Skew:	<±15ns, depending on cable length and quality, typically with 0.5 meter coax cables

GENERAL

Voltage Range:	85 to 265V
Frequency Range:	48 to 63Hz
Power Consumption:	60W max
Display Type:	Color LCD, back-lit
Size	3.8" reflective
Resolution	320 x 240 pixels,
Interfaces:	
USB Device	1 x rear, USB device, (A type)
LAN	100/10 BASE-T
GPIB	IEEE 488.2 standard interface
Dimensions:	
With Feet	212 x 102 x 415mm (WxHxD)
Without Feet	212 x 88 x 415mm (WxHxD)
Weight:	
Without Package	3.5Kg
Shipping Weight	4Kg
Temperature:	
Operating	0 - 50°C
Storage	-40°C to + 70°C.
Humidity:	
11°C to 30°C:	85%;
31°C to 50°C:	75%
Safety:	EN61010-1, 2nd revision
Calibration:	1 year
Warranty [1]**:**	5 years standard

ORDERING INFORMATION

MODEL	DESCRIPTION
WW1071	100MS/s Single Channel Arbitrary Waveform Generator
WW1072	100MS/s Dual Channel Arbitrary Waveform Generator

OPTIONS

Option 1:	2M Memory (per channel)
Option 2:	4M Memory (per channel)

ACCESSORIES

Sync Cable:	Multi-instrument synchronization
S-Rack Mount:	19" Single Rack Mounting Kit
D-Rack Mount:	19" Dual Rack Mounting Kit
Case Kit:	Professional Carrying Bag
Note:	Options and Accessories must be specified at the time of your purchase.