

WW

WONDER WAVE
SERIES

40 Years
Celebration



MODEL WW1281A

1.2GS/s Single Channel Arbitrary Waveform Generator

- Single-channel 1.2GS/s waveform generator
- Sine wave to 400MHz and Square to 250MHz
- 12 Bit amplitude resolution
- 8M waveform memory, 16M memory, optional
- 2Vp-p into 50Ω (4Vp-p option), double into open circuit
- Square wave transition times of less than 700ps
- Two serial bits to generate complex digital strings
- FM, Arbitrary FM, FSK, PSK, and Sweep
- Multiple run modes including gated, triggered and bursts
- Powerful sequencer allowing efficient, long waveforms with multiple sequences, fast coherent segment switching and coded segment hop connector
- Trigger delay inhibits the start of the output waveform
- User friendly 3.8" color LCD display
- Two-Instrument synchronization
- LAN, USB and GPIB interfaces
- ArbConnection software for easy waveform creation

The WW1281A, Single Channel Frequency Agile Waveform Synthesizer, combines industry-leading 1.2GS/s sample clock performance, frequency agility and modulation capability in a stand-alone package. Capable of generating waveforms from 1Hz to 400MHz the WW1281A supports test stimulus demands of the information age, applications requiring clear tone separation and less than 600ps transition time.

1.2GS/s Performance

As products, which use increased signal bandwidths evolve, test equipment and systems must keep pace with this trend. The WW1281A with its high sample rate generator assures that this test tool does not lag the outbreak of new technology. Combined with unsurpassed price tag, the WW1281A is the logical choice for future test technologies.

16M Memory

The WW1281A offers 8M words of waveform memory and 16M word as an option for generating extremely long arbitrary

waveforms. In addition, the memory can be divided into as many as 16k segments, which can be looped and linked in many different ways. Harnessing such memory to the high speed performance of the WW1281A provides breakthrough solution for many applications.

Powerful Segmentation and Sequencing

Solving almost every complex application, powerful segmentation and sequencing produce a nearly endless variety of complex waveforms. The waveform memory can be divided into multiple waveform segments and sequenced in user-selectable fashion to create complex waveforms that have repeatable segments and thus saving precious memory space. Five different advance modes are available for the WW1281A to step through the sequence table, including stepped and mixed advance modes and thus increasing efficiency of the test system. In addition, a rear panel connector has 8-bit control of segment replay providing additional and extremely useful hardware tool to hop between segments.

Frequency Agility

Decrypting radio transmission often employs frequency hopping. The WW1281A provides breakthrough technology that allows simulation of 2-level decrypted code as easy as simply writing two frequencies. The frequency hop mode is fast, coherent and provides a great tool for simulating code transmission without losing speed and/or integrity.

Accurate Output

As standard, the instrument is equipped with an internal frequency reference that has 1ppm accuracy and stability over a period of 1 year. A rear-panel input for an external frequency reference is available for applications requiring greater accuracy or stability. Using the external reference input and an external controlling host computer will enhance frequency setting resolution to an amazing 9 digits of resolution.

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Modulation Capability

Agility and modulation capabilities open the way for limitless array of applications. Not only can the WW1281A generate any shape and style of waveforms, but modulations such as FM, FSK, PSK, and Sweep are easily employed without sacrificing the power of the instrument control and output run modes.

High Speed Function Generator

The WW1281A generates 10 standard waveforms such as sine, square and triangle waves. Sine and square waves can be generated at frequencies up to 400MHz, making the WW1281A one of the fastest function generators available today. The internal reference oscillator provides 1 ppm accuracy and has excellent long-term stability. An external frequency reference can be used if greater accuracy or stability is required.

Two Serial Digital Output Bits

Standard with the WW1281A are two digital outputs, placed on the rear panel and supporting applications that require simultaneous generation of analog waveforms and digital streams. The instrument's sample clock generator drives both front and rear outputs and therefore provides jitter-free simulation of analog signals combined with serial data streams. The serial data is generated from the digital outputs at baud rates up to 2.4GHz.

Automated External Self-Calibration

Usually, calibration cycles in the industry range from one to three years where instruments are sent to a service center, opened to allow access to trimmers, calibrated and certified for repeated usage. In contrast, the innovative advanced technology implemented in these systems allows calibration from any interface, USB, GPIB or LAN. Calibration factors are stored in a flash memory and thus eliminating the need to open instrument covers.

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 WW1281A 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.

Two-Instrument Synchronization

Two WW1281As can be synchronized using a Master-Slave arrangement allowing users to benefit from the same high quality performance for their multi-channel needs. This arrangement can convert two WW1281As into a two-channel system that is phase-coupled for applications such as I & Q and more.

ArbConnection

The ArbConnection software provides you with full control of instrument functions, modes and features. ArbConnection is a powerful editorial tool that allows you to easily design any type of waveform. Whether it is the built in wave, pulse or serial data composers, or the built in equation editor with which you can create your own exotic functions, with ArbConnection virtually any application is possible.

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Specification

CONFIGURATION

Output Channels 1

STANDARD WAVEFORMS

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

Frequency Range:

Sine 50Hz to 400MHz, continuous;
50 Hz to 125 MHz, triggerable.
Square 50Hz to 250MHz
All Others 50Hz to 125MHz

SINE

Start Phase: 0 to 360°

Phase Resolution: 0.1°

Harmonics Distortion, 1Vp-p (typ.):

50Hz to 2.5MHz <-50dBc
2.5MHz to 50MHz <-55dBc
50MHz to 100MHz <-50dBc
100MHz to 400MHz <-45dBc

Non-Harmonic Distortion:

50Hz to 100MHz <-70dBc
100MHz to 125MHz <-65dBc
125MHz to 400MHz <-50dBc

Total Harmonic Distortion:

DC to 100kHz <0.7% (1.5% with option 2)

Fitness (1kHz, AC):

50Hz to 200MHz <0.7dB (<1dB with option 2)
200MHz to 400MHz 5dB (6dB with option 2)

or

50Hz to 400MHz 2dB; 1Vpp Max. (option 4)

Phase Noise (8 points Sine, Max. SCLK)

100Hz Offset <-83dBc/Hz
1kHz Offset <-87dBc/Hz
10kHz Offset <-92dBc/Hz
100kHz Offset <-115dBc/Hz
1MHz Offset <-132dBc/Hz

TRIANGLE

Start Phase: 0 to 360°

Phase Resolution: 0.1°

Timing Ranges: 0%-99.9% of period

SQUARE

Duty cycle Range: 0% to 99.9%

Timing Ranges: 0%-99.9% of period

Rise/Fall time: <600ps, typ.

Aberration: <5%, typ.

SINC (Sine(x)/x)

"0 Crossings" 4 to 100 cycles

GAUSSIAN

Time Constant 10 to 200

EXPONENTIAL PULSE

Time Constant: -100 to 100

DC

Range: -1V to +1V (Double with opt. 2)

PULSE

Pulse Mode: Single or double, programmable

Polarity: Normal, inverted or complement

Period: 4ns to 1000s

Resolution: 1ns

Pulse Width: 2ns to 1000s

Rise/Fall Time:

Fast <600ps, typ.
Linear 1ns to 1000s

High Time, Delay &

Double Pulse Delay: 1ns to 1000s

Impedance: 50Ω

Amplitude Window: 50mVp-p to 2Vp-p;
50mVp-p to 4Vp-p (opt. 2)

Low Level -2V to +1.95V;
-3V to +2.95V (opt. 2)

High Level -1.95V to +2V;
-2.95V to +3V (opt. 2)

⁽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 8,000,000 to 1. With the 16M option, the ratio is extended to 16,000,000 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: 50kS/s to 1.1GS/s (typ. 1.2GS/s)

Vertical Resolution: 12 Bits

Waveform Memory: 8M points (16M optional)

Min. Segment Size: 64 points

Resolution: 16 points

No. of Segments: 1 to 10k

SEQUENCED ARBITRARY WAVEFORMS

Multi Sequence: 1 to 10, Selectable

Sequencer steps: 1 to 4k

Segment Duration: 600ns min.

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

Multi Single:

Current segment is sampled to the end of the segment. If repeats are programmed, each trigger stimulates one repeat. At the end of the repeat count, the next trigger advances to next segment

Mixed:

Control input is TRIG IN. 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: Sinewave

Carrier Frequency: 1 Hz to 400MHz

Resolution: 9 digits

Accuracy: 10 ppm

Modulation Source:

Internal FM, Arbitrary FM, Sweep
External FSK, PSK

FM

Modulating Shape: Sine, square, triangle, ramp

Modulation Freq.: 1mHz to 100kHz

Deviation Range: 100mHz to 200MHz

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Specification

ARBITRARY FM

Modulating Shape: Arbitrary waveform
Memory Size: 64k waveform points
Memory Segmentation:
No. of Segments 1 to 100
Segment Size 16 points min.
Segment Control From any of the remote interfaces or from the Coded Segment Hop connector.

Vertical Resolution:

Frequency 32 bits
Phase 16 bits

Modulating SCLK: 1 mS/s to 2.5 MS/s

FSK / PSK

Baud Rate Range: DC to 10Mbits/sec

Resolution: Frequency dependent.

Carrier Phase: 0 to 360° (Up to 125MHz)

SWEEP

Sweep Type: Linear or log
Sweep Direction: Up or down
Sweep Range: 1 Hz to 400 MHz
Sweep Time: 1 ms to 1000 s,
Resolution: 7 digits, $\pm 0.1\%$
Flatness: $\pm 3\text{dB}$

COMMON CHARACTERISTICS

FREQUENCY

Resolution: 9 digits
Accuracy/Stability: Same as reference

ACCURACY REFERENCE CLOCK

Internal	0.0001% (1 ppm 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	10 MHz TTL, 50% 2%

AMPLITUDE

Range:
Normal 50mV to 2Vp-p into 50 Ω ;
50mV to 4Vp-p into 50 Ω (opt.2)
Bypass -3dBm Min, fixed level
Resolution: 4 digits
Accuracy (1kHz): $\pm(3\% + 5\text{ mV})$

OFFSET

Range: 0 to $\pm 1\text{V}$; 0 to $\pm 2\text{V}$ (opt.2)
Resolution: 4 digits
Accuracy: $\pm(3\% + 50\text{ mV})$

FILTERS

Type: 50 MHz, 3-pole Bessel
125 MHz, 3-pole Bessel

OUTPUTS

MAIN OUTPUT

Type and Coupling:

Normal Mode Differential, normal and inverse outputs, DC coupled
Single-ended, output amplifier is bypassed, AC coupled

Bypass Mode

Connectors:

Impedance: 50 Ω nominal, each output
Protection: Protected against temporary short to case ground

SYNC / MARKER OUTPUT

Connector: Front panel SMA
Level: $>2\text{ V}$ into 50 Ω , 3V nominal into high impedance
Protection: Protected against temporary short to case ground

Type:

BIT Pulse width is 16-points wide
SCOM Pulse width is <16 points wide
LCOM Pulse starts at the beginning of the sequence and ends before the last step of the sequence;

Position:

Point 0 to n

Resolution:

16 points

SAMPLE CLOCK OUTPUT

Connector: Part of the Synchronization connector
Level: 400mVrms, nominal

DIGITAL BIT OUTPUTS (B13/B14)

DESCRIPTION: Bits 13/14 (LVPECL level) are part of the arbitrary waveform, however, can be programmed separately without any effect on the main arbitrary waveform

Connectors:

Two rear-panel SMB's

Update Frequency: 50kpps to 1200Mpps

Position and Width: Programmable

Level: LVPECL into 50 Ω

Impedance: 50 Ω , $\pm 1\%$

Protection: Protected against temporary short to case ground

INPUTS

TRIGGER INPUT

Connector: Front panel SMA
Input Impedance: 50 Ω , $\pm 2\%$
Polarity: Positive or negative
Level: $\pm 5\text{V}$, programmable
Sensitivity: 250mV
Damage Level: $\pm 8\text{V}$
Min. Pulse Width: 20ns

EXTERNAL REFERENCE INPUT

Connector: Rear panel BNC
Frequency: 10MHz
Impedance & Level:
Default 10k Ω $\pm 2\%$, TTL, 50% $\pm 2\%$
Option 50 Ω $\pm 5\%$, 0dBm Sinewave

SAMPLE CLOCK INPUT

Connector: Part of the Master/Slave connector
Input Level: 120mV rms
Impedance: 50 Ω
Range: 50kHz to 1GHz
Min. Pulse Width: 0.5ns
Damage Level: 1Vrms

SEGMENT HOPS INPUT

Connector: 9-pin DSUB, female
Segment Hops: 8-bits, 256 maximum
Hop Delay: 3 periods max
Input Level: TTL, high = true

SYNCHRONIZATION CONNECTOR

Connector: (9W5)
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 transition enables or disables generator output. Last cycle always completed
Burst: Upon trigger, outputs a Dual or multiple pre-programmed number of waveform cycles from 1 through 1M.

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TRIGGER CHARACTERISTICS

System Delay: 1 Sample Clock+ (100 ns)
Trigger Delay: 0 to 16M sample clocks
Delay Resolution: 1 sample clock

EXTERNAL

Input: Front panel SMA
Frequency: DC to 10 MHz
Threshold Level: $\pm 5V$, programmable
Damage Level: $\pm 8V$
Sensitivity: 250mV
Min Pulse Width: 20 ns
Slope: Positive or negative
Trigger Jitter: ± 1 sample clock

INTERNAL

Range: 0.1 μ s to 100s
Resolution: 4 digits, limited by 0.1 μ s
Accuracy: 0.1%
Software: Soft trigger

MANUAL

Source: Soft trigger command from the front panel or remote

FREQUENCY COUNTER / TIMER

Measurements: Frequency, Period, Averaged Period, Pulse Width and Totalize
Source: Trigger Input
Range: 20Hz to 150MHz (170MHz typ.)
Sensitivity: 500mVpp
Accuracy: 1ppm
Slope: Positive/Negative transitions
Gate Time: 100 μ Sec to 1 Sec
Input Range: $\pm 5V$
Trigger Modes: Continuous, Hold and Gated
Period Averaged
Range 6.66ns to 50ms
Resolution 8 digits / Sec
Period and Pulse Width
Range 100ns to 50ms
Resolution 12.5ns
Totalize
Range $2^{32}-1$
Overflow Led indication

MULTI-INSTRUMENT SYNCHRONIZATION

PHASE OFFSET (LEADING EDGE)

Range: 0 to 8M waveform points (16M optional)

Resolution and Accuracy:

1 waveform point
Initial Skew: $< \pm 5$ ns typ.

GENERAL

Voltage Range: 85 to 265V
Frequency Range: 48 to 63Hz
Power Consumption: 60W
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
Segment control D-sub, 9 pin
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°C - 50°C
Storage -40°C to + 70°C.
Humidity:
11°C - 30°C 85%
31°C - 40°C 75%
41°C - 50°C 45%
Safety: EN61010-1, 2nd revision
Calibration: 1 year
Warranty ⁽¹⁾: 5 years standard

ORDERING INFORMATION

MODEL	DESCRIPTION
WW1281A	1.2GS/s Single Channel Arbitrary Waveform Generator

OPTIONS

Option 1: 16M Memory (per channel)
Option 2: 4Vp-p into 50 Ω

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.

⁽¹⁾ Standard warranty in India is 1 year.