1.2GS/s Single-Channel Arbitrary Waveform / Function Generator

TABOR'S NEW WW WONDER WAVE SERIES



MODEL WW1281A

- Single-channel 1.2GS/s waveform generator
- Sine and Square wave to 400MHz
- 12 Bit amplitude resolution
- 8M waveform memory, 16M memory, optional
- 2Vp-p into 50Ω (3.5Vp-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 modulations
- 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
- Multi-Instrument synchronization
- Ethernet 10/100, USB 2.0 and GPIB interfaces
- ArbConnection software for easy waveform creation&control

The 1281A, 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 1281A supports test stimulus demands of the information age, applications requiring clear tone separation and less than 500ps transition time.

High Speed Function Generator

The 1281A 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 1281A the fastest function generator 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.

1.2GS/s Performance

As products, which use increased signal bandwidths evolve, test equipment and systems must keep pace with this trend. The 1281A's 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 1281A is the logical choice for future test technologies.

16M Memory

The 1281A 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 1281A 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 1281A 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.

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Two Serial Digital Output Bits
Standard with the 1281A 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.

Frequency Agility
Decrypting radio transmission often employs frequency hopping. The 1281A 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 loosing 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 14 digits of resolution.

Modulation Capability
Agility and modulation capabilities open the way for limitless array of applications. Not only that the 1281A can generate any shape and style of waveforms, but modulation such as FM, FSK, PSK, and Sweep are easily employed without sacrificing the power of the instrument control and output run modes.

Multi-Instrument Synchronization
Multiple 1281A 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 1281As into a two-channel system that is phase-coupled for applications such as I & Q and more.

Easy to use
Large and user-friendly 3.8" back-lit color LCD display facilitates browsing though 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: Ethernet 10/100, USB 2.0 and GPIB so one may select the interface most compatible to individual requirements. Using any of the external interfaces, controlling instrument function and features as well as downloading waveforms and sequences are 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.

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.

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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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, IVI 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.

Five-year Warranty

Every instrument from the Wonder Wave series comes with a five-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 five 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.

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Specification
1.2GS/s Single-Channel Arbitrary Waveform / Function Generator

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STANDARD WAVEFORMS

Waveforms: Sine, Triangle, Square, Pulse, Ramp, Sinc (Sine(x)/x), Gaussian Pulse, Exponential Fall, Rising Pulse, Noise, DC.
Frequency Range: Waveform dependent
Source: Internal synthesizer

SINE

Frequency Range: 50 Hz to 400 MHz, continuous; 50 Hz to 125 MHz, triggerable.
Start Phase Range: 0 to 360°

Harmonics Distortion and Spurious at 1Vpp:

DC to 10MHz	-50dBc
10 to 50MHz	-45dBc
50 to 125MHz	-40dBc
125 to 300MHz	-30dBc
300 to 400MHz	-25dBc

Total Harmonic Distortion:

DC to 100kHz	0.5%

Flatness CW (1kHz):

DC to 200MHz	0.7dB
200MHz to 400MHz	4dB

or

DC to 400MHz	1dB; 1Vpp Max. (with option 1)

Phase Noise - Internal SCLK

100Hz Offset	-83dBc/Hz
1kHz Offset	-85dBc/Hz
10kHz Offset	-85dBc/Hz
100kHz Offset	-112dBc/Hz
1MHz Offset	-132dBc/Hz

Phase Noise - External SCLK

100Hz Offset	-105dBc/Hz
1kHz Offset	-105dBc/Hz
10kHz Offset	-122dBc/Hz
100kHz Offset	-140dBc/Hz
1MHz Offset	-146dBc/Hz

TRIANGLE

Frequency Range: 50 Hz to 125 MHz
Start Phase Range: 0 to 360°

SQUARE

Frequency Range: 50 Hz to 400 MHz
Duty cycle Range: 1.0% to 99.0%
Rise/Fall time: <700 ps (typically <600 ps)
Aberration: <10%

PULSE

Frequency Range: 50 Hz to 125 MHz
Delay, Rise/Fall Time, High Time: Adjustable with resolution of 0.01% of the period interval (each independently)
Rise/Fall time: <700 ps (typically <600 ps)
Aberration: <10%

RAMP

Frequency Range: 50 Hz to 125 MHz
Delay, Rise/Fall Time: Adjustable with resolution of 0.01% of the period interval (each independently)

SINC (Sine(x)/x)

Frequency Range: 50 Hz to 125 MHz
"0 Crossings" 4 to 100 cycles

GAUSSIAN

Frequency Range: 50 Hz to 125 MHz
Time Constant 10 to 200

EXPONENTIAL PULSE

Frequency Range: 50 Hz to 125 MHz
Time Constant: -100 to 100

NOISE

Bandwidth: 250MHz

DC

Range: -2V to +2V

ARBITRARY WAVEFORMS

Sample Rate: 50 kS/s to 1.1 GS/s (typically 1.2 GS/s)
Vertical Resolution: 12 bits
Waveform Memory: 8 Meg points standard, 16 Meg points optional

MEMORY SEGMENTATION

No. of Segments: 1 to 16k
Min. Segment Size: 64 points
Resolution: 16 points size increments from 16 to 8M points (16M optional)

CODED SEGMENT HOPS

Description: Provides fast and coherent selection between segments. Output hops between segments. The same connector may be used for hopping between segments of arbitrary FM.

Source: 9-pin connector. 8 pins are for code selection and 1 is for validating the code.
Segment Hops: 8-bits, 256 maximum
Hop Delay: 3 periods max
Input Level: TTL, high = true

SEQUENCED ARBITRARY WAVEFORMS

Operation: Segments may be linked and repeated in a user-selectable order to generate extremely long waveforms. Segments are advanced using either a command or a trigger

ADVANCE MODES

Automatic Sequence Advance: No triggers required to step from one segment to the next. Sequence is repeated continuously through a pre-programmed sequence table

Stepped Sequence Advance: Current segment is sampled continuously, external trigger advances to next programmed segment. Control input is TRIG IN connector.

Single Sequence Advance: Current segment is sampled to the end of the segment including repeats and idles there. Next trigger advances to next segment. Control input is TRIG IN connector.

Multi Single Sequence Advance: 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. Control input is TRIG IN connector.

Mixed Sequence Advance: Steps are marked with advance bit. Steps with "0" bit are stepped through automatically; Steps with "1" bit wait for a trigger to advance to the next step.

Advance Source: External, Internal or software
Sequencer steps: From 1 to 4096
Segment loops: From 1 to 1 Meg
Segment Duration: Min. 400ns for more than one loop
Multi Sequence: Up to 10, selectable
Segment Size: 16 points Min.

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DIGITAL PULSE GENERATOR

Pulse State:	On/Off
Pulse Mode:	Single or double, programmable
Polarity:	Normal, inverted or complemented
Period:	64 ns minimum, programmed with 1 ns increments
Pulse Width:	5 ns minimum
Rise/Fall Time:	0 ns minimum (actual <600ps)
High Time:	0 ns minimum
Delay:	0 ns minimum
Double Pulse Delay:	0 ns minimum
Amplitude Window:	
Normal	50mVp-p to 2Vp-p
Low Level	-2V to +1.95V
High Level	-1.95V to +2V
With option 2	50mVp-p to 3.5Vp-p
Low Level	-3.5V to +3.45V
High Level	-3.45V to +3.5V

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

FREQUENCY COUNTER / TIMER

Measurements:	Frequency, Period, Avaraged Period, Pulse Width and Totalize
Source:	Trigger Input
Range:	10Hz to 100MHz (typically 120MHz)
Sensitivity:	500mVpp
Accurcay:	1ppm
Slope:	Positive/Negative transitions
Gate Time:	100µSec to 1 Sec
Input Range:	±5V
Trigger Modes:	Continious, Hold and Gated
Period Avaraged	
Range	10ns to 0.1 Sec
Resolution	8 digits / Sec
Period and Pulse Width	
Range	200ns to 400 Sec
Resolution	100ns
Totalize	
Range	10^{12}-1
Overflow	Led indication

DIGITAL 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
Update Frequency:	50kpps to 1200Mpps
Position and Width:	Programmable

COMMON CHARACTERISTICS

FREQUENCY

Resolution:	9 digits
Accuracy and Stability:	Same as reference

10MHz 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% duty cycle

AMPLITUDE

Range:	
Normal	50 mV to 2 Vp-p (3.5Vp-p with option 2), into 50Ω; 100 mV to 4 Vp-p, into high Z
Bypass	-3dBm Min, fixed level
Resolution:	4 digits
Accuracy (1kHz):	±(3% + 5 mV)

OFFSET

Range:	0 to ±1V (±1.75V with option 1)
Resolution:	4 digits
Accuracy:	±(3% + 50 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
Bypass Mode	Single-ended, output amplifier is bypassed, AC coupled
Connectors:	Two Front panel SMA's
Impedance:	50Ω nominal, each output
Protection:	Protected against temporary short to case ground

SYNC / MARKER OUTPUT

Description:	Generates sync pulse, which is synchronous with the output waveform in all functions and modes. In FM and sweep modes only, this output generates a marker at designated frequencies.
Connector:	Front panel SMA
Level:	>2 V into 50Ω, 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 less than 16 points wide;
LCOM	Pulse starts at the beginning of the sequence and ends before the last step of the sequnce;
Position:	Point 0 to n, Programmable with 16-point resolution

SAMPLE CLOCK OUTPUT

Connector:	Part of the Synchronization connector
Level:	150mV rms, nominal

DIGITAL BIT OUTPUTS B13/B14

Connectors:	Two rear-panel SMB's
Impedance:	50Ω, ±1%
Level:	LVPECL into 50Ω, terminated to +1.3V
Protection:	Protected against temporary short to case ground

INPUTS

TRIGGER INPUT

Connector:	Front panel SMA
Impedance:	50Ω, ±2%
Threshold Level:	From 0V to ±5V, programmable
Damage Level:	±8V
Sensitivity:	100mV
Min Pulse Width:	20 ns
Slope:	Positive or negative, selectable

EXTERNAL REFERENCE INPUT

Connector:	Rear panel BNC
Level&Impedance:	TTL, 10 kΩ ±2%; 0dBm, 50Ω ±2%
Duty Cycle:	50%, ±2%

SAMPLE CLOCK INPUT

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

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SEGMENT HOPS INPUT

Connector: 9-pin DSUB, female
Input Level: TTL, high = true

SYNCHRONIZATION CONNECTOR

Connector Type: (9W5)
Interconnecting Cable: Optional, consult factory at the time of purchase

MODULATION

Carrier Waveform: Sinewave
Run Modes: Continuous, Triggered, Burst and Gated
Advance Source: Automatic, triggered, burst, gated or software command
Trigger Parameters: All trigger parameters such as level, slope, jitter, etc. apply

FM

Carrier Waveform: Sine wave
Carrier Frequency: 1 Hz to 400 MHz
Modulating Waveforms: Sine, square, triangle and ramp
Modulation Source: Internal
Modulating Frequency: 1 mHz to 100 kHz
Modulating Frequency Resolution: 5 digits
Accuracy: 10 ppm
Deviation Range: 100 mHz to 398 MHz
Marker:
Output and Level Position: Same as SYNC output. Programmable for selected frequency

ARBITRARY FM

Carrier Waveform: Sine wave
Carrier Frequency: 1 Hz to 400 MHz
Modulating Waveform: Arbitrary waveform; user defined
Memory Size: 64k waveform points
Memory Segmantation:
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
Modulation Source: Internal
Modulating Waveform Sample Clock: 1 mS/s to 2.5 MS/s
Resolution: 7 digits
Accuracy: 10 ppm
Marker:
Output and Level Position: Same as SYNC output. Programmable for selected frequency

FSK

Carrier Waveform: Sine wave
Carrier Frequency: 1 Hz to 400 MHz
Modulation Source: External
Baud Rate Range: DC to 10Mbits/sec

PSK

Carrier Waveform: Sine wave
Carrier Frequency: 1 Hz to 400 MHz
Modulation Source: External
Resolution: Frequency dependent.
Carrier phase: 0 to 360° (Up to 125MHz)
Baud Rate Range: DC to 10Mbits/sec

SWEEP

Carrier Waveform: Sine wave
Sweep Type: Linear, log or Arb
Sweep Direction: Up or down
Sweep Range: 1 Hz to 400 MHz
Sweep Time: 1 ms to 1000 s,
Resolution: 7 digits, ±0.1%
Flatness: ±3dB, throughout the frequency range
Marker:
Output and Level Position: Same as SYNC output. Programmable for selected frequency

TRIGGER CHARACTERISTICS

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

EXTERNAL

Input: Front panel SMA
Frequency: DC to 10 MHz
Threshold Level: From 0V to ±5V, programmable
Damage Level: ±8V
Sensitivity: 100mV
Min Pulse Width: 20 ns
Slope: Positive or negative going edge.

INTERNAL

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

MANUAL

Source: Soft trigger command through the front panel or external interface

GATED MODE External signal enables generator. First output cyclesynchronous with the active slope of the triggering signal. Last cycle of output waveform always completed

BURST

Waveforms: Sine, Triangle, Square, Pulse, Ramp, Sinc (Sine(x)/x), Gaussian Pulse, Exponential Fall, Rising Pulse, Noise, DC.
Counted Burst Cycles: 1 to 1Meg, programmable
Source: Manual, Internal or External

MULTI-INSTRUMENT SYNCHRONIZATION

Description: Two instruments can be connected together and synchronized to provide dual-channel synchronization. Phase (leading edge) offset between master and slave units is programmable as well as trigger delay

PHASE (LEADING EDGE) OFFSET

Description: Leading edge of master output trails the leading edge of the slave output by a programmable number of points.
Range: 0 to 8Meg waveform points (16Meg optional)
Resolution and Accuracy: 1 waveform point
Initial Skew: <±5 ns typically, with the supplied synchronization cable

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GENERAL

Power Supply:	85 to 265Vac, 47-63 Hz	
Power Consumption:	60W	
Front Panel Display:	Color LCD, 3.8" reflective, 320 x 240 pixels, back-lit	
Operating temperature:	0°C - 50°C	
Humidity (non-condensing):	11°C - 30°C	85%
	31°C - 40°C	75%
	41°C - 50°C	45%
Storage temperature:	-40°C to + 70°C.	
Interface:	Ethernet 10/100, USB 2.0 and GPIB standard	
Language:	IEEE-488.2 - SCPI – 1993.0	
Dimensions:	212 x 88 x 415 mm (WxHxD)	
Weight:	Approximately 7 lb	
Safety:	EN61010-1, 2nd revision	
EMC:	CE marked. Designed to meet VDE 0411/03.81 and UL 1244	
Reliability:	MTBF per MIL-HDBK-217E, 25°C, Ground Benign	
Workmanship Standards:	Conform to IPC-A-610D	
Supplied Accessories:	Power Cord, USB cable, CD containing Operating Manual, ArbConnection software and developer libraries.	
Warranty:	5 years standard	

OPTIONS

Description:	All 1281A options are factory installed. Therefore, if you want to purchase any of the options, make sure your order specifies the required option at the time of your purchase
Format:	Options are designated by numeral digits. For example, if you require option -1 and option -3, specify 1281A-1-3
Option 1:	16M arbitrary memory. Extends the arbitrary memory from the standard 8M to 16M
Option 2:	Expands the output level limit from 2 Vp-p to 3.5 Vp-p and offset rage to ±1.75V.
Note	Output bandwidth is reduced to roughly 350 MHz and square wave rise and fall times reduced to 1 ns. Amplitude and offset accuracy and resolution remain unchanged.
Option 3:	Adds 1/(sinx)/x filter in the output bypass path. Improves flatness of the arbitrary waveform output to within 2dB to 500 MHz, continuous waveforms. Filter is active in the bypass mode only.
Option 4:	Adds 1/(sinx)/x filters in the DDS output path. Improves flatness of the CW sine to within 2dB to 400MHz, continuous waveforms. The filter affects the standard sine waveform and the modulated functions only.

ORDERING INFORMATION

MODEL	**WW1281**
1.2GS/s Single-Channel ArbitraryWaveform Generator	

OPTIONS

Option 1:	16 Meg Memory
Option 2:	Expands Output level to 3.5Vpp
Option 3:	2dB Sine flatness filter (Arb)
Option 4:	2dB Sine flatness filter (DDS)

ACCESSORIES

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.