2.1GS/s Single-Channel Arbitrary Waveform Generator

MODEL WX2181

- Single Channel 2.1GS/s waveform generator
- 1GHz sine and 500MHz square waves
- 12 Bit amplitude resolution
- 16M waveform memory, 32M memory, optional
- 2 selectable output paths:
  - 2 Vp-p into 50Ω with 600MHz bandwidth, Differential DC output
  - ±5 dBm into 50Ω with >1 GHz bandwidth, RF AC output
- AM, FM, FSK, PSK, (n)PSK, (n)QAM and Sweep modulations
- Smart trigger allows: trigger hold-off, detect <=> pulse width, as well as wait-for-waveform-end or abort waveform and restart

- Advanced sequencing scenarios define stepping, looping, and conditional jumps of waveforms or waveform sequences, including fast dynamic segments and sequences hop connector control
- Two differential markers with programmable positions, width and levels
- Two instrument synchronization
- User friendly 4" color LCD display
- Remote control through LAN, USB and GPIB
- Waveforms and instrument settings can be uploaded and stored on disk-on-key or 4GB internal flash memory
- LXI Class C compliant

The WX2181, 2.1GS/s Single Channel Arbitrary Waveform Generator, offers unrivaled performance, even when compared to instruments designed to generate fewer types of signals or higher sampling rates. Its affordable footprint saves space and cost without compromising bandwidth and signal integrity.

Universal Waveform Source
Aside from its natural ability to generate arbitrary shapes with waveform granularity of 1 point, the WX2181 can also be used as a full-featured standard, modulation or pulse generator to solve various applications. Equipped with 2.1GS/s 12-bit clock and 16M points (32M optional) memory, the WX2181 can generate literally any waveform, short or long, at frequencies up to 1GHz with 8 digits of resolution, resulting in the highest precision signal creation and regeneration without compromising signal fidelity or system integrity.

DC or AC Coupled Outputs
Have a requirement for different output paths in your lab? Great! The WX2181 offers two output amplifiers: Single or Differential ended, 2Vp-p into 50 ohms with 600MHz bandwidth,

DC coupled path for applications demanding optimized transitions and aberrations. Alternatively, you can choose a Single-ended 5 dBm AC coupled path for applications requiring bandwidth and flatness for frequencies as high as 1 GHz.

Powerful Segmentation and Sequencing
Solving almost every complex application, powerful segmentation and sequencing produces 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, jump and nest, saving you precious memory space. The WX2181 also allows you to generate up to 1000 sequence scenarios and sequence between them to generate an even higher level of flexibility in waveform creation.

Dynamic Segment / Sequence Control
Working in the real-time world and need fast waveform switching? The WX2181 has a rear panel control designed specifically for that. Having the dynamic control feature, in effect,

can serve as replacement of the sequence table where the real-time application can decide when and for how long a waveform will be generated. For much more complex applications, this same input may serve as a dynamic switch for complete sequences, creating real-life scenarios for real-time applications.

Smart Trigger
Until now, you've been forced to trigger on a specific event. Tabor's all-new SmarTrigger feature was designed to enhance the trigger capability and facilitate wider flexibility of a specific pulse event. It allows triggering on either a pulse having a larger pulse width than a programmed time value (<time), a pulse having a smaller pulse width than a programmed time value (>time), or even on a pulse having a pulse width between two limits (<>time). In addition, the SmarTrigger has a hold-off function, in which the output is held idle after the first trigger and starts a waveform cycle only with the first valid trigger after a hold-off interval has lapsed, allowing you to solve endless "negotiation" scenarios.

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Programmable Deferential Markers

The WX2181 is equipped with two programmable deferential markers. Differential simply means outstanding signal integrity for high frequencies, whereas the programmability allows you to set position, width, delay and amplitude for any required peripheral triggering need. While bench usage enables setting only one marker position, you can set multiple markers and program different marker properties for each transition instance remotely, allowing various triggering profiles.

4-Channel Capability

Need more than one or two channels to drive your application? With the WX2181 you can reach up to 4 synchronized channels system using a Master-Slave arrangement, allowing users to benefit from the same high quality performance feven formulti-channel needs.

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 eliminating the need to open instrument covers.

Easy to Use

Large and user-friendly 4" 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, ten quick-link function & run modes buttons, 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 including: Ethernet 10/100/1000, USB 2.0 and GPIB so one may select the interface most compatible to indiviSingle 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, from simple benchtop instrumention to full-featured ATE system. IVI drivers and factory support speed-up system integration, minimizing time-to-market and significantly reducing system development costs.

Multiple Environments to Write Your Code

Model 2181 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.

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, ArbConnection makes virtually any application posssible.

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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 indiviSingleized, 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 WaveXciter 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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STANDARD WAVEFORMS

Type:	Sine, triangle, square, ramp, pulse, sinc, exponential rise, exponential decay, gaussian, noise and dc.
Frequency Range:	
Sine	10 kHz to 1 GHz
Square, Pulse	10 kHz to 500 MHz
All others	10 kHz to 250 MHz
Waveform Control:	All the waveform parameters can be adjusted to specific requirements. The waveform is re-computed with each parameter change.

ARBITRARY WAVEFORMS

Sample Rate:	10 MS/s to 2.1 GS/s
Vertical Resolution:	12 bits
Waveform Memory:	16 M points standard, 32 M points optional
Min. Segment Size:	256 points
Resolution:	32 points size increments
No. of Segments:	1 to 16k
Waveform Granularity:	1 point
Dynamic control:	Software command or rear panel segment control port
Jump Timing:	Coherent or asynchronous

SEQUENCED WAVEFORMS

Operation:	Segments are grouped in a sequence table that links, loops and jumps to next in user-defined scenarios. Sequence steps are advanced on trigger events or remote commands. Each channel has its own sequence scenario
Multi Sequence:	1 to 1,000 unique scenarios
Sequencer Steps:	1 to 16k steps.
Segment Duration:	32 ns minimum step duration
Segment Loops:	1 to 1M cycles, each segment
Sequence Loops:	1 to 1M ("Once" mode only)
Step Advance Modes:	Continuous, once (x "N") and stepped

SEQUENCED SEQUENCES

Operation:	Enables the grouping of sequences into scenarios in a way that is similar to how segments are grouped in a sequence table. Each channel has its own advance sequencing generator
Sequence Scenarios:	1 Scenario
Dynamic Control:	Software command or rear panel sequence control port.

Table Length:	1 to 1k steps
Advance Control:	Continuous, once and stepped
Sequence Loops:	1 to 1,000,000 cycles

MODULATION

COMMON CHARACTERISTICS

Carrier Waveform:	Sine
Carrier Frequency:	10 kHz to 1 GHz
Modulation Source:	Internal

FM

Modulation Shape:	Sine, square, triangle and ramp
Modulation Freq.:	$(CW/6) > (M.F) > (30e^{-6} \times CW)$
Deviation Range:	CW/2

FSK / FREQUENCY HOPPING

Hop Table Size:	2 to 10,000 ($<CW \times 10.24e^{-3}$)
Hop Type:	Fast or Linear
Dwell Time Mode:	Fixed or programmable per step
Dwell Time:	100 ns to 1 Sec
Dwell Time Resolution:	100 ns

SWEEP

Sweep Type:	Linear, log or Arb
Sweep Direction:	Up or down
Sweep Time:	$(9/\text{High Freq.}) > (S.T) > (50e^9/\text{High Freq.})$

AM

Modulation Shape:	Sine, square, triangle and ramp
Modulation Freq.:	$(CW/9) > (M.F) > (CW/50e^3)$
Modulation Depth:	0.1 to 100%

ASK / AMPLITUDE HOPPING

Hop Table Size:	2 to 10,000 ($<CW \times 10.24e^{-3}$)
Hop Type:	Fast or Linear
Dwell Time Mode:	Fixed or programmable per step
Dwell Time:	100 ns to 1 Sec
Dwell Time Resolution:	100 ns
Resolution:	Maximum amplitude/4096

PSK

Carrier phase:	0 to 360°
Baud Rate Range:	100 kHz to 65 MHz

WIRELESS SIGNAL GENERATION

EVM (Error Vector Magnitude)*

	10 MS/s	20 MS/s	50 MS/s
100 MHz	0.40%	0.45%	0.5%
250 MHz	0.55%	0.65%	0.95%
500 MHz	0.65%	0.75%	0.85%
750 MHz	1.00%	1.50%	2.50%

* All the numbers refer to typical results

Test conditions:
Sample Clock Frequency = 2.1 GS/s
Sample Clock = Internal
Signal Type = IF
Modulation = QPSK
Baseband Filter = Raised Cosine
Alfa = 0.35

DIGITAL PULSE GENERATOR

Pulse State:	On/Off
Pulse Mode:	Single or double, programmable
Polarity:	Normal, inverted or complemented
Period:	2 ns to 1.6 Sec
Resolution:	500 ps
Pulse Width:	1 ns to 1.6 Sec
Rise/Fall Time	
Fast:	700 ps (typical < 600 ps)
Linear:	1 ns to 1.6 Sec
Delay:	1 ns to 1.6 Sec
Double Pulse Delay:	1 ns to 1.6 Sec
Amplitude Window:	
Range	50mVp-p to 2Vp-p
Low Level	-2V to +1.95V
High Level	-1.95V to +2V

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 16,000,000 to 1.
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 1,000,000 to 1.
3. The sum of all pulse parameters must not exceed the pulse period setting.

COMMON CHARACTERISTICS

FREQUENCY

Resolution:	8 digits
Accuracy and Stability:	Same as reference
Reference Clock:	
Internal	1 ppm from 19°C to 29°C; 1ppm/°C below 19°C or above 29°C; 1 ppm/year aging rate
External	Same as accuracy and stability of the external reference.

OUTPUTS

MAIN OUTPUTS

Coupling:	DC-coupled, or AC-coupled
Connectors:	Front panel SMAs
Impedance:	50Ω nominal, each output
Protection:	Protected against temporary short to case ground.

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DC-COUPLED

Type:	Single-ended or differential
Amplitude Range:	
Single-ended	50 mVp-p to 2 Vp-p
Differential	100 mVp-p to 4 Vp-p (Double into high impedance)
Resolution:	3 digits
Accuracy:	±(3% +5 mV), offset = 0 V
Rise/Fall Time:	600 ps, typical (10% to 90%)
Overshoot:	5%, typical
Harmonic Distortion:	-52dBc at 1 Vp-p
Non Harmonic Distortion:	-76dBc at 1 Vp-p, DC to 600MHz
Phase Noise:	>90 dBc/Hz at 1Vp-p, 10kHz offset
Offset Control:	Common mode, specified into 50Ω , levels double into high Z
Offset Range:	-1.5 V to + 1.5 V
Offset Resolution:	3 digits
Offset Accuracy:	±(5% +5 mV)

RF, AC-COUPLED

Type:	Single-ended
Amplitude Range:	-5 dBm to 5 dBm, double into high impedance
Resolution:	3 digits
Accuracy:	(3% +0.5dBm)
Bandwidth:	1 GHz
Flatness:	±1dB, typical
Harmonic distortion:	-50 dBc at 0 dBm
Non Harmonic Distortion:	-65 dBc at 0 dBm, DC to 600MHz
Phase Noise:	>90 dBc/Hz at 1Vp-p, 10kHz offset

MARKER OUTPUTS

Number of Markers:	Two markers per channel
Type:	Differential (+) and (-) outputs
Connectors:	SMB
Skew between Markers:	100 ps, typical
Impedance:	50Ω
Amplitude Voltage:	
Window	0V to 1.25 V, single-ended; 0V to 2.5 V, differential
Low level	0 V to 0.8 V, single-ended; 0 V to 1.6 V, differential
High level	0.5 V to 1.25 V, single-ended; 0 V to 2.5 V, differential
Resolution:	10 mV
Accuracy:	10% of setting
Width control:	4 SCLK to segment length
Position control:	0 to segment length in 4 points increments
Initial delay:	3.5 ns, typical (Output to marker)
Variable delay:	
Control	Separate for each channel
Range	0 to 3 ns
Resolution	10 ps
Accuracy	±(10% of setting +20 ps)
Rise/Fall Time:	1.0 ns, typical

SYNC OUTPUT

Connector:	Front panel SMA
Source:	Channel 1 or channel 2
Type:	Single ended
Waveform Type:	Pulse (32 points width), WCOM
Impedance:	50Ω
Amplitude:	1 V; doubles into high impedance
Variable Position Control:	
Range	0 to segment length
Resolution	32 points
Rise/Fall Time	2 ns, typical
Variable Width control:	
Range	32 points to segment length
Resolution	32 points

INPUTS

TRIGGER INPUT

Connector:	Rear panel SMA
Input Impedance:	10 kΩ
Polarity:	Positive, negative, or both
Damage Level:	±20 Vdc
Frequency Range:	0 to 15 MHz
Trigger Level Control:	
Range	-5 V to 5 V
Resolution	12 bit (2.5 mV)
Accuracy	±(5% of setting + 2.5 mV)
Sensitivity	0.2 Vp-p
Pulse Width:	10 ns, minimum

EVENT INPUT

Operation:	Used for branching in or out from a sequence loop. Also used for enabling or disabling the output in armed mode.
Connector:	Rear panel BNC
Input Impedance:	10 kΩ
Polarity:	Positive, negative or either
Damage Level:	±20 Vdc
Frequency Range:	0 to 15 MHz
Trigger Level Control:	
Range	-5 V to 5 V
Resolution	12 bit (2.5 mV)
Accuracy	±(5% of setting + 2.5 mV)
Sensitivity	0.2 Vp-p minimum
Pulse Width:	10 ns, minimum

SEQUENCE / SEGMENT CONTROL INPUT

Connectors:	Rear panel D-sub, 8 bit lines
Input Impedance:	10 kΩ
Input Level:	TTL

EXTERNAL REFERENCE INPUT

Connector:	Rear panel BNC
Input Frequency:	10 MHz to 100 MHz
Input Impedance:	50Ω
Input Voltage Swing:	-5dBm to 5dBm
Damage Level:	10dBm

EXTERNAL SAMPLE CLOCK INPUT

Connector:	Rear panel SMA
Input Impedance:	50Ω
Input Voltage Swing:	0dBm to 10dBm
Input Frequency:	2.0 GHz
Clock Divider:	1/1, 1/2, 1/4, … 1/256, separate for each channel
Damage Level:	15dBm

RUN MODES

Continuous	A selected output function shape is output continuously. No start commands are required to generate waveforms.
Self armed	
Armed	The output dwells on a dc level and waits for an enable command and then the output waveform is output continuously; An abort command turns off the waveform.
Triggered	A trigger signal activates a single-shot or counted burst of output waveforms and then the instrument waits for the next trigger signal.
Normal mode	The first trigger signal activates the output; consecutive triggers are ignored for the duration of the output waveform.
Override mode	The first trigger signal activates the output; consecutive triggers restart the output waveform regardless if the current waveform has been completed or not.
Gated	A waveform is output when a gate signal is asserted. The waveform is repeated until the gate signal is de-asserted. Last period is always completed.

TRIGGER CHARACTERISTICS

EXTERNAL

Source:	Channel 1, channel 2, or both
Connector:	SMA
Input Impedance:	10 kΩ
Polarity:	Positive, negative, or both
Damage Level:	±20 Vdc
Frequency Range:	0 to 15 MHz
Trigger Level Control:	
Range	-5 V to 5 V
Resolution	12 bit (2.5 mV)
Accuracy	±(5% of setting + 2.5 mV)
Sensitivity	0.2 Vp-p
Pulse Width:	10 ns, minimum
System Delay:	200 sample clock periods + 50ns, typical (Trigger to Output)

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Trigger Delay: Separate for each channel
  Range — 0 to 8,000,000 sclk periods
  Resolution — 8 points
  Accuracy — Same as sample clock accuracy
Smart Trigger: Detects a unique pulse width range
  Conditioned trigger — < pulse width, > pulse width or <>pulse width
  Pulse Width Range — 50 ns to 2 second
  Resolution — 2 ns
  Accuracy — ±(5% of setting +20 ns)
Trigger Holdoff: Ignores triggers for a holdoff duration
  Holdoff range — 100 ns to 2 second
  Resolution — 2 ns
  Accuracy — ±(5% of setting +20 ns)
Trigger jitter: 8 sampling periods

INTERNAL

Source: Common or separate
Modes:
  Timer — Waveform start to waveform start
  Delayed — Waveform stop to waveform start
Timer:
  Range — 100 ns to 2 s
  Resolution — 3 digits
  Accuracy — 100 ppm
Delay
  Range — 152 to 8,000,000 sclk periods
  Resolution — Even numbers, divisible by 8

MANUAL

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

TWO INSTRUMENTS SYNCHRONIZATION

Operation: TBD
Initial Skew: TBD
Offset Control: TBD
Clock Source: Master sample clock generator
Trigger Source: Master trigger input

GENERAL

Voltage Range: 100 VAC to 240 VAC
Frequency Range: 50 Hz to 60 Hz
Power Consumption: 150 VA
Display Type: TFT LCD, back-lit
  Size — 4 "
  Resolution — 320 x 240 pixels
Interfaces:
  USB 2.0 — 1 x front, USB host, (A type); 1 x rear, USB device, (B type)
  LAN — 1000/100/10 BASE-T
  GPIB — IEEE 488.2 standard interface
  Segment control — 2 x D-sub, 9 pin
Dimensions:
  With feet — 315 x 102 x 395 mm (WxHxD)
  Without feet — 315 x 88 x 395 mm (WxHxD)
Weight:
  Without package — 4.5 kg
  Shipping weight — 6 kg
Operating temperature: 0°C to 40°C
Storage temperature: -40°C to 70°C
Humidity: 85% RH, non condensing
Safety: CE Marked, IEC61010-1
EMC: IEC 61326-1:2006
Calibration: 2 years
Warranty: 5 years standard

ORDERING INFORMATION

MODEL	WX2181
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OPTIONS

Option 1: 32M Memory

ACCESSORIES

S-Rack mount: 19" Single Rack Mounting Kit
Case Kit: Professional Carrying Bag

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

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