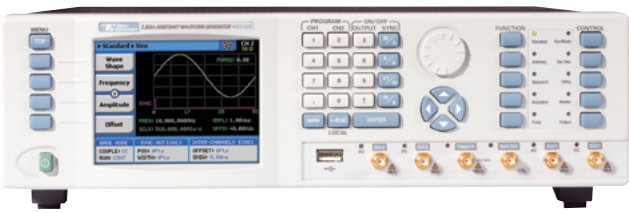
WAVEXCITER SERIES

45 YEARS OF INNOVATION



MODELS WX2181/2C

2.3GS/s Single/Dual Channel Arbitrary Waveform Generators

- Single / Dual Channel 2.3GS/s,14 Bit waveform generator, configurable as separate or synchronized channels
- Inter-channel control from -3ns to +3ns with 10ps resolution
- 1GHz sine and 500MHz square waves
- 16M waveform memory, 32M memory optional
- 3 selectable output paths:
  - 2Vp-p into 50Ω with 700MHz bandwidth, Differential DC output
  - 4Vp-p into 50Ω with 350MHz bandwidth, Differential DC output
  - -20 to +10 dBm into 50Ω with >1GHz bandwidth, RF AC output
- AM, FM, FSK, PSK, ASK, Amp. Hop, Freq. Hop, Sweep & Chirp
- Powerful pulse composer for analog, digital and mixed signals
- 32 Bit LVDS Parallel / Separate Outputs (Option D)
- Smart trigger allows: trigger hold-off, detect <=> pulse width, as well as wait-for-waveform-end or abort waveform and restart
- Advanced sequencer for step, loop, nest and jumps scenarios
- Two differential markers per channel with programmable positions, width and levels
- Two instrument synchronization to form a four-channel system
- User friendly 4” color LCD display
- Remote control through LAN, USB and GPIB
- Store/recall capability on disk-on-key or 4GB internal memory
- LXI Class C compliant

The WX2181/2C, 2.3GS/s Single / Dual 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 WX2181/2C can also be used as a full-featured standard, modulation or pulse generator to solve various applications. Equipped with 2.3GS/s 14-bit DAC and 16M points (32M optional) memory, the WX2181/2C can generate literally any waveform, short or long, at frequencies up to 1GHz with 12 digits of resolution, resulting in the highest precision signal creation and regeneration without compromising signal fidelity or system integrity.

Signal Integrity and Purity

One of the most important requirement in today’s testing and measurement applications is high signal quality. With a typical SSB phase noise of <-115dBc at 100MHz, and <-95dBc at 1GHz, at 10 kHz carrier offset and with exceptionally good SFDR of <-70dBc at 1GHz carrier, Tabor’s WX2181/2C unique platform delivers one of the best quality signals available on the market today, answering the ever-growing demand for clear and precise signals.

IQ Generation

The ability to generate IQ signals is fundamental for any RF or communication engineer. With the advanced arbitrary capabilities and highly synchronized channels, the WX is ideal for generating digital modulations. The new WX C-Series offers excellent EVM performance even at 1.8GHz IQ bandwidth with less than 1% EVM for a 16QAM modulation, making it, by far, the best performance for price IQ source available in the market today.

Common or Separate Clocks

Need a dual channel unit, a single channel unit… why choose? With the new WX2182C you can have it both ways. The WX2182C has two output channels, which can either operate independently, or synchronized to share the same sample clock source. As two separate channels, one has the advantage of having two separate instruments in one box, with each having the ability to be programmed to output different function shapes, frequency, amplitude levels and/or to operate in different run modes. Alternatively, the advantage of having two synchronized channels with less than 10ps skew and skew control is very significant in applications that require an accurate and controlled phase between the two channels, which is ideal for many X-Y modes and I&Q output applications.

MODELS WX2181/2C

2.3GS/s Single/Dual Channel Arbitrary Waveform Generators

45 YEARS OF INNOVATION

DC or AC Coupled Outputs

Have a requirement for different output paths in your lab? Great! The WX2181/2C offers two single or differential ended DC coupled and one single ended AC coupled output amplifiers: 2Vp-p into 50Ω with 700MHz bandwidth, for applications demanding optimized transitions and aberrations; 4Vp-p into 50Ω with 350MHz bandwidth, for applications demanding high voltage or -20 to +10dBm path for applications requiring bandwidth and flatness for frequencies as high as 1GHz.

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 WX2181/2C 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 WX2181/2C 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.

Pulse / Pattern Creation

Generating complex pulse trains has never been easier. The Pulse Composer is a powerful built-in tool that converts the WX2181/2C to a very sophisticated Pulse/Pattern Generator, allowing to create literally any complex pulse train / pattern, whether it's a single pulse, multi-level, linear-points, initialization or preamble pattern definition, user-defined or even standard random patterns with programmable resolution, so it doesn't matter if your application is radar communications, nanotechnology or serial bus testing, the pulse/pattern composer is the right tool for your application. Moreover, all the WX2181/2C advanced trigger modes are applicable, hence one can choose to use the "step" mode to advance every bit independently or the "once" mode to advance a complete data block in one trigger event, enabling even more applications, such as trigger, clock and data protocols.

Programmable Differential Markers

The WX2181/2C is equipped with two programmable differential markers for each output channel. 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.

Digital Outputs (Option D)

In today's world, many applications require multiple digital outputs or a parallel digital interpretation of the analog outputs. With the new digital option the WX now offers 32 programmable digital outputs, up to extra 16M of digital memory, up to 1.15Gb/s of data rate and controllable skew between outputs. Combined with Tabor's dedicated digital signal amplifier, WXD1, the WX is, by far, the best mixed signal source on the market to meet all of today's requirements.

4-Channel Capability

Need more than two channels to drive your application? With two WX2182C you can reach up to 4 synchronized channels system using a Master-Slave arrangement, allowing users to benefit from the same high quality performance even for multi-channel needs.

Easy to Use

Large and user-friendly 4" backlit color LCD display facilitates browsing through menus, updating parameters and displaying detailed and critical information for your waveform output. Combined with numeric keypad, ten quick-link function & run mode buttons, cursor position control and a dial, the front panel controls simplify the often complex operation of an arbitrary waveform generator.

Multiple Environments to Write Your Code

Model WX2181/2C 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.

MODELS WX2181/2C

2.3GS/s Single/Dual Channel Arbitrary Waveform Generators

45 YEARS OF INNOVATION

Specification

CONFIGURATION

Output Channels 1/2, Synchronized/fully separated

STANDARD WAVEFORMS

Type: Sine, triangle, square, ramp, pulse, sin(x)/x, exponential rise, exponential decay, gaussian, noise and DC.

Frequency Range:

Sine	1µHz to 1GHz
Square, Pulse	1µHz to 500MHz
All others	1µHz to 250MHz

SINE

Start Phase: 0 to 360°
PhaseResolution: 0.01°
Harmonics Distortion (typ.):

	1Vpp DC	3Vpp HV	0dBm AC
5MHz to 200MHz	<-44dBc	<-40dBc	<-40dBc
200MHz to 375MHz	<-40dBc(1)	<-40dBc(1)	<-40dBc
375MHz to 500MHz	<-35dBc(1)	<-35dBc(1)	<-50dBc
500MHz to 700MHz	<-32dBc(1)	<-32dBc(1)	<-55dBc
700MHz to 1GHz	<-70dBc(1)	<-70dBc(1)	<-70dBc

(1) Measured with 1GHz lowpass fiter

Non-Harmonics Distortion (typ.):

1MHz to 100MHz	<-80dBc
100MHz to 250MHz	<-75dBc
250MHz to 500MHz	<-70dBc
500MHz to 1GHz	<-65dBc

SSB Phase Noise (10kHz offset):

1MHz Carrier	<-120dBc/Hz
10MHz Carrier	<-118dBc/Hz
100MHz Carrier	<-115dBc/Hz
250MHz Carrier	<-108dBc/Hz
500MHz Carrier	<-100dBc/Hz
1GHz Carrier	<-95dBc/Hz

Flatness (AC Path):

Cross Range	±0.5dB

PULSE

Pulse Mode: Single or double, programmable
Polarity: Normal, inverted or complement
Period: 2ns to 1.6s
Resolution: 500ps
Pulse Width: 1ns to 1.6s
Rise/Fall Time:

Fast	
DC Path	600ps (typical < 500ps)
HV Path	1ns (typical < 900ps)
Linear	1ns to 1.6s

Delay: 1ns to 1.6s
Double Pulse Delay: 1ns to 1.6s
Amplitude:

Range	
DC Path	50mVp-p to 2Vp-p into 50Ω
HV Path	100mVp-p to 4Vp-p into 50Ω
Levels	
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.

PULSE / PATTERN COMPOSER

MULTI-LEVEL / LINEAR-POINTS

Number of Levels: 1 to 1000
Dwell Time: 500ps to 1s
Transition type: Fast or Linear
Memory: 100k
Amp. Resolution: 4 digits
Time Resolution: 500ps to 100ns (auto or user)

PATTERN

Pattern Source: PRBS or user-defined
PRBS Type: PRBS7, PRBS9, PRBS11, PRBS15, PRBS23, PRBS31, USER
Data Rate: 1Bit/s to 500MBit/s
Number of Levels: 2, 3, 4, 5
High/Low Levels: ±2V
Resolution: 4 digits
Loops: 1 to 1e6
Preamble: 1 to 16e6
Length: 2 to 16e6

ARBITRARY WAVEFORMS

Sample Rate: 10MS/s to 2.3GS/s
Vertical Resolution: 14 bits
Waveform Memory: 16M points standard, 32M points optional
Min. Segment Size: 192 points
Resolution: 16 points
No. of Segments: 1 to 32k
Waveform Granularity: 1 point
Dynamic control: Software command or rear panel segment control port
Jump Timing: Coherent or asynchronous

SEQUENCED WAVEFORMS

Multi Sequence: 1 to 1,000 unique scenarios
Sequencer Steps: 1 to 48k steps.
Segment Loops: 1 to 16M cycles, each segment
Sequence Loops: 1 to 1M ("Once" mode only)
Step Advance Modes: Continuous, once (x "N") and stepped

SEQUENCED SEQUENCES

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, square, triangle
Carrier Frequency: 10kHz to 1GHz
Modulation Source: Internal

FM

Modulation Shape: Sine, square, triangle, ramp
Modulation Freq.: 100Hz to 100MHz
Deviation Range: 10mHz to 500MHz

FSK / FREQUENCY HOPPING

FSK Baud Rate: 10mbps to 500Mbps
Hop Table Size: 2 to 256
Hop Type: Fast or Linear
Dwell Time Mode: Fixed or programmable per step
Dwell Time: 2ns to 10s
Dwell Time Res.: 2ns

SWEEP / CHIRP

Sweep Type: Linear or log
Sweep Direction: Up or down
Sweep Time: 1.4 µs to 10ms
Modulation Shape: Pulse
Pulse Repetition:

Range	200ns to 20s
Resolution	3 digits
Accuracy	100ppm

AM

Modulation Shape: Sine, square, triangle, ramp
Modulation Freq.: 100Hz to 1MHz
Modulation Depth: 0.1 to 200%

ASK / AMPLITUDE HOPPING

ASK Baud Rate: 10mbps to 500Mbps
Hop Table Size: 2 to 256
Hop Type: Fast or Linear
Dwell Time Mode: Fixed or programmable per step
Dwell Time: 2ns to 10s
Resolution 2ns

MODELS WX2181/2C

2.3GS/s Single/Dual Channel Arbitrary Waveform Generators

45 YEARS OF INNOVATION

Specification

(n)PSK and (n)QAM

Modulation Type:	PSK, BPSK, QPSK, OQPSK, PI/4 DQPSK, 8PSK, 16PSK, 16QAM, 64QAM, 256QAM and User Defined
Symbol Rate Range:	10mbps to 500Mbps
Symbol Accuracy:	1ppm
Table Size:	2 to 256

COMMON CHARACTERISTICS

FREQUENCY

Resolution:	12 digits
Accuracy/Stability:	Same as reference

ACCURACY 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 ref.

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

DC-COUPLED

Type:	Single-ended or differential
Resolution:	4 digits
Accuracy:	±(2% +2 mV), offset = 0V
Overshoot:	5%, typical

DC PATH

Rise/Fall Time:	<600ps (typical <500ps)
Amplitude Range:	
Single-ended	50mVp-p to 2Vp-p*
Differential	100mVp-p to 4Vp-p*

HV PATH

Rise/Fall Time:	1ns (typical < 900ps)
Amplitude Range:	
Single-ended	50mVp-p to 4Vp-p*
Differential	100mVp-p to 8Vp-p*

* Double into high impedance

OFFSET

Offset Range:	-1.5V to + 1.5V into 50Ω
Offset Resolution:	4 digits
Offset Accuracy:	±2% + 15mV

RF, AC-COUPLED

Type:	Single-ended
Amplitude Range:	-20dBm to +10dBm into 50Ω,
Resolution:	4 digits
Accuracy:	±(3% +0.5dBm)
Bandwidth:	1GHz

MARKER OUTPUTS

Number of Markers:	Two markers per channel
Type:	Differential (+) and (-) outputs
Connectors:	SMB
Skew Between Markers:	100ps, typical
Impedance:	50Ω
Amplitude Voltage:	
Window	0V to 1.25V, single-ended; 0V to 2.5V, differential
Low level	0V to 0.8V, single-ended; 0V to 1.6V, differential
High level	0.5V to 1.25V, single-ended; 0V to 2.5V, differential
Resolution:	10mV
Accuracy:	10% of setting
Width control:	2 SCLK to segment length;
Position control:	
Range	0 to segment length
Resolution	2 points
Initial delay:	4ns±½ clock (Output to marker)
Variable delay:	
Control	Separate for each channel
Range	0 to 3ns
Resolution	10ps
Accuracy	±(10% of setting +20ps)
Rise/Fall Time:	<1ns, typical

DIGITAL OUTPUTS (OPTION D)

Number of Bits:	32 output channels
Type:	Differential (+) and (-) outputs
Connectors:	High speed I/O receptacle, 68-pin VRDPC
Skew Between Bits:	100ps, typical
Level:	LVDS
Impedance:	100Ω
Max. Data Rate:	1.15Gb/s
Pattern Memory:	Up to 16MWord
Source	Dedicated or parallel

SYNC OUTPUT

Connector:	Front panel SMA
Source:	Channel 1 or channel 2
Type:	Single ended
Waveform Type:	
Pulse	16 points width
WCOM	Waveform complete
Impedance:	50Ω
Amplitude:	1V; doubles into high impedance
Variable Position Control:	
Range	0 to segment length
Resolution	16 points
Rise/Fall Time	2ns, typical
Variable Width control:	
Range	16 points to segment length
Resolution	16 points

INPUTS

TRIGGER INPUT

Connector:	Front panel SMA
Input Impedance:	1kΩ or 50Ω, selectable
Polarity:	Positive, negative, or both
Damage Level:	±20Vdc
Frequency Range:	0 to 15MHz
Trigger Level Control:	
Range	-5V to 5V into 50Ω; -10V to 10V into 1kΩ
Resolution	12 bit (2.5mV)
Accuracy	±(5% of setting + 2.5mV)
Sensitivity	0.2Vp-p
Min. Pulse Width:	10 ns

EVENT INPUT

Connector:	Rear panel BNC
Input Impedance:	10kΩ or 2.2kΩ pull up to +5V
Polarity:	Positive, negative or either
Damage Level:	±20Vdc
Frequency Range:	0 to 15MHz
Trigger Level Control:	
Range	-5V to 5V
Resolution	12 bit (2.5mV)
Accuracy	±(5% of setting + 2.5mV)
Sensitivity	0.2 Vp-p minimum
Min. Pulse Width:	10 ns

SEQUENCE/SEGMENT CONTROL INPUT

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

EXTERNAL REFERENCE INPUT

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

MODELS WX2181/2C

2.3GS/s Single/Dual Channel Arbitrary Waveform Generators

45 YEARS OF INNOVATION

Specification

EXTERNAL SAMPLE CLOCK INPUT

Connector:	Rear panel SMA
Input Impedance:	50Ω
Voltage Swing:	0dBm to 10dBm
Input Frequency:	10MHz to 2.3GHz
Clock Divider:	1/1, 1/2, 1/4, 1/256, separate for each channel
Damage Level:	15dBm
Input Voltage Range:	
AC	0.25Vp-p to 1Vp-p
DC	±10V max.

RUN MODES

Continuous:	A selected output function shape is output continuously.
Self Armed:	No start commands are required to generate waveforms.
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.
Burst:	Upon trigger, outputs a Dual or multiple pre-programmed number of waveform cycles from 1 through 1M.

TRIGGER CHARACTERISTICS

EXTERNAL

Source:	Channel 1, channel 2, or both
Connector:	SMA
Input Impedance:	1kΩ or 50Ω, selectable
Polarity:	Positive, negative, or both
Damage Level:	±20Vdc
Frequency Range:	0 to 15MHz
Trigger Level Control:	
Range	-5V to 5V into 50Ω; -10V to 10V into 1kΩ
Resolution	12 bit (2.5mV)
Accuracy	±(5% of setting + 2.5mV)
Sensitivity	0.2Vp-p
Pulse Width:	10 ns, minimum
System Delay:	200 SCLK periods + 50ns
Trigger Delay:	Separate for each channel
Range	0 to 8,000,000 SCLK periods
Resolution	4 points
Accuracy	Same as SCLK accuracy
Smart Trigger:	Detects a unique pulse width
Conditioned Trigger:	< pulse width, > pulse width or <>pulse width
Pulse Width Range	50ns to 2s
Resolution	2ns
Accuracy	±(5% of setting +20ns)
Trigger Hold-off:	Ignores triggers for a hold-off
Hold-off range	100ns to 2s
Resolution	2ns
Accuracy	±(5% of setting +20ns)
Trigger jitter:	4 SCLK periods

INTERNAL

Source:	Common or separate
Modes:	
Timer	Waveform start to waveform start
Delayed	Waveform stop to waveform start
Timer:	
Range	200ns to 10s
Resolution	3 digits
Accuracy	100ppm
Delay	
Range	152 to 8,000,000 SCLK periods
Resolution	Even numbers, divisible by 4

MANUAL

Source:	Soft trigger command from the front panel or remote

INTER-CHANNEL SKEW CONTROL

COURSE TUNING

Initial skew:	200ps
Control:	
Range	0 to waveform-length points
Resolution	4 points
Accuracy:	Same as SCLK accuracy

FINE TUNING

Initial skew:	200ps
Control:	
Range	-3ns to +3ns
Resolution	10ps
Accuracy:	(10% of setting + 20ps)

TWO INSTRUMENTS SYNCHRONIZATION

Initial Skew:	20ns + 0 to 8 SCLK
Offset Control:	0 to Waveform length
Offset Resolution:	4 SCLK increments
Skew Control:	-5ns to 5ns
Skew Resolution:	10ps

GENERAL

Voltage Range:	100VAC to 240VAC
Frequency Range:	50Hz to 60Hz
Power Consumption:	150VA
Display Type:	TFT LCD, 4 “, 320 x 240 pixels
Interfaces:	
USB	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	4.5kg
Shipping Weight	6kg
Temperature:	
Operating	0°C to 40°C
Storage	-40°C to 70°C
Humidity:	85% RH, non condensing
Safety:	CE Marked, IEC61010-1
EMC:	IEC 61326-1:2006
Calibration:	2 years
Warranty [1]:	5 years standard

ORDERING INFORMATION

MODEL	DESCRIPTION
WX2181C	2.3GS/s Single Channel Arbitrary Waveform Generator
WX2182C	2.3GS/s Dual Channel Arbitrary Waveform Generator

OPTIONS

Option 1:	32M Memory (per channel)
Option D:	32 Bits / Digital Outputs
Option 520D:	Tek AWG520 Hardware and Firmware Emulator

ACCESSORIES

Sync Cable:	Multi-instrument synchronization
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.

[1] Standard warranty in India is 1 year.