



- Single / Dual Channel 1.25GS/s,14-Bit waveform generator, configurable as separate or synchronized channels
- Inter-channel control from -3ns to +3ns with 10ps resolution
- 500MHz sine and 350MHz square waves
- 16M waveform memory, 32M memory optional
- 3 selectable output paths:
  - 2Vp-p into 50Ω with 500MHz bandwidth. Differential DC output
  - 4Vp-p into 50Ω with 350MHz bandwidth, Differential DC output
  - -20 to +10 dBm into  $50\Omega$  with >500MHz bandwidth, RF AC output
- AM, FM, FSK, PSK, ASK, Amp. Hop, Freq. Hop, Sweep & Chirp
- · Powerful pulse composer for analog, digital and mixed signals

# 1.25GS/s Single/Dual Channel Arbitrary Waveform Generators

- 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 WX1281/2C, 1.25GS/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 WX1281/2C can also be used as a full-featured standard, modulation or pulse generator to solve various applications. Equipped with 1.25GS/s 14-bit DAC and 16M points (32M optional) memory, the WX1281/2C can generate literally any waveform, short or long, at frequencies up to 500MHz 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 <-100dBc at 500MHz, at 10 kHz carrier offset and with exceptionally good SFDR of <-70dBc at 500MHz carrier, Tabor's WX1281/2C unique platform delivers one of the best quality signals available on the market today, answering the ever-growing demand for clear and precise signals.

#### **Common or Separate Clocks**

Need a dual channel unit, a single channel unit... why choose? With the new WX1282C you can have it both ways. The WX1282C 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.

#### **DC or AC Coupled Outputs**

Have a requirement for different output paths in your lab? Great! The WX1281/2C offers two single or differential ended DC coupled and one single ended AC coupled output amplifiers: 2Vp-p into  $50\Omega$  with 500MHz bandwidth, applications for demanding optimized transitions aberrations; 4Vp-p into 50Ω with 350MHz bandwidth, for applications demanding high voltage or -20 to +10dBm path for applications requiring bandwidth flatness for frequencies as high as 500MHz.



1.25GS/s Single/Dual Channel Arbitrary Waveform Generators



#### **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 WX1281/2C 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 WX1281/2C 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 holdoff 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 WX1281/2C 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 WX1281/2C 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 WX1281/2C 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 WX1282C 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 WX1281/2C 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.

#### **ArbConnection**

ArbConnection is a powerful software package that allows you to easily design any type of waveform and control the instrument functions, modes and features via a graphical user interface (GUI). Whether you need to generate output using a built-in waveform, a hand sketched or played back waveform, a pulse pattern, a serial data string, a modulated carrier or even an equation, ArbConnection provides you the editing tools which makes virtually any application possible.







### **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 500MHz Square, Pulse 1µHz to 350MHz All others 1µHz to 125MHz

#### SINE

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

 1Vpp<sup>6</sup> 3Vpp<sup>HV</sup> 0dBm<sup>AC</sup>

 5MHz to 200MHz
 <-44dBc</td>
 <-40dBc</td>
 <-40dBc</td>

 200MHz to 325MHz
 <-50dBc<sup>(1)</sup> <-50dBc</td>
 <-50dBc</td>
 <-50dBc</td>

 325MHz to 425MHz
 <-60dBc<sup>(1)</sup> <-60dBc<sup>(1)</sup> <-70dBc</td>
 <-70dBc</td>
 <-70dBc</td>

 425MHz to 500MHz
 <-70dBc<sup>(1)</sup> <-70dBc</td>
 <-70dBc</td>
 <-70dBc</td>
 <-70dBc</td>

) Measured with 500MHz lowpass fiter

Non-Harmonics Distortion (typ.):

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

SSB Phase Noise (10kHz offset):

 1MHz Carrier
 <-120dBc/Hz</td>

 10MHz Carrier
 <-118dBc/Hz</td>

 100MHz Carrier
 <-115dBc/Hz</td>

 250MHz Carrier
 <-108dBc/Hz</td>

 500MHz Carrier
 <-100dBc/Hz</td>

Flatness (AC Path):

Cross Range ±0.5dB (typ.)

#### **PULSE**

Pulse Mode: Single or double, programmable Polarity: Normal, inverted or complement

Period: 4ns to 1.6s Resolution: 1ns Pulse Width: 2ns to 1.6s

Rise/Fall Time:

Fast

DC Path 700ps (typical < 600ps) HV Path 1ns (typical < 900ps)

Linear 2ns to 1.6s **Delay:** 2ns to 1.6s **Double Pulse Delay:** 2ns to 1.6s

Amplitude:

Range

DC Path 50mVp-p to 2Vp-p into  $50\Omega$  HV Path 100mVp-p to 4Vp-p into  $50\Omega$ 

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
Transition type: Fast or Linear
Dwell Time: 1ns to 1s
Memory: 100k
Amp. Resolution: 4 digits

**Time Resolution:** 1ns to 100ns (auto or user)

#### **PATTERN**

PRBS or user-defined PRBS Type: PRBS7, PRBS9, PRBS11,

PRBS15, PRBS23, PRBS31,

ISER

Data Rate: 1Bit/s to 250MBit/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 1.25GS/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 500MHz

Modulation Source: Internal

#### FΜ

**Modulation Shape:** Sine, square, triangle, ramp **Modulation Freq.:** 100Hz to 50MHz

**Deviation Range:** 100Hz to 250MHz

#### **FSK / FREQUENCY HOPPING**

FSK Baud Rate: 10mbps to 250Mbps

**Hop Table Size:** 2 to 256 **Hop Type:** Fast or Linear

**Dwell Time Mode:** Fixed or programmable per step

**Dwell Time:** 4ns to 10s

**Dwell Time Res.:** 4ns

#### 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 250Mbps

**Hop Table Size:** 2 to 256 **Hop Type:** 2 to 256 Fast or Linear

**Dwell Time Mode:** Fixed or programmable per step

**Dwell Time:** 4ns to 10s Resolution 4ns







### **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 250Mbps

Symbol Accuracy:1ppm 2 to 256 Table Size:

**COMMON CHARACTERISTICS** 

**FREQUENCY** 

Resolution: 12 digits

Accuracy/Stability: Same as reference

**ACCURACY REFERENCE CLOCK** 

1 ppm from 19°C to 29°C; Internal

1ppm/°C below 19°C or above 29°C; 1 ppm/year

aging rate

Same as accuracy and External

stability of the external ref.

**OUTPUTS** 

**MAIN OUTPUTS** 

DC-coupled, or AC-coupled Coupling: 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

 $\pm$ (2% +2 mV), offset = 0V Accuracy:

Overshoot: 5%, typical

DC PATH

Rise/Fall Time: <700ps (typical <600ps)

**Amplitude Range:** 

50mVp-p to 2Vp-p\* Single-ended 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  $50\Omega$ 

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: 500MHz

**MARKER OUTPUTS** 

Number of Markers: Two markers per channel

Differential (+) and (-) outputs Type:

Connectors: Skew Between

Markers: 100ps, typical

Impedance: 50Ω

Amplitude Voltage:

Window OV to 1.25V, single-ended;

OV to 2.5V. differential Low level OV to 0.8V, single-ended; OV to 1.6V. differential

High level 0.5 V to 1.25V, single-ended; OV to 2.5V, differential

10mV

Resolution: Accuracy: 10% of setting

Width control: 2 SCLK to segment length

Position control:

0 to segment length Range

Resolution 2 points

Initial delay: 4ns±1/2 clock (Output to marker)

Variable delay:

Separate for each channel Control

Range 0 to 3ns Resolution 10ps

Accuracy  $\pm$ (10% of setting +20ps)

Rise/Fall Time: <1ns, typical

**DIGITAL OUTPUTS (OPTION D)** 

Number of Bits: 32 output channels

Differential (+) and (-) outputs Type: Connectors: High speed I/O receptacle,

68-pin VRDPC

Dedicated or parallel

Skew Between Bits: 100ps, typical

Level: LVDS Impedance: 100Ω 625Mb/s Max. Data Rate: Pattern Memory: Up to 16MWord

Source

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:

0 to segment length Range

Resolution 16 points Rise/Fall Time 2ns, typical Variable Width control:

Range 16 points to seament length

Resolution 16 points

**INPUTS** 

TRIGGER INPUT

Connector: Front panel SMA Input Impedance: 1kΩ or 50Ω. selectable Polarity: Positive, negative, or both

Damage Level: Frequency Range: 0 to 15MHz

**Trigger Level Control:** -5V to 5V into  $50\Omega$ ; Range

-10V to 10V into 1kΩ

12 bit (2.5mV) Resolution

Accuracy  $\pm$ (5% of setting + 2.5mV)

Sensitivity 0.2Vp-p

Min. Pulse Width: 10 ns

**EVENT INPUT** 

Connector: Rear panel BNC

Input Impedance:  $10k\Omega$  or  $2.2k\Omega$ , pull up to +5VPolarity: Positive, negative or either

Damage Level: Frequency Range: 0 to 15MHz Trigger Level Control:

-5V to 5V Range Resolution 12 bit (2.5mV)

±(5% of setting + 2.5mV) Accuracy 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

-5dBm to 5dBm Voltage Swing:

Damage Level: 10dBm







### **Specification**

#### **EXTERNAL SAMPLE CLOCK INPUT**

Connector: Rear panel SMA

Input Impedance: 500

Voltage Swing: 0dBm to 10dBm Input Frequency: 10MHz to 1.25GHz Clock Divider: 1/1, 1/2, 1/4, 1/256, separate for each channel

**Damage Level:** 15dRm 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. 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**

Gated:

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:** 

-5V to 5V into  $50\Omega$ ; Range -10V to 10V into  $1k\Omega$ Resolution 12 bit (2.5mV)

 $\pm$ (5% of setting + 2.5mV) Accuracy

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

Accuracy ±(5% of setting +20ns) Trigger Hold-off: Ignores triggers for a hold-off

Hold-off range 100ns to 2s

Resolution

Accuracy ±(5% of setting +20ns) Trigger jitter: 4 SCLK periods

#### **INTERNAL**

Source: Common or separate Modes: Waveform start to waveform start Timer Delayed Waveform stop to waveform start Timer:

Range 200ns to 10s Resolution 3 digits Accuracy 100ppm

Delay

152 to 8,000,000 SCLK periods Range Even numbers, divisible by 4 Resolution MANUAL

Accuracy:

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 (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 IEEE 488.2 standard interface

**GPIB** 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
WX1281C	1.25GS/s Single Channel Arbitrary Waveform Generator
WX1282C	1.25GS/s Dual Channel Arbitrary Waveform Generator
OPTIONS	
Option 1: Option D:	32M Memory (per channel) 32 Bits / Digital Outputs
ACCESSORIES	
Sync Cable: S-Rack Mount: Case Kit:	Multi-instrument synchronization 19" Single Rack Mounting Kit Professional Carrying Bag
Note:	Options and Accessories must be specified at the

time of your purchase.



<sup>(1)</sup> Standard warranty in India is 1 year.