The new Signal Expert Series sets new standards for high speed arbitrary waveform generators. With an analog bandwidth of nearly 7 GHz, the new Signal Expert Series can reach frequencies much higher than its sampling rate. Combining this vast analog bandwidth with multi Nyquist zone operation, the Signal Expert series is capable of solving applications well beyond baseband and into the microwave frequencies. This new technology combined with advanced arbitrary and sequencing capabilities, excellent spectral purity, configurable output modules, and advanced triggering make the new Signal Expert Series the highest performing and most cost effective AWG of its class and even beyond.

**Configurable Outputs Option**
Different applications require different output paths. This is why the Signal Expert Series offers a selection of various factory configured output modules. Each output module offers a different amplifier path, utilizing benefits which would match your specific application need. For example, the High Voltage module, which offers 2Vpp into 50Ω but is limited in bandwidth, is utilized for various time domain applications, while for applications that require faster rise time and higher bandwidth, one can order the DC output module, which offers 1.2Vpp with <100ps rise time and 3GHz bandwidth. The default configuration is the direct DAC output path which offers 540mVpp, <85ps rise time and 4GHz bandwidth. Other output modules will be made available soon, so feel free to share with us your requirements so that we can try and meet your application needs.

**Signal Integrity and Purity**
One of the most important requirement in today's test and measurement applications is high signal quality. With a typical SSB phase noise of <-120dBc at 100MHz, 10 kHz carrier offset and with exceptionally good SFDR of <-70dBc at 1GHz carrier, Tabor's Signal Expert Series' 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 SE is ideal for generating digital modulations. The new Signal Expert 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 or a single channel unit... why choose? With the new Signal Expert Series you can have it all. The Signal Expert Series has up to two output channels, which can either operate independently, or synchronized to share the same sample clock source. As separate channels, one has the advantage of having up to 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 synchronized channels with less than 10ps skew and skew control is very significant in applications that require an accurate and controlled phase between the channels, which is ideal for many X-Y and I&Q output 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), 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.

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 Signal Expert 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.

Programmable Differential Markers
The Signal Expert series is equipped with two programmable differential markers per 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.

Pulse / Pattern Creation
Generating complex pulse trains has never been easier. The Pulse Composer is a powerful built-in tool that converts the Signal Expert Series 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 Signal Expert Series 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.

Dynamic Segment / Sequence Control
Working in the real-time world and need fast waveform switching? The Signal Expert series 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.

Multiple Environments to Write Your Code
The Signal Expert Series comes with a complete set of drivers, allowing you to write your application in various environments including Labview, CVI, C++, VB, Python and MATLAB. You may also link the supplied dll to other Windows-based API's or use low-level SCPI commands to program the instrument, regardless of whether your application is written for Windows, Linux or Macintosh operating systems.

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.

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 tool which makes virtually any application possible.

Visit our website at www.taborelec.com
### 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: 1Hz to 2.5GHz  
- Square, Pulse: 1Hz to 1.25GHz  
- All others: 1Hz to 300MHz

#### Pulse

**Pulse Mode**: Single or double, programmable

**Polarity**: Normal, inverted or complement

**Period**:  
- DC/DAC Module: 800ps to 1.6s  
- HV Module: 4ns to 1.6s

**Resolution**:  
- DC/DAC Module: 200ps  
- HV Module: 1ns

**Pulse Width**:  
- DC/DAC Module: 200ps to (1.6s-200ps)  
- HV Module: 2ns to (1.6s-2ns)

**Rise/Fall Time**:  
- Fast  
- DC/DAC Module: 200ps (typical < 150ps)  
- HV Module: 600ps (typical < 500ps)  
- Linear  
- DC/DAC Module: 200ps to (1.6s-200ps)  
- HV Module: 1ns to (1.6s-1ns)

**Delay**:  
- DC/DAC Module: 200ps to (1.6s-200ps)  
- HV Module: 1ns to (1.6s-1ns)

**Double Pulse Delay**:  
- DC/DAC Module: 1ns to 1s  
- HV Module: 200ps to 1s

**Amplitude Range**:  
- DAC Module: 50mVp-p to 0.54Vp-p into 50Ω  
- DC Module: 50mVp-p to 1Vp-p into 50Ω  
- HV Module: 50mVp-p to 2Vp-p into 50Ω

**High/Low Levels**:  
- DAC Module: -0.27 to +.27 V  
- DC Module: -0.75 to +0.75 V  
- HV Module: -1.5 to +1.5 V

#### 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 32,000,000 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**: 400ps to 1s
- **Transition type**: Fast or Linear
- **Memory**: 100k
- **Amp. Resolution**: 4 digits
- **Time Resolution**: 200ps 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 1GBit/s

**Number of Levels**: 2, 3, 4, 5

**High/Low Levels**: ±0.75V, ±1.5V

**Resolution**: 4 digits

**Loops**: 1 to 16e6

**Preamble**: 1 to 16e6

**Length**: 1 to 16e6

#### Arbitrary Waveforms

**Sample Rate**: 50MS/s to 5GS/s

**Vertical Resolution**: 12 bits

**Waveform Memory**: 32M/64M points optional

**Min. Segment Size**: 364 points

**Resolution**: 36 points

**No. of Segments**: 1 to 32k

**Waveform Granularity**: 1 point

**Dwell Time**: 1ns to 10s

**Jump Timing**: Coherent or asynchronous

#### Sequenced Waveforms

**Multi Sequence**: 1 to 1,000 unique scenarios

**Sequencer Steps**: 3 to 49,152 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

#### Sweep / Chirp

**Range**: 200ns to 20s

**Resolution**: 3 digits

**Accuracy**: 100ppm

#### AM

**Modulation Shape**: Sine, square, triangle, ramp

**Modulation Freq.**: 100Hz to 100MHz

**Modulation Depth**: 0 to 200%

#### ASK / Amplitude Hopping

**ASK Baud Rate**: 100mbps to 1Gbps

**Hop Table Size**: 2 to 256

**Hop Type**: Fast or Linear

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

**Dwell Time**: 1ns to 10s

**Dwell Time Res.**: 1ns

#### Common Characteristics

**Frequency**

- Resolution: 12 digits
- Accuracy/Stability: Same as reference

**Accuracy Reference Clock**

- Internal: 1 ppm from 19°C to 29°C; 1 ppm/year aging rate
- External: Same as accuracy and stability of the external ref.

**Outputs**

**Type of output**: Single-ended or differential

**Impedance**: 50Ω typical

**Connectors**: Front panel SMAs
DC-coupled

Amplitude control\(^{(2)}\)

- Range, single-ended: 400 mV to 540 mV
- Range, differential: 800 mV to 1080 mV
- Resolution: 4 digits
- Accuracy, (offset = 0 V): ±(1% + 5 mV)
- RMS Jitter (typical): <1ps
- Phase Noise (typical, @10kHz): -120 dBc/Hz
- Bandwidth (3 dB): 4 GHz
- IMD\(^3\): -70 dBc

Harmonics\(^{(8)}\) (typical)

- Up to 650 MHz: <65 dBc
- 650 MHz to 2.5 GHz: <65 dBc

SFDR (NRZ Mode, typical)

- Up to 625 MHz: <80 dBc
- 625 MHz to 1.5 GHz: <65 dBc
- 1.5 GHz to 2.5 GHz: <60 dBc

DAC OUTPUT MODULE (DEFAULT)

Coupling: AC-coupled

Amplitude control\(^{(2)}\)

- Range, single-ended: 400 mV to 540 mV
- Range, differential: 800 mV to 1080 mV
- Resolution: 4 digits
- Accuracy, (offset = 0 V): ±(2% +15 mV)
- Rise/Fall Time (20% to 80%): 500ps
- Overshoot: 5%, typical
- Phase Noise (typical, @10kHz): -115 dBc/Hz
- Bandwidth (3 dB, typical): 600 MHz (calculated)
- Harmonic distortion\(^{(8)}\): <42 dBc
- Non harmonic distortion\(^{(8)}\): <70 dBc

NOTES:

1. The unused output must be terminated with 50Ω to ground
2. Specified into 50Ω, levels double into high impedance
3. Calculated bandwidth for NRZ mode
4. 400 MHz±1 MHz Arbitrary Mode, DAC, NRZ Mode with 4.992 GS/s clock
5. Amplitude=540 mVp-p, offset=0 V, SCLK=4.5 GS/s, arbitrary 32 points sine waveforms, typical values
6. 1 Vp-p, Offset=0 V, SCLK=5 GS/s, sine waveform, typical values measured using balun
7. Amplitude=1 Vp-p, offset=0 V, SCLK=4.5 GS/s, arbitrary 32 points sine waveforms, typical values
8. Exceeding the amplitude window is allowed but may cause excessive signal distortion
9. Amplitude=1 Vp-p, offset=0 V, SCLK=4 GSs, 40 points sine waveform (100 MHz output frequency)
10. 540 mVp-p, Offset=0 V, SCLK=5 GS/s, sine waveform, typical values measured using balun

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 1.25V, 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:
- Accuracy: ±(5% of setting + 2.5mV)
- Sensitivity: 0.2 Vp-p

Min. Pulse Width: 40 ns

SYNC OUTPUT

Connector: Front panel SMA

Source: Channel 1 or channel 2

Type: Single ended

Waveform Type:
- Pulse: 32 points
- WCOM: Waveform complete

Impedance: 50Ω

Amplitude: 1.2 V typical; doubles into high impedance

Variable Position Control:
- Range: 0 to (segment length-32)
- Resolution: 32 points

Variable Width control:
- Range: 32 points to (segment length-32)
- Resolution: 32 points

REFERENCE CLOCK OUTPUT (OPTION)

Connector: Rear panel BNC

Frequency: 100 MHz if using internal reference, 10MHz or 100MHz if using external reference

Output impedance: 50Ω, typical

Output voltage: 1 Vp-p

INPUTS

TRIGGER INPUT

Connector: Front panel SMA

Input Impedance: 10kΩ 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)

Min. Pulse Width: 10 ns

EVENT INPUT

Connector: Rear panel BNC

Input Impedance: 10kΩ typical

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
### Speciation

#### SEQUENCE/SEGMENT CONTROL INPUT
- **Connectors:** Rear panel D-sub, 8 bit lines, per channel
- **Switching Rate:** 20ns + waveform duration minimum
- **Input Impedance:** 10kΩ, typical
- **Input Level:** TTL

#### EXTERNAL REFERENCE INPUT
- **Connector:** Rear panel BNC
- **Input Frequency:** 10/20/50/100 MHz, programmable
- **Input Impedance:** 50Ω
- **Voltage Swing:** 0dBm to 10dBm, per channel
- **Input Level:** 0 to 8,000,000 SCLK periods
- **Resolution:** 8 points
- **Accuracy:** Same as SCLK accuracy
- **Smart Trigger:** Detects a unique pulse width, > pulse width or <> pulse width
- **Conditioned Trigger:** Pulse Width Range: 10ns to 2s
- **Resolution:** 2ns
- **Accuracy:** ±5% of setting + 20ns
- **Trigger Hold-off:** Ignores triggers for a hold-off of 100ns to 2s
- **Resolution:** 2ns
- **Accuracy:** ±5% of setting + 20ns
- **Trigger Jitter:** 8 SCLK periods

#### EXTERNAL SAMPLE CLOCK INPUT
- **Connector:** Rear panel SMA
- **Input Frequency:** 10kHz to 5GHz, per channel
- **Clock Divider:** 1/1, 1/2, 1/4, 1/64, separate for each channel
- **Input Impedance:** 10dBm

#### 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 of 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
- **System Delay:** Separate for each channel
- **Trigger Delay:** Range 0 to 8,000,000 SCLK periods
- **Resolution:** 8 points
- **Accuracy:** Same as SCLK accuracy
- **Smart Trigger:** Detects a unique pulse width, > pulse width or <> pulse width

#### INTERNAL
- **Source:** Common or separate
- **Modes:** Timer Waveform start to waveform start
- **Delay:** Waveform stop to waveform start
- **Resolution:** 2ns
- **Accuracy:** ±5% of setting + 20ns
- **Delay:** 100pm
- **Resolution:** Even numbers, divisible by 8
- **Accuracy:** ±5% of setting + 20ns

#### MANUAL
- **Source:** Soft trigger command from the front panel or remote

### INTER-CHANNEL SKEW CONTROL

#### COARSE TUNING
- **Initial skew:** 200ps
- **Control:** Range 0 to waveform-length points; 0 to 80 points with external segment control
- **Resolution:** 8 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 16 SCLK

### 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);
  - LAN 1 x rear, USB device, (B type)
  - GPIB IEEE 488.2 standard interface
  - Segment control 2 x D-sub, 9 pin
- **Dimensions:**
  - With Feet: 315 x 102 x 425 mm (WxHxD)
  - Without Feet: 315 x 88 x 425 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
- **EMC:** IEC 61326-1:2006
- **Warranty:** 5 years standard of your purchase.

### ORDERING INFORMATION

#### MODEL
- **DESCRIPTION**
- SE5082 5GS/s Dual Channel Arbitrary Waveform Generator

#### OPTIONS
- **64M Memory (per channel)**
- **Reference clock output**
- **High Voltage output module**
- **DC coupled output module**

#### ACCESSORIES
- **Sync Cable:** Multi-instrument synchronization
- **S-Rack Mount:** 19" Single Rack Mounting Kit
- **Case Kit:** Professional Carrying Bag

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