Model 2411B

ARBITRARY WAVEFORM GENERATORS

- **Very High-Fidelity - 0.005 % Waveform Distortion**
- **16-Bit (0.0015 %) Resolution**
- **0.1 S/s to 2 MS/s Adjustable Sample Rate**
- **4 Fully-Programmable Sync Outputs**
- **20 Standard Waveforms**
- **64 k Waveform Memory**
- **Stores 100 Custom Waveforms**
- **Summing Input**
- **RS-232C**
- **Options**
  - **1000 Step Sequence Generator**
  - **WaveWorks™ Pro+ Waveform Creation Software**
  - **GPIB Communications**
  - **Rack Mount Kit**

Signal Integrity

Waveforms will always be consistent and repeatable because the 2411B is a true arb. It uses the raster scan technique with sequential addressing of waveform memory and a variable sample clock rate to adjust the output frequency. Other generators use phase accumulator-based addressing, which can skip or repeat waveform data points. The typical THD (total harmonic distortion plus noise) of the 2411B is -86 dB making it ideal for applications requiring wide dynamic range signals.

16-Bit True AWG

Comprehensive Features

The 2411B has outstanding performance, offering 16-bit vertical resolution and over 64 k of horizontal memory. Standard or arbitrary waveforms are created through the front panel or optional WaveWorks™ Pro+ software. The adjustable sample clock ranges from 0.1 S/s to 2 MS/s. The 2411B's superior fidelity and wide dynamic range make it ideal for applications involving high precision, low voltage or signal amplification. Some applications include micro miniature machine stimulation (MEMS), sensor simulations, sonar, automatic airbag triggering, multi-tone audio signals, cardiac and respiratory device testing.

Function Generator Simplicity

Keypad access to 20 standard waveforms, with adjustable parameters, provides function generator simplicity for general lab applications. For custom signal applications, up to 100 unique waveforms may be defined and stored in waveform memory using the keypad or optional WaveWorks™ Pro+ software. All programmed waveforms are available for recall and editing from the front panel, RS-232C, or GPIB (optional) interfaces.

Programmable Synchronous Outputs

Each 2411B is equipped with four independently controlled, synchronous outputs.

Sync outputs allow external instruments, including additional 2411B units, to be hardware triggered by waveform events. Because each output is fully programmable, multiple sync pulses can be defined at any width or location within waveform memory. Hardware sync is more precise than software sync, enhances system performance, and reduces development time.

Facilitates the Design of Complex Test Systems

The RS-232C and optional IEEE-488.2 offer direct, easy, programming. The 2411B has numerous triggering and timing inputs/outputs for precise, multi-phase operation of several instruments. Up to four slave arbs may be triggered by a single master 2411B. With four sync outputs available from each slave (16 total outputs), numerous instruments can be simultaneously triggered by a single waveform event. Further expansion is limited only by propagation delay.

Extensive User Tools

Expand the 2411B's memory up to 30,000 times with the optional sequence generator. Each sequence program can have up to 1,000 steps, which can link to any of the 2411B's 100 user-defined waveforms. Each waveform may be looped up to one million times per step. Up to one hundred unique sequence programs may be stored in the sequencer's non-volatile memory.

WaveWorks™ Pro+ software (optional) is a total software solution for importing, exporting, creation and editing waveform data in up to seven formats including the common ASCII formats .CSV, and .PRN. See the WaveWorks™ Pro+ data sheet for more information.

Warranty

The Model 2411B is backed by a full 3-year warranty and TEGAM's 30-day no risk trial.

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Specifications

Output Waveforms

Up to 100 High-definition custom waveforms, Sine, Square, Triangle, ±Sawtooth, DC, ±Pulse, ±Exponential, AM, SCM, FM, Lin/Log Sweep, Sin x/x (Sinc), Gaussian, Haversine, Circle, Noise.

Four programmable sync signals per waveform.

Sequence Generator (Optional)

Waveform:	Transient-free Loop-and-Link
Repetitions:	Loop: 1,048,575 times
	Link: 100 waveforms
Program:	1000 Steps total
File:	100 Sequences

Waveform

Storage:	100
Resolution:	Horizontal Points: 65,504 max
	Vertical Points: 16 bits, 65,536
	(+32,767,-32,768)
Sample Rate:	0.1 Hz to 2 MHz (10 s to 500 ns)
	4-digit resolution
	±50 ppm accuracy
Transition Time:	< 150 ns

(Tested with square wave, filter off, 10 Vp-p, 50 Ω termination.).

Spectral Purity: (THD + Noise): -86 dB typical

(Tested with 80 kHz measurement bandwidth, 2 MHz clock, 2 kHz sine wave, 1000 points, filter on, full amplitude, 50 Ω termination.)

Amplitude and Offset

Range	Resolution	Accuracy
±1.00 to 10 V	10 mV	1 % of setting + 20 mV
±100 mV to 999 mV	1 mV	3 % of setting + 5 mV
±10 mV to 99.9 mV	100 µV	5 % of setting + 1 mV

Note: 50 Ω source impedance, measured at open circuit tested with l kH sinewave plus DC offset.

Analog Filter

User-selectable 700 kHz 7th order, 40 kHz 3rd order

Operational Modes

Continuous, Triggered, Gated, Burst (1 to 1,048,575), Toggled, Hold, RTS (Return to start)

Outputs

Main Output:	Front-panel/50 Ω impedance
Sync Outputs:	SYNC 1-SYNC; 4 All fully programmable addresses & widths.
SYNC 1 OUT:	Front-panel (TTL)/50 Ω
SYNC 2 OUT:	Rear panel BNC (TTL)
SYNC 3 OUT:	Rear panel BNC (TTL)
SYNC 4 OUT:	Rear panel BNC (TTL)
CLOCK IN/OUT:	Rear panel sample clock I/O (TTL)
REF IN/OUT:	Rear panel internal or external 10 MHz reference (TTL).
Sync Trigger Out:	Rear-panel BNC (TTL) for multiple unit operation.

Inputs

SUM IN:	SUM IN allows external signal to be added to output. Gain = +1 open circuit at 10 kΩ input Z.
TRIG IN:	Rear-panel TTL trigger input for triggered, gated, toggled, and burst modes.
CLOCK IN:	Rear-panel sample clock input (TTL, ≤ 4 MHz).
REF IN:	Rear-panel 10 MHz reference input. The internal crystal-controlled oscillator will phase-lock to the input.
HOLD IN:	Rear-panel TTL input to stop waveform.
RTS IN:	Rear-panel TTL input to initiate RTS mode.

Trigger Sources

Internal Trigger:	0.02 to 10 seconds
Manual Trigger:	Front-panel button
Ext. Trigger Input:	Rear-panel BNC connector

Creation Tools (Internal)

Waveform Editing:	Point Mode, Line Mode, Vertex Mode; Insert Function, Sum Function, Dump Function, Digital Amplitude/Offset, Smooth, Copy/Paste, Waveform Math (A+B, A-B, AxB).
Pointing Device:	Front-panel keys and knob.
Software:	WaveWorks™ Pro+ (Optional)

Stored Settings

Setups:	20 instrument settings

Computer Interface

RS-232C:	19.2 kBaud, max.
GPIB:	IEEE Std. 488.2-1987 (Optional)

General

Temperature Range:	23 ºC +/-3 ºC (73.4 ºF +/-5.4 ºF) for specified accuracy
Operates:	0 ºC to +50 ºC (32 ºF to +122 ºF)
Storage:	-20 ºC to +60 ºC (-4 ºF to +140 ºF)
Dimensions:	25.8 X 11.5 X 30 cm W x H x D (10.14 in X 4.53 in X 11.81 in)
Weight:	5.0 kg (11 lb)
Power:	55 VA; 45 W (max) 100/120/220/240 VAC, +5 %, -10 %; 48 to 63 Hz.

NATIONAL INSTRUMENTS

LabVIEW Driver available.

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