

Data Sheet

Arbitrary/Function Waveform Generators 4075B Series



Point-by-Point Signal Integrity

The 4075B Series Arbitrary/Function Waveform Generators are versatile high-performance single- and dual-channel arbitrary waveform generators with large arbitrary memory depth. The instruments provide variable output voltages from 0 to 10 Vp-p into 50 ohms or up to 20 Vp-p into open circuit and a continuously variable DC offset that allows the output to be injected directly into circuits at the correct bias level.

These generators combine the benefits of DDS (direct digital synthesis) and true AWG (arbitrary waveform generator) architectures without the limitations of either. Standard waveforms such as sine, square, and triangle are generated with a DDS chip, delivering great frequency resolution at a low cost. Custom arbitrary waveform generation is implemented with a true point-by-point design, offering improved signal integrity by producing significantly less jitter and distortion compared to a DDS-only architecture. This point-by-point

generation capability allows these instruments to be used for simulating reliable clock signals, generating triggers, or validating serial data buses.

Additionally, these generators can be used with B&K Precision's waveform editing software WaveXpress to create complex arbitrary waveforms.

Extensive features such as internal or external AM, FM, and FSK modulation along with versatile sweep capabilities and variable edge pulse generation make these generators suitable for a wide range of applications.

Features

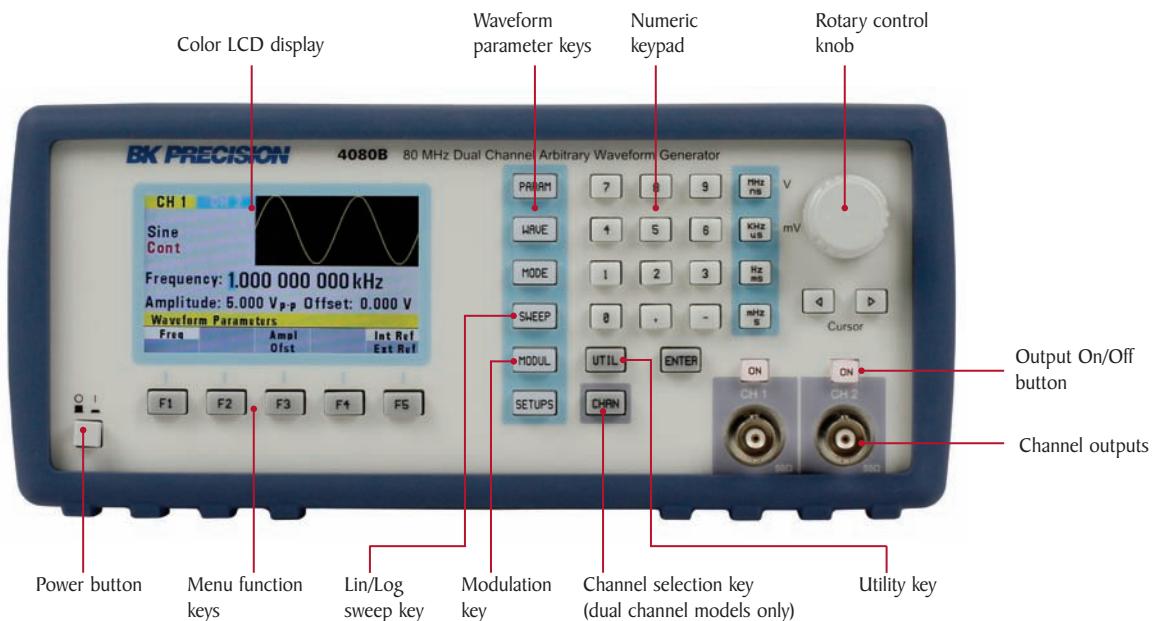
- 14-bit, 200 MSa/s, 16 Mpts arbitrary waveform generator
- Generate sine waveforms up to 80 MHz
- Bright color LCD display
- Linear and logarithmic sweep
- AM/FM/FSK modulation
- Variable DC offset
- Adjustable duty cycle
- Output ON/OFF button
- Internal/external triggering
- Gate and burst mode
- Fully programmable markers
- Store/recall up to 49 instrument settings
- Standard USBTMC interface (all models) and GPIB interface (50 MHz & 80 MHz models only) supporting SCPI commands
- Closed case calibration
- Short circuit protection for resistive and capacitive loads on outputs and overvoltage protection on inputs

Model	4075B	4078B	4076B	4079B	4077B	4080B
Channels	1	2	1	2	1	2
Sine frequency range	1 µHz – 30 MHz		1 µHz – 50 MHz		1 µHz – 80 MHz	
Square frequency range	1 µHz – 30 MHz		1 µHz – 50 MHz		1 µHz – 60 MHz	
Arbitrary waveform length	1 Mpts		4 Mpts		16 Mpts	



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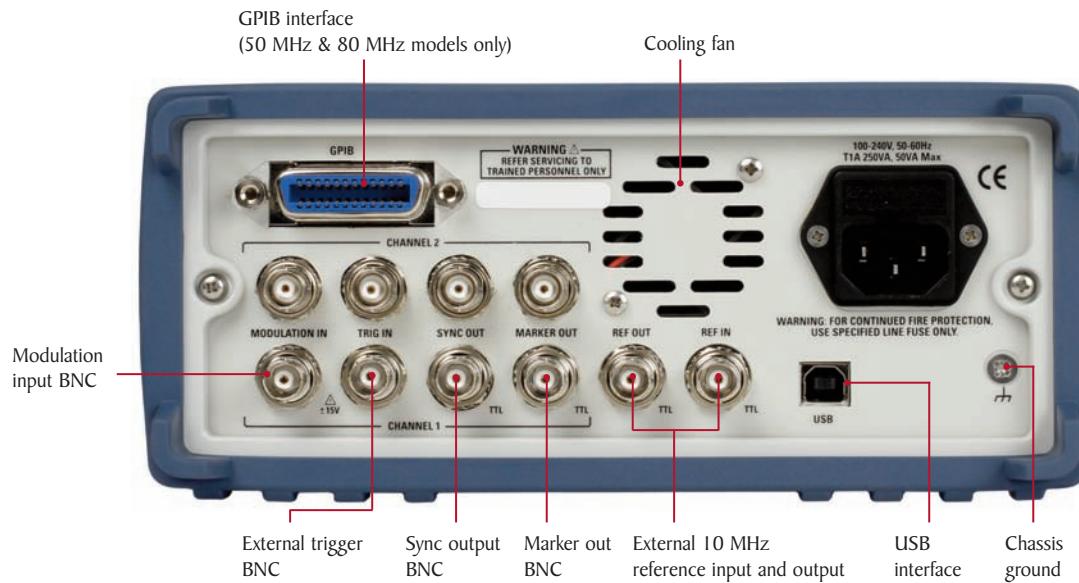
Front panel



Intuitive user interface

Easily change all waveform parameters using the intuitive menu-driven front panel keypad, control knob, and easy-to-read LCD. Convenient waveform and range selection buttons let users make quick and precise adjustments to the output signal.

Rear panel



Multi-unit/channel synchronization and external triggering

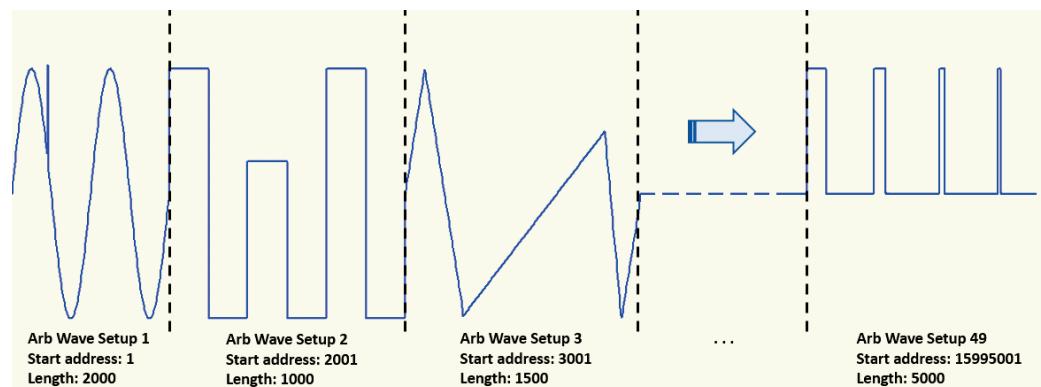
Use the built-in 10 MHz external reference input and output, external trigger input, and programmable marker output to synchronize multiple units or channels. The generator can be connected with another generator or to an external 10 MHz clock for precise phase adjustment. The Sync output connector can be used to generate a positive TTL pulse output on each waveform cycle. An external trigger input connector is also available to trigger the instrument via an external TTL signal.

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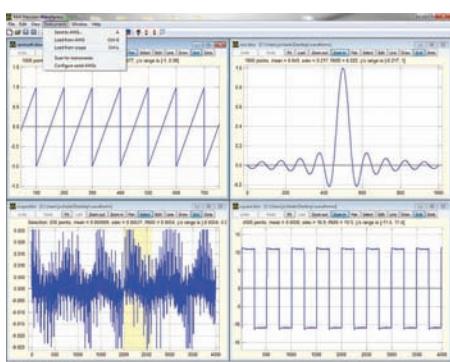
Versatile arbitrary waveform generation

Flexible memory management

The 4075B Series gives users more freedom by allowing the flash memory to be allocated via start address and length parameter setups. For instance, a model 4080B user could generate one large 16M-point waveform or up to 49 different waveform setups totaling 16 Mpts in one memory bank. Up to eight non-volatile memory banks are available to store arbitrary waveforms with 14-bit vertical resolution.



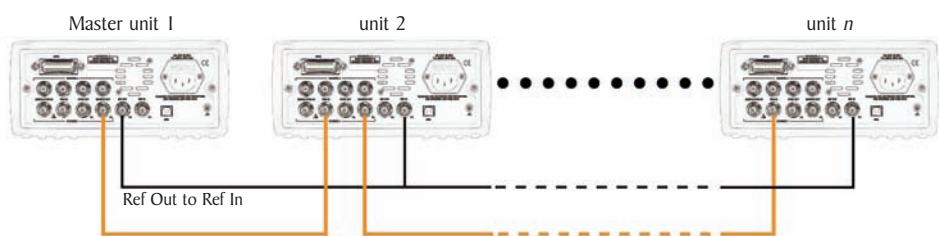
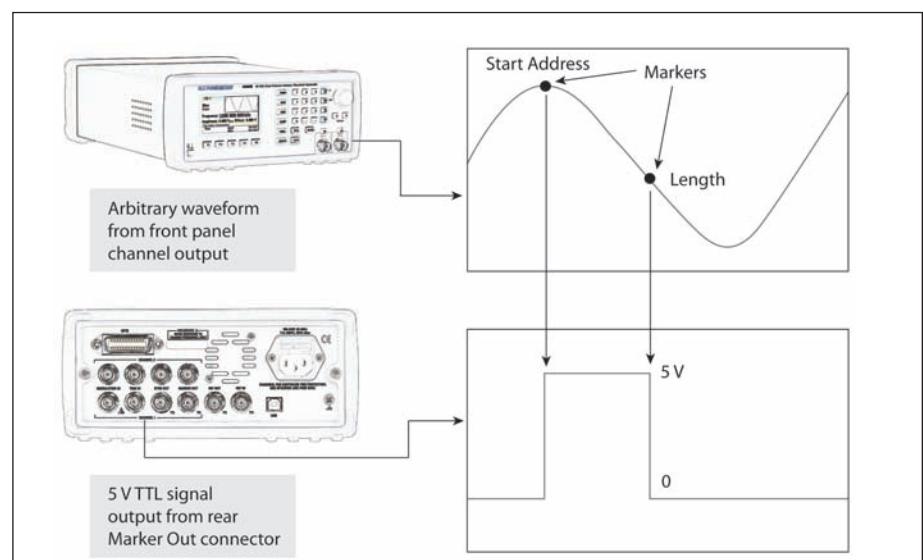
Waveform creation tools



WaveXpress software

From the front panel, waveforms can be defined from scratch by entering data point-by-point or by loading and modifying predefined waveforms. The WaveXpress waveform editing software is also provided for users to easily generate, edit, and upload custom arbitrary waveforms to the generator via the remote interface. Create waveforms in the software by importing a text file or define via freehand, point draw, and waveform math functions.

Programmable markers



Multi-unit/channel synchronization

The 4075B Series provides fully programmable markers that allow you to generate a positive TTL level output signal at the points specified by address and length up to 4000 points. It could be used for applications requiring triggering at specific points in the arbitrary waveform for precise synchronization between two signals, e.g. simulation of a real world 3-phase AC network where one of the phases is degraded.

Easy noise generation

Conveniently add noise to your waveform directly from the front panel and precisely adjust the scale of the noise amplitude. This feature allows you to choose between generating a noise waveform and adding noise to an existing waveform.

Specifications

Model	4075B	4078B	4076B	4079B	4077B	4080B
Channels	1	2	1	2	1	2
Maximum frequency	30 MHz		50 MHz		80 MHz	
Waveforms						
Standard	Sine, Square, Triangle/Ramp, Pulse					
Built-in arbitrary	Sine, Triangle, Square, Noise, Ramp Up, Ramp Down, Sine(X)/X, Exponential Up, Exponential Down, Gaussian					
User-defined arbitrary	1 Mpts x 8 memory banks per ch	4 Mpts x 8 memory banks per ch	16 Mpts x 8 memory banks per ch			
Operating Modes & Modulation Types						
Operating modes	Continuous, Triggered, Burst, Gated					
Modulation types	AM, FM, FSK					
Sine						
Frequency range	1 µHz to 30 MHz		1 µHz to 50 MHz		1 µHz to 80 MHz	
Resolution	1 µHz, up to 12 digits					
Amplitude flatness (relative to 1 kHz)						
$f_{\text{OUT}} \leq 1 \text{ MHz}$	$\pm 0.2 \text{ dB}$					
$f_{\text{OUT}} \leq 50 \text{ MHz}$	$\pm 1.0 \text{ dB}$					
$f_{\text{OUT}} \leq 80 \text{ MHz}$	$\pm 2.0 \text{ dB}$					
Harmonic distortion (typical)						
$f_{\text{OUT}} \leq 100 \text{ kHz}$ (10 Hz - 100 kHz)	-65 dBc					
$f_{\text{OUT}} \leq 5 \text{ MHz}$ (100 kHz - 5 MHz)	-45 dBc					
$f_{\text{OUT}} \leq 80 \text{ MHz}$ (5 MHz - 80 MHz)	-35 dBc					
Spurious						
$f_{\text{OUT}} \leq 1 \text{ MHz}$ (DC - 1 MHz)	-60 dBc					
$f_{\text{OUT}} < 20 \text{ MHz}$ (1 MHz - 20 MHz)	-50 dBc					
Phase noise ($f_{\text{OUT}} = 10 \text{ MHz}$)						
10 kHz offset	-110 dBc/Hz					
Square						
Frequency range (Square)	1 µHz to 30 MHz		1 µHz to 50 MHz		1 µHz to 60 MHz	
Rise & Fall time	< 5 ns (10% to 90%) at full amplitude into 50Ω					
Duty Cycle	20% to 80% to 10 MHz, 40% to 60% to 30 MHz, 50% > 30 MHz					
Asymmetry (50% duty cycle)	1% of period $\pm 5 \text{ ns}$					
Aberrations	< 5% + 50 mV					
Jitter	< 70 ps rms (typical)					
Ramp & Triangle						
Frequency range	1 µHz to 5 MHz					
Resolution	1 µHz, up to 12 digits					
Symmetry	1 uHz to 500 kHz: 0%-100%, 500 kHz to 2 MHz: 10%-90%, 50% > 2 MHz					
Linearity	< 0.1% of peak output (1 µHz to 250 kHz)					
Pulse						
Frequency range	1 mHz to 25 MHz					
Resolution	1 µHz					
Pulse width	20 ns minimum, 10 ns resolution, 999 s max					
Variable edge time	< 5 ns (Fast setting) to pulse period (!)					
Jitter	< 50 ps rms (typical)					

Arbitrary Waveform Generators
4075B Series

Specifications (cont.)

Model	4075B	4078B	4076B	4079B	4077B	4080B
Arbitrary Waveform Characteristics						
Waveform Length	2 points to 1,048,576 points		2 points to 4,194,304 points		2 points to 16,777,216 points	
Sampling Rate		200 MSa/s, point execution rate adjustable from 5 ns – 100 s				
Vertical Resolution			14 bits (16,384 levels)			
Noise			Add 1% to 100% to output arbitrary waveform			
Bandwidth			100 MHz max (2-point waveform length)			
Frequency			Accuracy: $\pm 0.002\%$, Resolution: 4 digits or 1 ps			
Rise and Fall Time			< 5 ns (typical)			
Jitter			< 50 ps rms (typical)			
Output Characteristics						
Signal Output						
Output Impedance			50 Ω (typical)			
Output Protection			Protected against short circuit or accidental voltage applied to the main output connector ⁽²⁾			
Amplitude						
Range			10 mV to 10 Vp-p into 50 Ω			
Resolution			4 digits (9,999 counts)			
Units			Vpp, Vrms, or dBm			
Accuracy			$\pm 1\% \pm 20$ mV of the programmed output value from 1 V – 10 V, $\pm 1\% \pm 1$ mV of the programmed output value from 50 mV – 999 mV			
DC Offset						
Range			± 4.99 Vpk into 50 Ω			
Resolution			1 mV with 4 digits resolution			
Units			VDC			
Accuracy			$\pm 1\% \pm 10$ mV into 50 Ω			
Frequency						
Accuracy			± 10 ppm for DDS waveform, ± 20 ppm for arbitrary mode			
Phase			-180 to +180 degrees with 0.1 degree resolution			
Modulation Characteristics						
Amplitude Modulation (AM)						
Carrier			Sine, Square, or Triangle			
Source			Internal, External			
Internal Modulation			0.01 Hz - 20 kHz			
Depth			0% to 100%			
Frequency Modulation (FM)						
Carrier			Sine, Square, or Triangle			
Source			Internal, External			
Internal Modulation			0.01 Hz - 20 kHz			
Deviation			1 μ Hz to max frequency / 2			
Frequency-shift Keying (FSK)						
Carrier			Sine, Square, or Triangle			
Source			Internal, External			
Rate			≤ 1 MHz			

Specifications (cont.)

Model	4075B	4078B	4076B	4079B	4077B	4080B
Sweep Characteristics						
Sweep Shape				Linear and Logarithmic, up or down		
Sweep Time				10 ms to 500 s		
Sweep Trigger				Internal, External, Continuous, or Burst		
Burst Characteristics						
Waveforms				Sine, Square, Triangle, Pulse, Arb		
Count				1-999,999 cycles		
Trigger Source				Manual, Internal, External		
Inputs and Outputs						
Trigger IN				TTL Compatible Maximum rate: 20 MHz Minimum width: 20 ns Input impedance: 10 kΩ nominal		
Sync OUT				TTL pulse at programmed frequency, 50 Ω impedance		
Modulation IN				5 Vp-p for 100% modulation 10 kΩ input impedance DC to 50 kHz bandwidth		
Marker OUT				Positive TTL pulse, user programmable in arbitrary waveform, 50 Ω impedance		
External Reference OUT				10 MHz clock for synchronization, TTL, 50 Ω impedance		
External Reference IN				10 MHz from an external source, >1 kΩ impedance		
Internal Trigger						
Repetition				1 µs to 100 s (0.01 Hz – 1 MHz)		
Resolution				4 digits		
Accuracy				± 0.002%		
General						
Display Resolution				400 x 240 dots		
Remote Interface	USB (USBTMC-compliant)			USB (USBTMC-compliant) and GPIB		
Storage Memory				50 full panel settings at power-off, including last working setup		
Dimensions (W x H x D)				213 mm x 88 mm x 300 mm (8.4" x 3.5" x 12")		
Weight				3 kg (6.6 lbs)		
AC Input				100 - 240 V ±10%, 50 - 60 Hz ±5% (<40 VA)		
Temperature				0° C to +50° C (operating) -20° C to +70° C (non-operating)		
Humidity				95% RH, 0° C to 30° C 75% RH to 40° C 45% RH to 50° C		
EMC				According to EN55011 for radiated and conducted emissions		
Electrical Discharge Immunity				According to EN55082		
Safety Specifications				According to EN61010, CE approved		
Three-Year Warranty						
Included Accessories				Power Cord, Manual on CD, USB Type A to Type B Cable, Certificate of Calibration		

(1) Depending on pulse width.

(2) Output turns off automatically when an overload is applied. The instrument can tolerate shorts to ground indefinitely.