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.

Applications

These generators are suitable for applications such as electronic design, sensor simulation, functional test, or generation of I/Q modulated signals.

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	

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

Dual-channel models

- Both channels offer full functionality and all parameters can be set independently
- Synchronize the phase of both channels with the push of a button

WaveXpress™ Compatible

For more information, visit www.bkprecision.com/WaveXpress

Technical data subject to change
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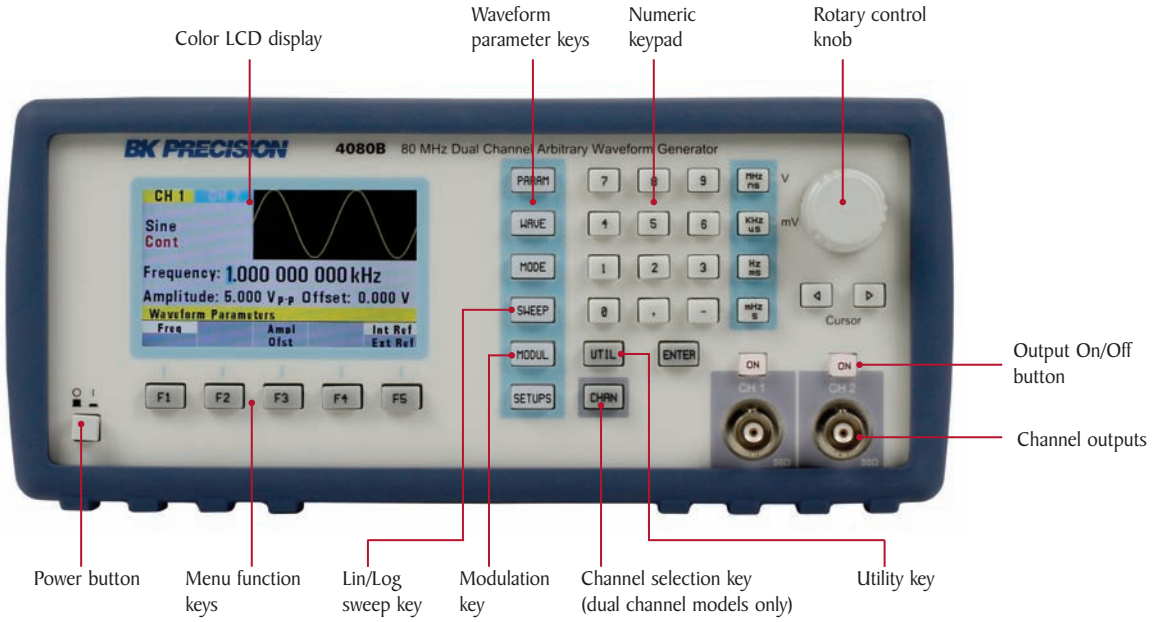
B&K PRECISION ELECTRONIC TEST INSTRUMENTS

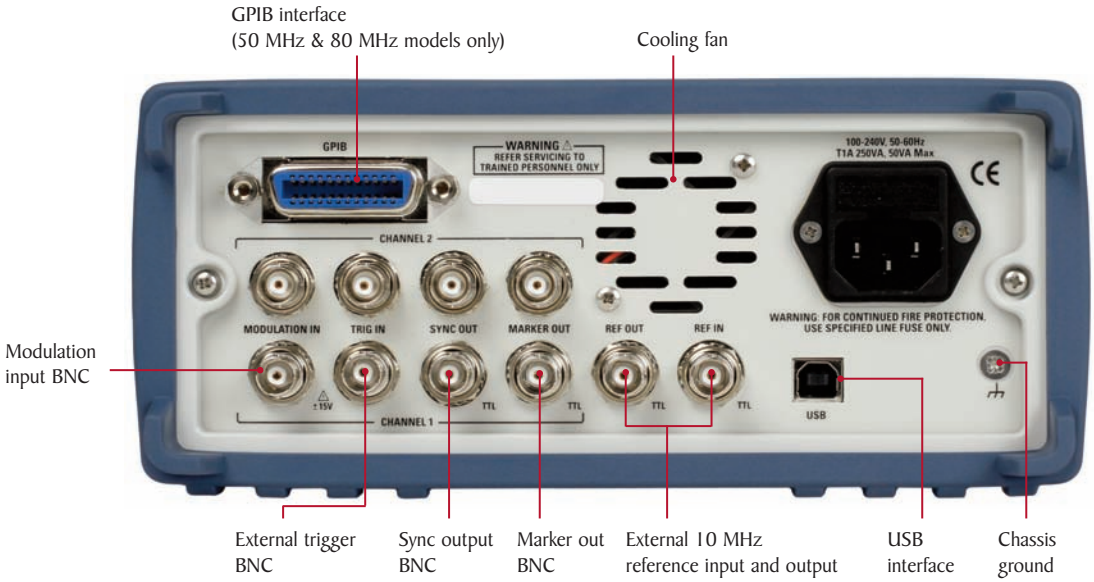
Front panel



Extensive modulation functions
The generators provide AM, FM, and FSK modulation schemes along with combined AM plus FM capabilities. Users can also simulate analog VCOs and VCAs by inputting a voltage to the external modulation input.

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



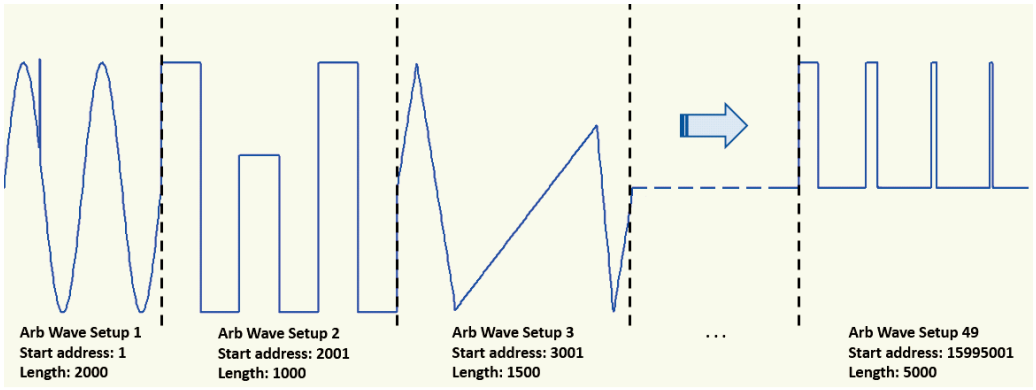
SCPI-compliant programming
The generators can be programmed remotely via the USB and GPIB interface using SCPI commands.

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.

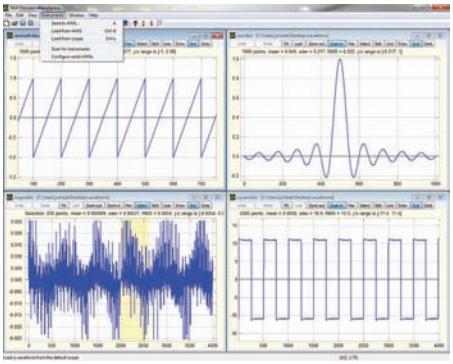
Versatile arbitrary waveform generation

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



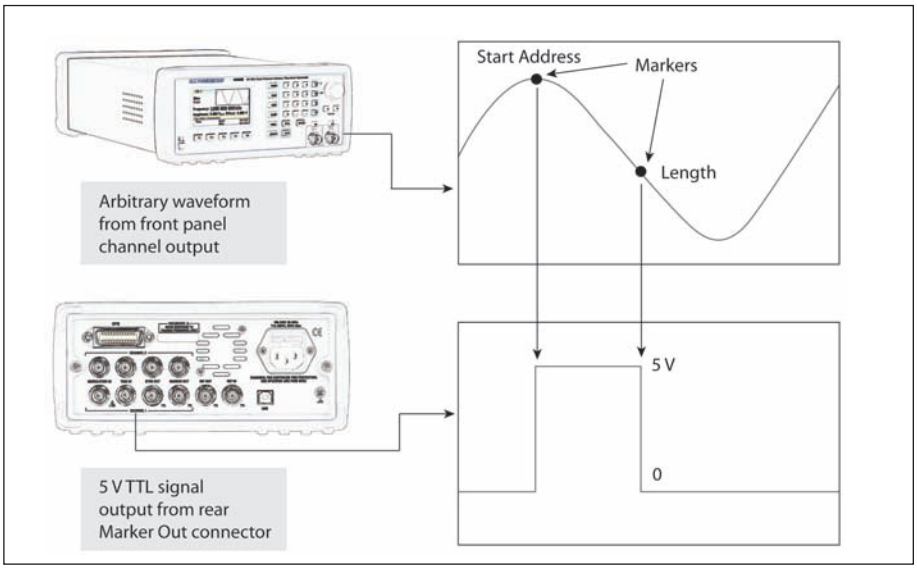
WaveXpress software

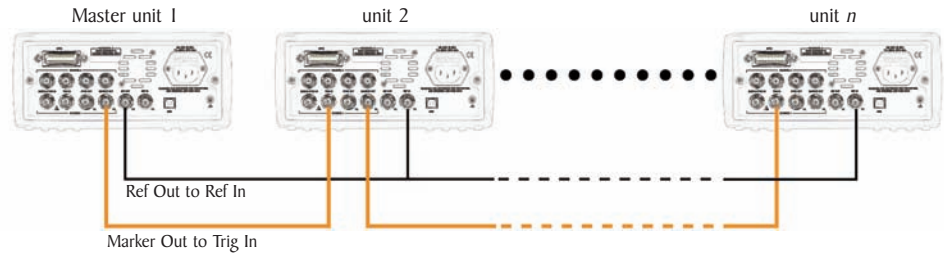
From the front panel, waveforms can be defined from scratch by entering data point-by-point or by loading and modifying predefined waveforms. The WaveXpress waveform editing software is also provided for users to easily generate, edit, and upload custom arbitrary waveforms to the generator via the remote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

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.

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.

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)						
$f_{OUT} \leq 1$ MHz	± 0.2 dB					
$f_{OUT} \leq 50$ MHz	± 1.0 dB					
$f_{OUT} \leq 80$ MHz	± 2.0 dB					
Harmonic distortion (typical)						
$f_{OUT} \leq 100$ kHz (10 Hz -100 kHz)	-65 dBc					
$f_{OUT} \leq 5$ MHz (100 kHz - 5 MHz)	-45 dBc					
$f_{OUT} \leq 80$ MHz (5 MHz - 80 MHz)	-35 dBc					
Spurious						
$f_{OUT} \leq 1$ MHz (DC - 1 MHz)	-60 dBc					
$f_{OUT} < 20$ MHz (1 MHz - 20 MHz)	-50 dBc					
Phase noise (f_{OUT} =10 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 50 Ω					
Duty Cycle	20% to 80% to 10 MHz, 40% to 60% to 30 MHz, 50% > 30 MHz					
Asymmetry (50% duty cycle)	1% of period ± 5 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 (1)					
Jitter	< 50 ps rms (typical)					

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: ± 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	± 1% ± 20 mV of the programmed output value from 1 V – 10 V, ± 1% ± 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	± 1% ± 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 μHz 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.