

## Data sheet

# 25 MHz Arbitrary / Function Generators

## Models 4075 & 4078



4075



4078

### Industry Leading Performance

Models 4075 and 4078 are versatile high performance function/arbitrary waveform generators with the largest arbitrary memory depth in their class. The generators combine the ability to produce nearly any conceivable arbitrary waveform with accuracy and precision and a DDS architecture offering easy to use conventional function generator capabilities. Arbitrary waveforms have 14 bit amplitude resolution, 100MSa/s sample rate and up to 400,000 points length. Waveforms can be output in continuous, triggered, gated or burst modes. Front panel operation is straightforward and user-friendly. The instruments can be remotely controlled using SCPI-compliant commands via RS232.

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 including electronic design, sensor simulation, functional test or generation of I/Q modulated signals.

### Common Features & Benefits

- 14-bit, 100 MSa/s, 400 k point Arbitrary Waveform Generator
- 25 MHz Sine / 25 MHz Square waveforms
- Predefined Pulse, Ramp, Triangle, Noise, Sin (X)/X, Exponential and Gaussian waveforms
- AM, FM and FSK modulation
- 10 mVpp to 10 Vpp into 50  $\Omega$
- Large graphical LCD shows a detailed output waveform representation
- Fully programmable markers
- Fully protected output
- Closed case calibration
- Arbitrary waveform editing software included
- SCPI compliant command set
- Optional GPIB versions available

### Dual Channel Model 4078

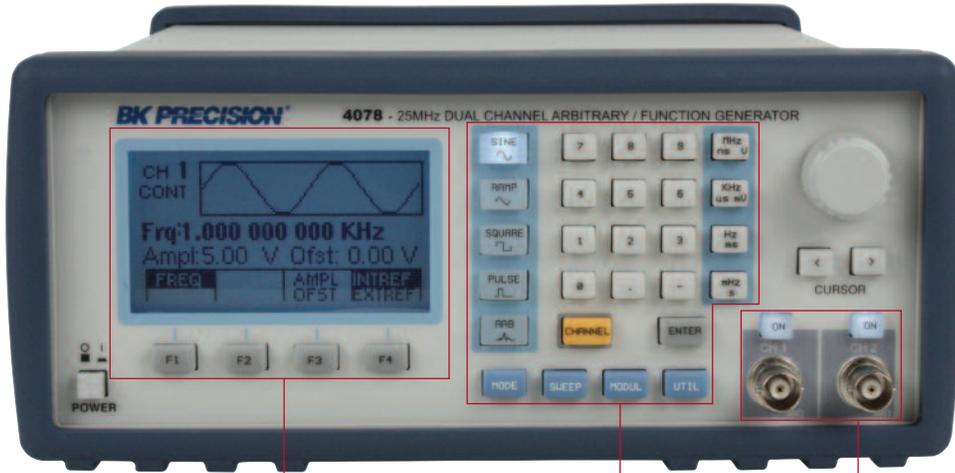
- Both channels offer full functionality. All waveform parameters such as frequency, amplitude and offset can be set independently
- Synchronize both output signals to the same clock signal (external or internal) and precisely adjust the phase relationship between the two signals
- Economical baseband I/Q signal source
- Saves cost and bench space

### Options

Model 4075 with GPIB interface: Order model number 4075GPIB

Model 4078 with GPIB interface: Order model number 4078GPIB

### ▲ Front panel



Informative LCD with detailed display of waveform parameters

Easy-to-use keypad allows efficient parameter configuration

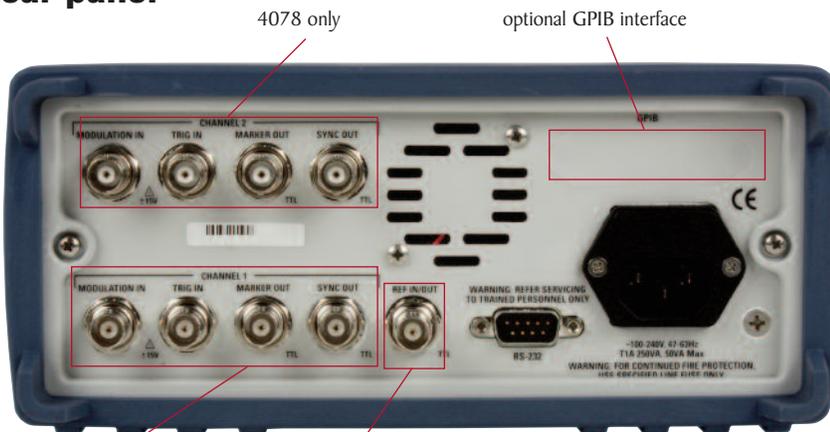
Model 4078 allows for both independent and phase synchronized waveform generation

### Intuitive user interface

These Waveform Generators use a menu-driven front panel keypad and control knob along with an easy-to-read graphical LCD to adjust all waveform parameters, which are visible at one glance. Arbitrary waveform editing and definition is flexible and easy: Waveforms can be defined from scratch by entering data point by point, by

loading and modifying predefined built-in waveforms or by downloading waveforms via the remote interface, using either the included arbitrary waveform generation software Wave-X or a custom program. Standard function generator waveforms sine, square, ramp and pulse can be created by pressing a single button.

### ▲ Rear panel



4078 only

optional GPIB interface

4075 & 4078

10 MHz external reference

### Flexible interface

Built-in 10 MHz external reference is included at no extra cost (both models).

This input/output let's you synchronize with another 4075/4078 generator or to an external 10 MHz Clock for precise phase adjustment.

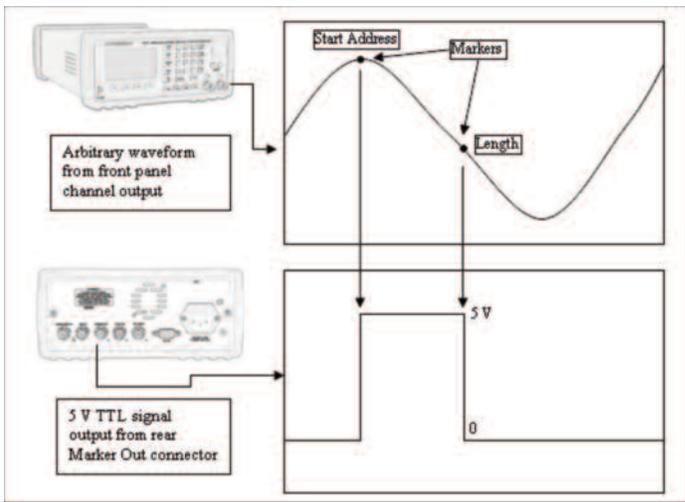
Connect the programmable marker Output to the Trigger input of additional generators to create complex polyphase scenarios.

### Flexible memory management

Unlike other comparable generators, which typically contain only a few fixed-size memory locations for waveform storage, the 4075 and 4078 gives users more freedom - the 400000 point flash memory can be allocated to one large waveform or up to 50 different waveforms, each with a customizable length.

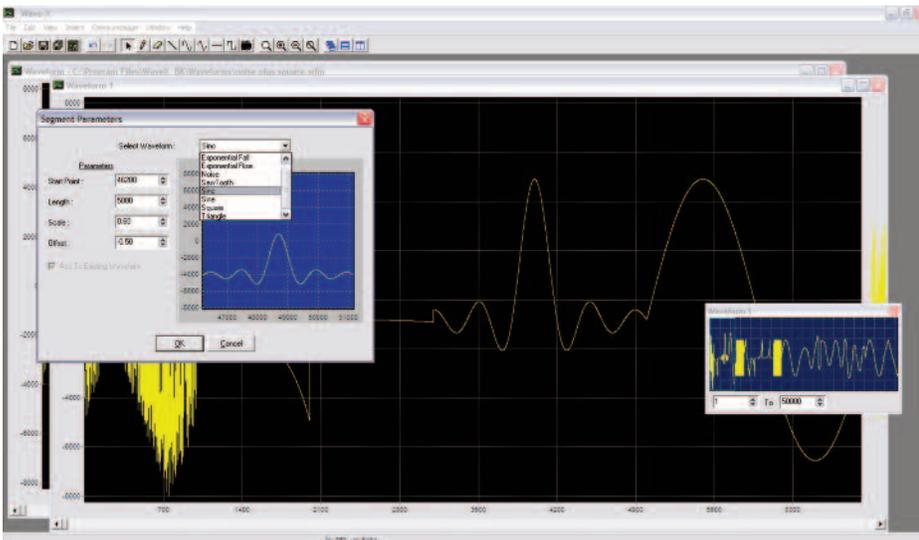
### Versatile noise generation

In Arb mode you can conveniently add noise to your waveform directly from the front panel and precisely adjust the scale of the noise amplitude. Unlike other generators that only produce a noise waveform, this feature allows you to choose between generating a noise waveform or adding noise to an existing waveform.



### Programmable Markers

Models 4075 and 4078 provide fully programmable markers, allowing you to generate a positive TTL level output signal at the points specified by address and length up to 4000 points. This feature is available in Arbitrary mode and can not be found in other comparable waveform generators. It could be used for applications requiring polyphase signal generation, e.g. simulation of a real world 3 phase AC network where one of the phases is degraded with spikes or noise.



### Generate waveforms with ease

The included PC Software allows you to easily generate, edit and download custom arbitrary waveforms.

Generate waveforms by importing a textfile, or define via freehand, point draw or waveform math. Waveforms can also be uploaded from the generator for documentation purposes.

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Models 4075 & 4078

Specifications		models	
		4075	4078
Channels		1 Channel	2 Channels
<b>Frequency Characteristics</b>			
Sine		1 $\mu$ Hz to 25 MHz	
Square		1 $\mu$ Hz to 25 MHz	
Triangle, Ramp		1 $\mu$ Hz to 5 MHz	
Pulse		1 MHz to 10 MHz	
Accuracy		0.002 % (20 ppm)	
Resolution		12 digits or 1 $\mu$ Hz	
<b>Arbitrary Characteristics</b>			
Built-in Waveforms		Sine, Triangle, Square, Noise, Ramp Up, Ramp Down, Sine(X)/X, Exponential Up, Exponential Down, Gaussian	
Waveform Length		2 points to 400,000 points	
Vertical Resolution		14 bits (16,384 levels)	
Noise		Add 1% to 100% to output waveform	
Sampling Rate		100 MSa/s, Point execution rate adjustable from 10 ns-50 s	
Frequency		Accuracy: 0.005% (50 ppm) Resolution: 4 digits	
<b>Output Characteristics</b>			
Amplitude Range		10 mV to 10 Vp-p into 50 $\Omega$	
Amplitude Resolution		3 digits (1000 counts)	
Amplitude Accuracy (1 kHz)		$\pm 1\% \pm 1$ mV	
Flatness (relative to 1 kHz)		$\pm 0.2$ dB to 1 MHz $\pm 1$ dB to 25 MHz	
Offset Range		$\pm 5$ V into 50 $\Omega$ , depending on the Amplitude setting	
Offset Resolution		10 mV with 3 digits resolution	
Offset Accuracy		$\pm 1\% \pm 10$ mV into 50 $\Omega$	
Output Impedance		50 $\Omega$ typical	
Output Protection		The instruments output is protected against short circuit or nominal accidental voltages applied to the main output connector	
<b>Waveform Characteristics</b>			
Total Harmonic Distortion (sine)		DC-20 kHz, -65 dBc, 20 kHz-50 kHz, -60 dBc 50 kHz-100 kHz, -50 dBc 100 kHz-5 MHz, -45 dBc 5 MHz-25 MHz, -30 dBc	
Spurious (sine)		DC-1 MHz < -60 dBc	
Rise/Fall Time (square, pulse)		< 12 ns (10% to 90%) at full amplitude into 50 $\Omega$	
Variable Duty Cycle		20% to 80% to 5 MHz (square) 40% to 60% to 10 MHz (square) 50% > 10 MHz (square)	
Variable Symmetry		10%-90% to 5 MHz (triangle)	
Symmetry at 50%		< 1% + 5 ns	
Linearity (triangle, ramp)		< 0.1% of peak output (1 $\mu$ Hz to 250 kHz)	
Pulse Width (period 10 $\mu$ s - 0.1 $\mu$ s)		20 ns to <(Period-20 ns) 10 ns resolution	
Variable Edge Time (period 100 $\mu$ s - 0.16 $\mu$ s)		100 ns to Width/0.625 (50 % duty cycle) 10 ns resolution	
<b>Operating Modes</b>			
Continuous		Output continuous at programmed parameters	
Triggered		Output quiescent until triggered by an internal or external trigger, at which time one waveform cycle is generated to programmed parameters. Frequency of	

Triggered	waveform cycle is limited to 10 MHz in ARB mode and 5 MHz in DDS mode.
Gate	Same as triggered mode, except waveform is executed for the duration of the gate signal. The last cycle started is completed
Burst	2-999,999 cycles
Phase	-180.0 to +180.0 degrees with 0.1 degree resolution
Trigger Source	Trigger source may be internal, external or manual. Internal trigger rate 0.01 Hz-1 MHz (1 $\mu$ s – 10 s)

**Modulation Characteristics**

<b>Amplitude Modulation</b>	
Internal	0.1 Hz-20 kHz sine, square or triangle waveform variable modulation from 0% to 100%
External	5 Vp-p for 100% modulation, 10 k $\Omega$ input impedance
<b>Frequency Modulation</b>	
Internal	0.1 Hz-20 kHz sine wave, square or triangle
External	5 Vp-p for 100% deviation, 10 k $\Omega$ input impedance

**Sweep Characteristics**

Sweep Shape	Linear and Logarithmic, up or down
Sweep Time	20 ms to 500 s
Sweep Trigger	internal, external, continuous or burst

**Inputs and Outputs**

Trigger IN	TTL Compatible Maximum rate 10 MHz Minimum width 50 ns
Sync OUT	TTL pulse at programmed frequency, 50 $\Omega$ source impedance
Modulation IN	5 Vp-p for 100% modulation 10 k $\Omega$ input impedance DC to >50 kHz minimum bandwidth
Marker Out	Positive TTL pulse user programmable in Arbitrary waveform, 50 $\Omega$ source impedance
Reference IN-OUT	10 MHz, TTL compatible, input or output, for external unit synchronization 50 $\Omega$ output impedance and 1 k $\Omega$ input

**Internal Trigger**

Repetition	1 $\mu$ s to 100 s
Resolution	4 digits
Accuracy	+0.002%

**General**

Store Memory	50 full panel settings at power-off
Arbitrary Memory	400,000 points in flash memory
Dimensions	8.4(213) x 3.5(88) x 12(300) inches (mm) (WxHxD)
Weight	Approx. 3 kg (6.6 lbs)
Power	100 VAC-240 VAC $\pm 10\%$ , 50 VA max.
Temperature	Operating 0 $^{\circ}$ C to + 50 $^{\circ}$ C Non-operating -20 $^{\circ}$ C to + 70 $^{\circ}$ C
Humidity	95 % RH, 0 $^{\circ}$ C to 30 $^{\circ}$ 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**

**Accessories**

Supplied: CD containing user manual & Wave-X software, null modem serial interface cable, power cord