Dual Channel Function/Arbitrary Waveform Generators
4060B Series

The 4060B Series Dual Channel Function/Arbitrary Waveform Generators are capable of producing precise sine, square, triangle, pulse, and arbitrary waveforms. This series combines the cost saving benefits of both DDS and true point-by-point arbitrary architectures to meet a wide range of applications that require high signal fidelity and low jitter arbitrary waveform generation capabilities.

Dual architecture operation

The 4060B Series arbitrary waveform generator (AWG) architecture can be toggled between conventional DDS or true arbitrary mode. Compared to DDS (Fig. 1), true point-by-point AWG implementation offers improved signal integrity by producing lower jitter and less distortion (Fig. 2). All models are capable of generating 16-bit waveforms up to 300 MSa/s in DDS or 75 MSa/s in true arbitrary mode.

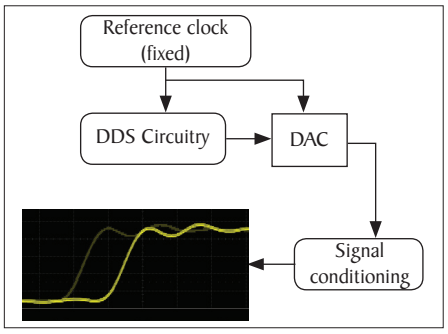


Fig. 1: DDS mode

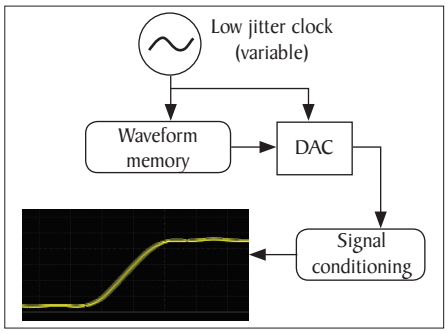


Fig. 2: True point-by-point arbitrary mode

The intuitive touchscreen display simplifies control of many features including extensive waveform modulation schemes, linear/logarithmic sweep, burst mode, and variable DC offset. These generators provide system integrators with auxiliary triggering capabilities, and a 10 MHz reference clock for synchronizing multiple instruments.

196 built-in arbitrary waveforms offer a variety of arbitrary test signals for both simple and complex applications. Generate custom arbitrary waveforms and download them to the instrument using the included application software. Alternatively, use the included LabVIEW™ drivers to load .csv or .txt waveform data files directly into the generator's internal memory.

Model	4062B	4063B	4064B
Sine frequency range	1 µHz to 40 MHz	1 µHz to 80 MHz	1 µHz to 120 MHz
Square frequency range	1 µHz to 25 MHz		

Features and benefits

- 16-bit resolution, 8 Mpts, 300 MSa/s (DDS), 75 MSa/s (true point-by-point) arbitrary waveform generator
- Up to 1.2 GSa/s sample rate for sine, square, triangle, and pulse waveforms
- Two independent channels with one-button phase synchronization
- Channel copy, track, and waveform combine functions
- Generate sine waves up to 120 MHz
- Harmonic generator function
- Linear sweep, logarithmic sweep, and burst functions
- Precise pulse width and rise/fall time adjustments
- Supports AM/DSB-AM/FM//PM/PSK/FSK/ASK and PWM modulation types
- DC signal level up to ±10 V into a high-z load or ±5 V into a 50 Ω load
- Variable DC offset
- Adjustable duty cycle
- Frequency counter
- Internal/external triggering
- 196 built-in predefined arbitrary waveforms
- Store/recall up to 10 instrument settings
- LAN and USB device port (USBTMC-compliant)
- GPIB connectivity with optional USB-to-GPIB adapter
- Front-panel USB host port
- Arbitrary waveform editing software included
- LabVIEW™ driver is available

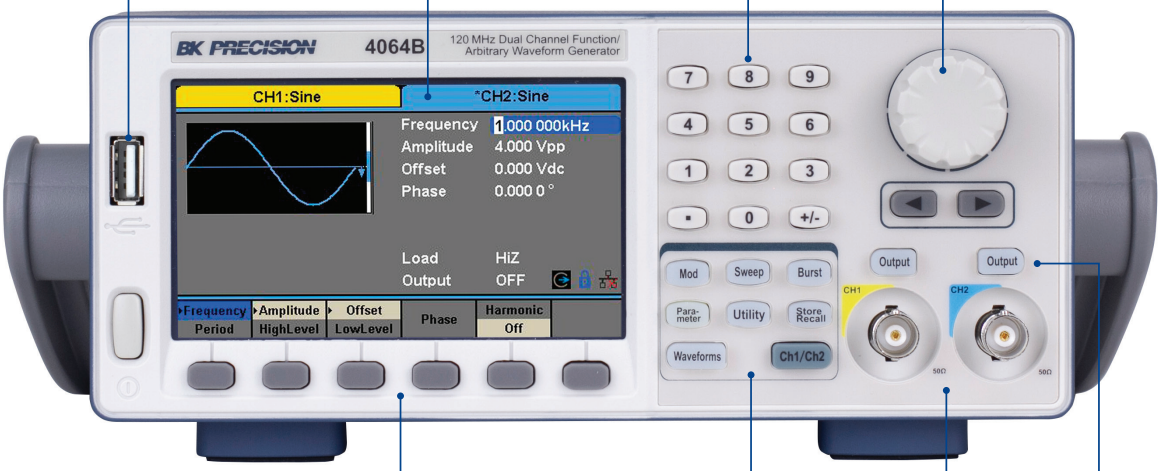
Front panel

USB host port
Save/recall waveforms and instrument setups

4.3-inch LCD
Anti-smudge touch screen display makes it easy to jump to different parameters on screen.

Numeric keypad
Input values directly

Rotary control knob
Increment and decrement values quickly and precisely



Function keys
Adjust waveform parameters and access built-in waveforms

Waveforms and channel selection keys

Channel outputs

Dedicated channel output buttons

Rear panel

Counter input
Measure frequencies up to 200 MHz

Auxiliary input/output
Sync output, modulation input, external trigger input/output

10 MHz reference clock input/output
Synchronize output signals to a master time base

LAN interface

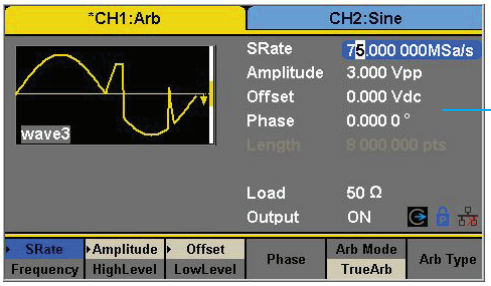
USB interface

Chassis ground

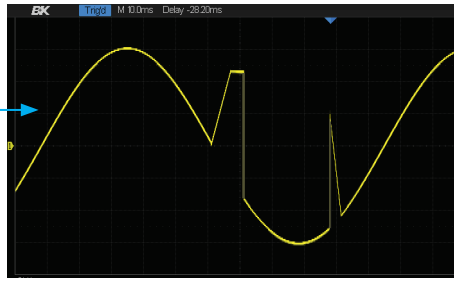
Universal AC input
No need to change fuses, switches, or jumpers

Operation highlights

Generate precise true arbitrary waveforms



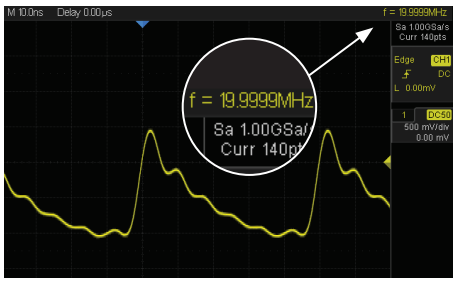
Custom true arbitrary waveform at 75 MSa/s, 8 Mpts



True arbitrary mode oscilloscope view

True arbitrary mode uses a variable clock signal to generate precise custom arbitrary waveforms without skipping data points. As shown in the oscilloscope view above, the 8 million point arbitrary waveform is accurately reproduced with high signal fidelity.

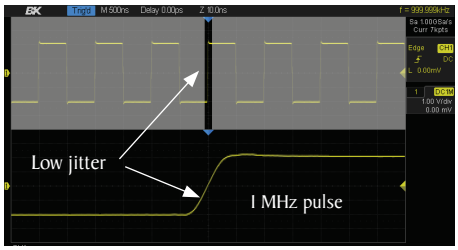
Versatile DDS operation



Built-in arbitrary waveform at 20 MHz, 300 MSa/s

In DDS mode, these generators are capable of producing arbitrary waveforms at a frequency up to 20 MHz. DDS arbitrary waveforms can also be combined with modulation, sweep, and burst functions.

High-performance pulse generator

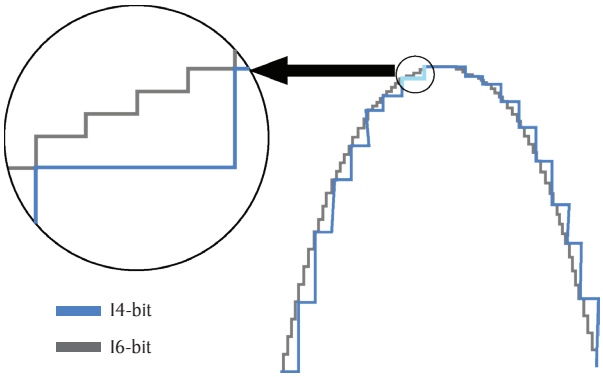


This series is equipped with advanced digital signal processing to reduce jitter and produce clean pulse waveforms.

The pulse width is adjustable to a minimum of 16.3 ns. Shown above is the oscilloscope view of the pulse width being incremented using the generators rotary control knob.

Sharp rise/fall times can be set from 8.4 ns up to 22.4 s with adjustment steps as small as 100 ps.

16-bit vertical resolution



The 4060B Series uses 16-bit sampling for enhanced resolution resulting in lower distortion and more accurate waveforms.

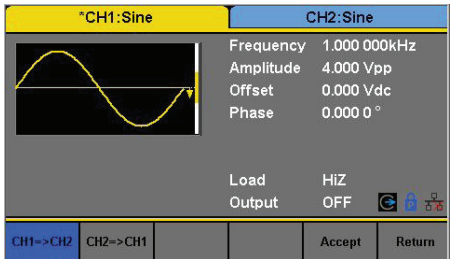
Modulation types and operating modes

Carrier	AM/DSB-AM/FM/ PM/PSK/FSK/ASK	PWM	Burst	Sweep
Sine and Square	√		√	√
Triangle / Ramp	√		√	√
Pulse		√	√	
Noise			√	
Arbitrary	√		√	√

These generators are capable of many different modulation types for various applications.

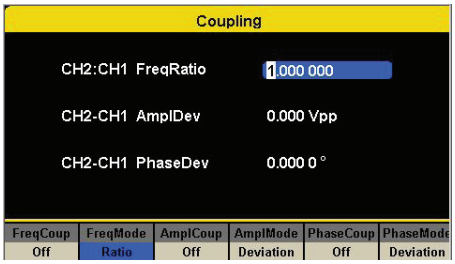
Operation highlights

Channel copy and sync function



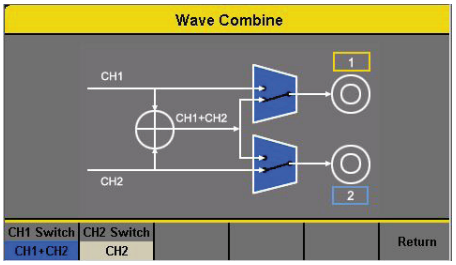
With the push of a button, all waveform parameters can be quickly copied between channels. Phase between channels can be adjusted.

Channel tracking function



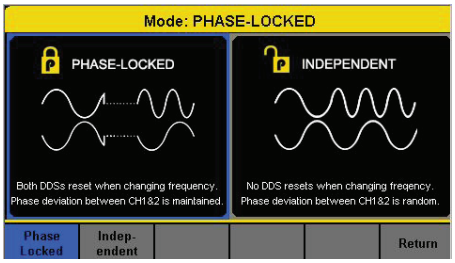
Customize channel coupling using frequency, amplitude, and phase. Enable automatic tracking between channels using deviation or ratio.

Channel combine function



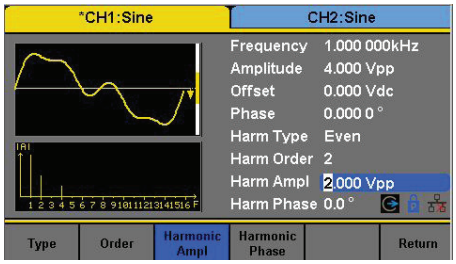
Create complex waveforms by internally adding each channel's waveform and outputting the combined waveform on channel 1 or 2.

Flexible phase control



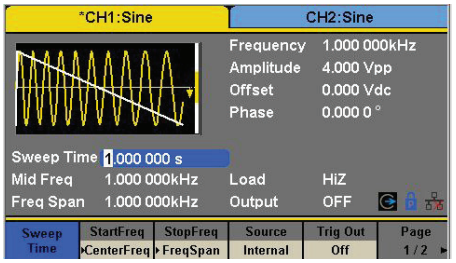
Phase-lock maintains phase deviation over both channels. In independent mode, the phase deviation between CHI and CH2 changes at random allowing for smoother frequency transitions.

Harmonics function



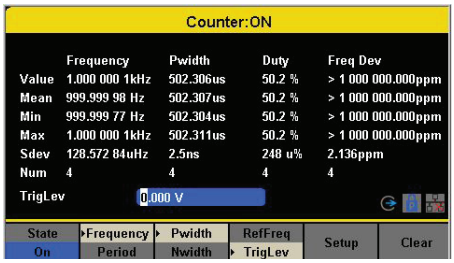
Quickly output harmonics up to the 16th order with independent amplitude and phase settings.

Sweep



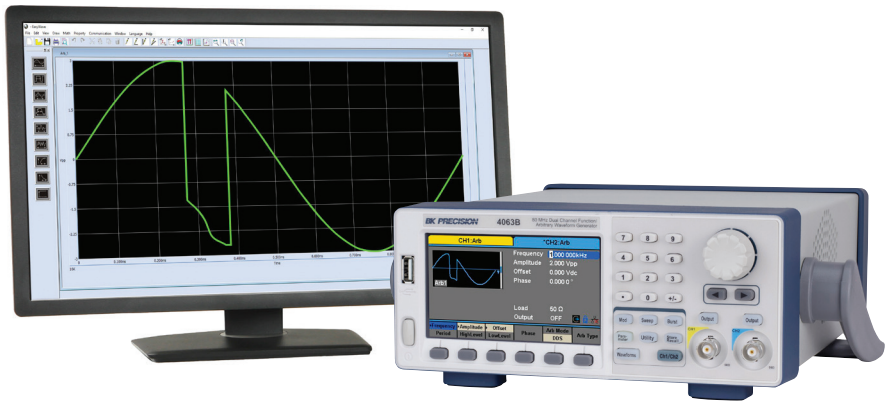
Perform linear or log sweep functions with up or down directional control. The sweep source can be set to internal, external, or manual.

Frequency counter



Displays mean, min, max, and many other frequency characteristics with an input frequency range of 0.1 Hz to 200 MHz.

Generate waveforms with ease



The provided waveform editing software can be used to create point-by-point arbitrary waveforms via freehand or waveform math functions. The standard LAN and USBTMC-compliant interfaces on the rear panel allow users to easily interface with a PC to load these waveforms into internal memory. The front panel also offers a convenient USB host port to save/recall instrument settings and waveform files on a USB flash drive.

Specifications

Note: All specifications apply to the unit after a temperature stabilization time of 30 minutes over an ambient temperature range of 23 °C ± 5 °C.

Model	4062B	4063B	4064B
Channels	2		
Frequency Characteristics			
Sine	1 µHz to 40 MHz	1 µHz to 80 MHz	1 µHz to 120 MHz
Square	1 µHz to 25 MHz		
Triangle, Ramp	1 µHz to 1 MHz		
Pulse	1 µHz to 25 MHz		
Gaussian Noise (-3 dB)	> 120 MHz		
Arbitrary	1 µHz to 20 MHz		
Accuracy	± 1 ppm (1 year)		
Resolution	1 µHz		
Arbitrary Characteristics			
Built-in Waveforms	196		
Waveform Length	8 points to 8 M points		
Vertical Resolution	16 bits		
Sampling Rate	300 MSa/s (DDS mode) 75 MSa/s (true arbitrary mode)		
Minimum Rise/Fall Time (typical)	4.5 ns (DDS mode) 8.5 ns (true arbitrary mode)		
Jitter (rms)	< 150 ps (1 Vpp, into 50 Ω load, true arbitrary mode)		
Non-volatile Memory Storage	80 MB file system		
Output Characteristics			
Amplitude Range[1] (into open circuit)	2 mVpp to 20 Vpp (≤ 20 MHz) 2 mVpp to 10 Vpp (> 20 MHz)		
Amplitude Resolution	Up to 4 digits		
Amplitude Accuracy (10 kHz, 0 V offset)	± (1% + 1 mVpp)		
Amplitude Flatness (reference to 10 kHz Sine, 2.5 Vpp)	± 0.3 dB (50 Ω load, DC to 100 MHz) ± 0.4 dB (50 Ω load, 100 MHz to 120 MHz)		
Cross Talk	< -60 dBc (between channels)		
Offset Range (DC)	± 5 V (into 50 Ω load) ± 10 V (into open circuit)		
Offset Resolution (DC)	Up to 4 digits		
Offset Accuracy (DC)	± (1% + 2 mV), into open circuit		
Output Impedance (typical)	50 Ω		
Output Protection	Overvoltage (see user manual for details)		
Waveform Characteristics			
Harmonic Distortion (sine, 0 dBm input, typical)	DC to 10 MHz, < -65 dBc 10 MHz to 20 MHz, < -60 dBc 20 MHz to 40 MHz, < -55 dBc 40 MHz to 60 MHz, < -50 dBc 60 MHz to 80 MHz, < -45 dBc 80 MHz to 100 MHz, < -40 dBc 100 MHz to 120 MHz, < -38 dBc		

Waveform Characteristics (continued)	
Total Harmonic Distortion (sine)	< 0.075% (10 Hz to 20 kHz at 0 dBm)
Spurious (non-harmonic)	≤ 50 MHz, -70 dBc max. > 50 MHz, -65 dBc max.
Rise/Fall Time (square)	< 9 ns (10% to 90% at 1 Vpp, into 50 Ω load)
Variable Duty Cycle (square)	0.001% to 99.999% (depending on frequency setting)
Jitter (rms) Cycle to Cycle (square)	150 ps (1 Vpp, into 50 Ω load, typical)
Ramp Symmetry	0% to 100%
Ramp Linearity	< 1% of peak output (triangle, ramp at 1 kHz, 1 Vpp, 100% symmetry)
Pulse	
Pulse Width	16.3 ns minimum
Rise/Fall Time	8.4 ns to 22.4 s (1 Vpp, 10% to 90%, into 50 Ω load)
Duty Cycle Range	0.001% to 99.999% (depending on frequency setting)
Overshoot	< 3% (100 kHz, 1 Vpp)
Jitter (rms) Cycle to Cycle	150 ps (1 Vpp, into 50 Ω load)
Burst	
Waveform	Sine, square, ramp, pulse, arbitrary, noise
Type	Cycle (1 to 1,000,000 cycles), infinite, gated
Start/Stop Phase	0° to 360°
Internal Period	1 µs to 1000 s
Gated Source	Internal, external trigger
Trigger Source	Internal, external, manual
Phase Offset	
Range	-360° to 360°
Resolution	0.1°
AM, FM & PM Modulation Characteristics	
Carrier[2]	Sine, square, ramp, arbitrary
Source	Internal, external
Modulation Waveform	Sine, square, ramp, noise, arbitrary
AM Modulation Depth	0% to 120%
FM Frequency Deviation	0 to 0.5 x (maximum output frequency)
PM Phase Deviation	0° to 360°
ASK & FSK Modulation Characteristics	
Carrier[2]	Sine, square, ramp, arbitrary
Source	Internal, external
Modulation Waveform	50% duty cycle square waveform

(1) This specification will be divided by 2 while applied to a 50 Ω load.

(2) Modulation schemes not available in DC mode.

Specifications (continued)

Model	4062B, 4063B, 4064B
DSB-AM Modulation Characteristics	
Carrier[2]	Sine, square, ramp, arbitrary
Source	Internal, external
Modulation Waveform	Sine, square, ramp, noise, arbitrary
PWM Modulation Characteristics	
Source	Internal, external
Modulation Waveform[2]	Sine, square, ramp, noise, arbitrary
Internal Modulation Frequency	1 mHz to 1 MHz
Sweep Characteristics	
Waveforms[2]	Sine, square, ramp, arbitrary
Sweep Shape	Linear or logarithmic, up or down
Sweep Time	1 ms to 500 s
Sweep Trigger	Internal, external, manual
Harmonic Output Characteristics	
Maximum Order	16
Type	Even, odd, all
Auxiliary Input / Output	
Sync Out	TTL compatible[4] Output impedance: 100 Ω (typical) Maximum frequency: 10 MHz Minimum pulse width: 50 ns (typical)
Modulation Input	± 12 Vpp (typical) for 100% modulation Input impedance: 10 kΩ Frequency range: 0 kHz to 50 kHz
Trigger	
Input – Level	TTL compatible[3]
Input – Slope	Rising or falling, selectable
Input – Pulse Width	> 100 ns
Input – Impedance	> 100 kΩ
Input – Latency	100 ns maximum (sweep mode) 600 ns maximum (burst mode)
Output – Voltage Level	TTL compatible[4]
Output – Pulse Width	> 500 ns
Output – Impedance	100 Ω (typical)
Output – Maximum Frequency	1 MHz
Reference Clock	
Input	Frequency range: 10 MHz (typical) Minimum voltage input: 1.4 Vpp Input impedance: 5 kΩ
Output	Frequency range: 10 MHz (typical) Voltage level: 3.3 V (typical), 2 V (minimum) Output impedance: 50 Ω

Frequency Counter	
Measurement	Frequency, period, positive/negative pulse width, duty cycle
Measurement Range	100 mHz to 200 MHz (DC coupling) 10 Hz to 200 MHz (AC coupling)
Input Range	100 mVrms to ± 2.5 V (< 100 MHz, DC coupling) 200 mVrms to ± 2.5 V (100 MHz to 200 MHz, DC coupling) 100 mVrms to 5 Vpp (< 100 MHz, AC coupling) 200 mVrms to 5 Vpp (100 MHz to 200 MHz, AC coupling)
Input Impedance	1 MΩ (typical)
Coupling	AC, DC, HF REJ (≥ 250 kHz filter)
Environmental and Safety	
Temperature	Operating: 32 °F to 104 °F (0 °C to 40 °C) Storage: -4 °F to 140 °F (-20 °C to 60 °C)
Humidity	< 86 °F (30 °C), ≤ 90 % RH 104 °F (40 °C), ≤ 50 % RH
Altitude	Operating: below 10,000 ft (3,048 m) Storage: below 49, 212 ft (15,000 m)
Electromagnetic Compatibility	EMC Directive 2014/30/EU, EN61326-1:2013
Safety	Low voltage directive (LVD) 2014/35/EU, EN61010-1:2010
General	
Display	4.3" TFT color (24-bit) LCD touch screen
I/O Interfaces	USBTMC device, LAN, USB host port
Storage Memory	10 instrument settings
AC Input	100 to 240 VAC ± 10 %, 50/60 Hz 100 to 120 VAC ± 10 %, 400 Hz
Power Consumption	50 W maximum
Dimensions (W x H x D)	10.25" x 4.22" x 11.61" (260.3 x 107.2 x 295 mm)
Weight	7.6 lbs (3.43 kg)
Warranty	3 years
Standard Accessories	AC power cord, user manual (downloadable), USB type A-to-B cable, BNC coaxial cable, certificate of calibration
Optional Accessories	USB-to-GPIB adapter (model AK40G)

(2) Modulation schemes not available in DC mode.

(3) V_{IH} = 2 V to 5.5 V, V_{IL} = 0.5 V to 0.8 V

(4) V_{OH} = 3.8 V (I_{OH} = -8 mA), V_{OL} = 0.44 V (I_{OL} = 8 mA)