Data Sheet

Dual Channel Function/Arbitrary Waveform Generators
4060 Series

The 4060 Series Dual Channel Function/Arbitrary Waveform Generators are capable of generating stable and precise sine, square, triangle, pulse, and arbitrary waveforms. With an easy-to-read color display and intuitive user interface with numeric keypad, these instruments offer plenty of features including linear/logarithmic sweep, built-in counter, extensive modulation and triggering capabilities, a continuously variable DC offset, and a high performance 14-bit, 500 MSa/s arbitrary waveform generator.

Easily create custom arbitrary waveforms using the included waveform editing software or use any of the 36 built-in predefined arbitrary waveforms. Up to 8 user-defined 512-kpt arbitrary waveforms and 24 user-defined 16-kpt arbitrary waveforms can be saved to the instrument. Additionally, the included LabVIEW™ drivers allow users to conveniently load and save .CSV or text file data directly into the arb memory without having to use waveform editing software.

Extensive modulation capabilities include amplitude and frequency modulation (AM/FM), double sideband amplitude modulation (DSB-AM), amplitude and frequency shift keying (ASK/FSK), phase modulation (PM), and pulse width modulation (PWM).

The standard external 10 MHz reference clock input and output allows users to synchronize their instrument with another generator. This feature is typically not found in function generators at this price point. Additionally, the phase of both output channels can be synchronized conveniently with the push of a button.
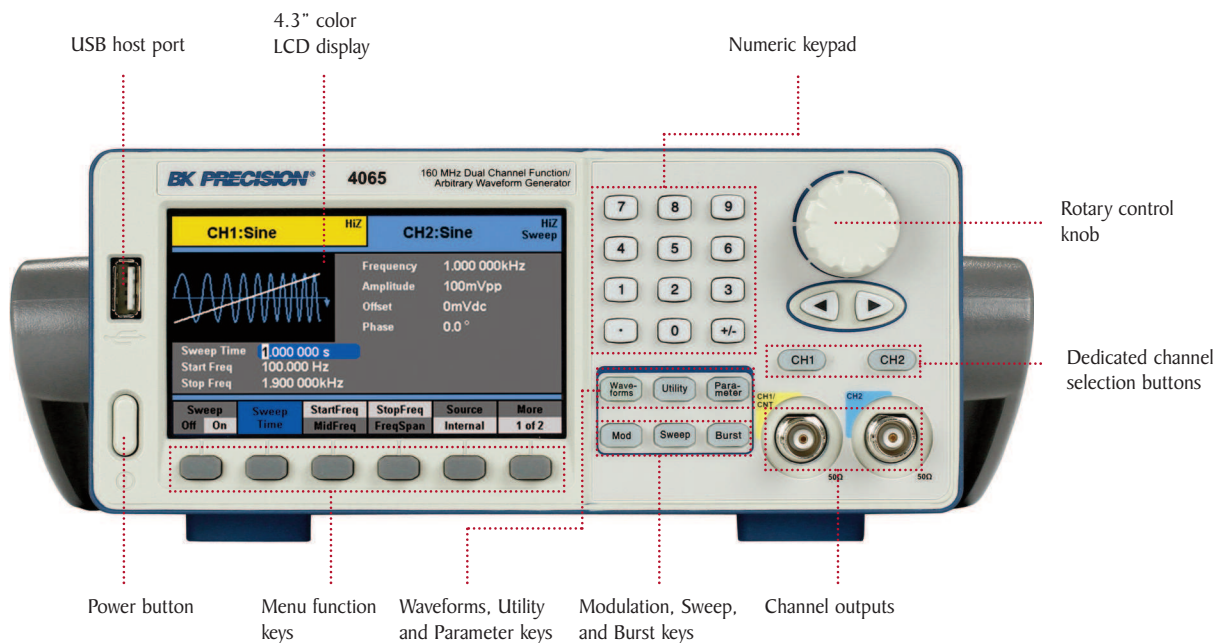
These versatile function/arbitrary waveform generators are suitable for education and other applications that require high signal fidelity, a variety of modulation schemes, or arbitrary waveform generation capabilities.

Features & Benefits

- 14-bit, 500 MSa/s, 512k point (Ch2 only) arbitrary waveform generator
- Two independent channels with one-button synchronization
- Generate sine waves up to 160 MHz
- Large 4.3-inch LCD color display
- Linear and logarithmic sweep
- AM/DSB-AM/ASK/FM/FSK/PM/PWM modulation functions
- Variable DC offset
- Adjustable duty cycle
- Internal/external triggering
- Gate and burst mode
- 36 built-in predefined arbitrary waveforms
- Store/recall up to 10 instrument settings and 32 user-defined arbitrary waveforms (8 x 512 kpts, 24 x 16 kpts)
- Built-in counter
- USB device port (USBTMC-compliant) and front panel USB host port
- GPIB connectivity with optional USB-to-GPIB adapter
- Arbitrary waveform editing software included
- Short circuit output protection
- LabVIEW™ drivers available

Model	4063	4064	4065
Sine frequency range	1 μHz – 80 MHz	1 μHz – 120 MHz	1 μHz – 160 MHz
Square frequency range	1 μHz – 40 MHz	1 μHz – 50 MHz	

B&K PRECISION
ELECTRONIC TEST INSTRUMENTS

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Front panel

USB host port

4.3" color
LCD display

Numeric keypad

Rotary control knob

BK PRECISION® 4065 — 160 MHz Dual Channel Function/Arbitrary Waveform Generator

CH1:Sine — HiZ
CH2:Sine — HiZ Sweep

Frequency 1.000 000kHz
Amplitude 100mVpp
Offset 0mVdc
Phase 0.0°

Sweep Time 1.000 000 s
Start Freq 100.000 Hz
Stop Freq 1.900 000kHz

| Sweep Off On | Sweep Time | StartFreq MidFreq | StopFreq FreqSpan | Source Internal | More 1 of 2 |

Dedicated channel selection buttons

Power button

Menu function keys

Waveforms, Utility and Parameter keys
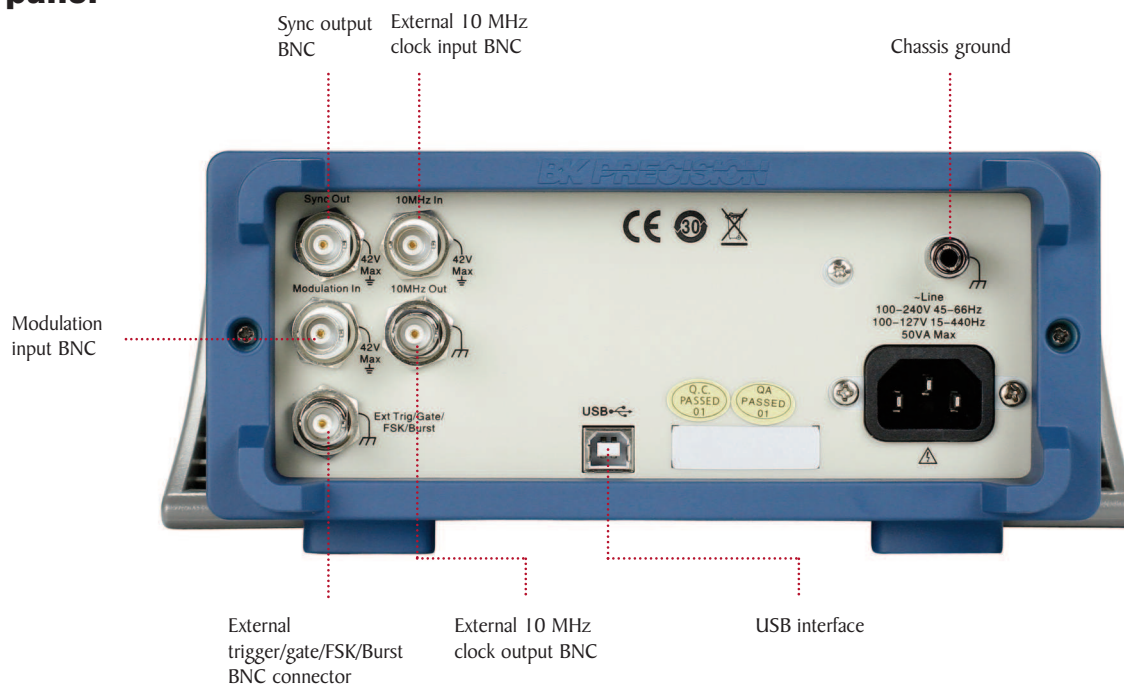
Modulation, Sweep, and Burst keys
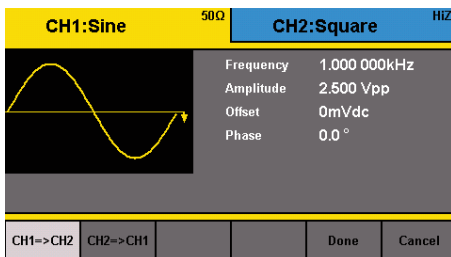
Channel outputs

Intuitive user interface

Easily adjust all waveform parameters using the intuitive menu-driven front panel keypad with dedicated channel selection keys, numeric keypad, and rotary control knob. Connect your USB flash drive to the USB host port to quickly save and recall instrument settings and waveforms.

Rear panel

Sync output BNC

External 10 MHz clock input BNC

Chassis ground

Sync Out — 42V Max
10MHz In — 42V Max
Modulation In — 42V Max
10MHz Out
Ext Trig/Gate/FSK/Burst

~Line
100–240V 45–66Hz
100–127V 15–440Hz
50VA Max

CE — 30 — X

O.C. PASSED 01
QA PASSED 01

USB

Modulation input BNC

External trigger/gate/FSK/Burst BNC connector

External 10 MHz clock output BNC

USB interface

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# Flexible operation

Dual channel output

Save time with the 4060 Series' two independent channels to output synchronous signals. With a push of a button, all waveform parameters can be quickly copied between channels to set up identical output signals. Phase between channels can also be adjusted from the front panel.

Arbitrary waveform generation
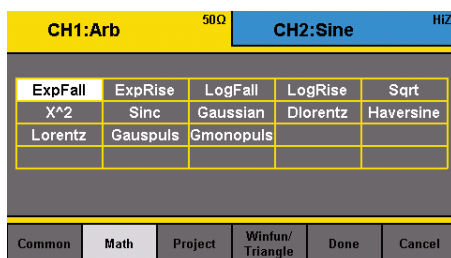
All models in the 4060 series provide non-volatile memory to create, store, and recall up to 24 different 16-kpt arbitrary waveforms and up to 8 different 512-kpt arbitrary waveforms. Users can also output any of the 36 built-in predefined arbitrary waveforms.

Wide variety of modulation schemes
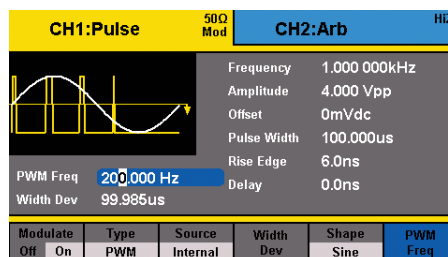
These instruments are capable of many different types of modulation for various applications. Modulate your waveforms with AM, DSB-AM, FM, PM, ASK, FSK, and PWM modulation schemes.

## Synchronization and external triggering

Use the external 10 MHz clock input and output to synchronize your signals to a master time base. The Sync output generates a TTL pulse for synchronization to a channel's frequency. An external trigger BNC connector is also available for inputting or generating a trigger signal.

Generate waveforms with ease
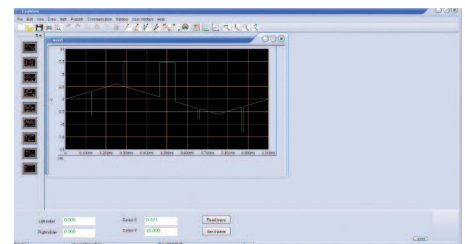
The provided waveform editing software can be used to create point-by-point arbitrary waveforms via freehand or waveform math functions. A standard USB interface on the rear panel allows users to easily interface with a PC to load these arbitrary waveforms into the instrument. The front panel also offers a convenient USB host port for connecting your USB flash drive to save/recall instrument settings and waveforms.
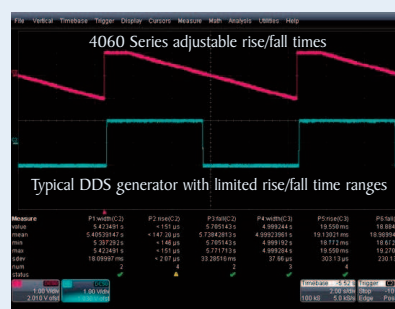
Easy-to-read color display
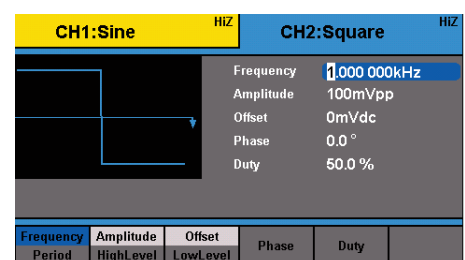
Large 4.3" color display shows the currently selected channel and all relevant parameters.

Advanced pulse generator
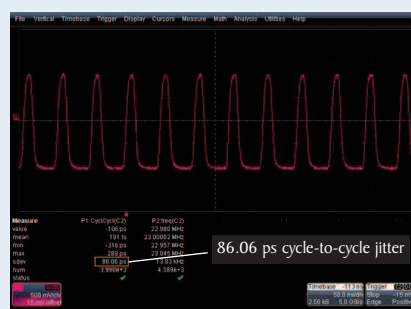
For applications requiring high signal integrity and edge stability, the 4060 Series can generate pulses with a low cycle-to-cycle jitter of < 100 ps.

Capable of setting edge times within a large range, the 4060 Series can generate pulses with minimum rise/fall times of 6 ns and maximum rise/fall times of 6 seconds.
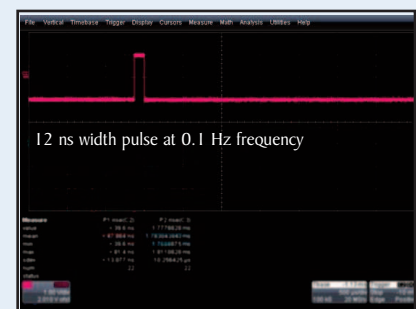
Unlike traditional DDS generators, the 4060 Series has the capability to output a rapid pulse at very low frequencies. Duty cycle can be set to as low as 0.0001%.

Specifications

Model	4063	4064	4065
Channels		2	
Frequency Characteristics			
Sine	1 μHz – 80 MHz	1 μHz – 120 MHz	1 μHz – 160 MHz
Square	1 μHz – 40 MHz	1 μHz – 50 MHz	
Triangle, Ramp		1 μHz – 4 MHz	
Pulse	1 μHz – 20 MHz	1 μHz – 30 MHz	1 μHz – 40 MHz
Gaussian Noise (-3 dB)		100 MHz	
Arbitrary	1 μHz – 20 MHz	1 μHz – 30 MHz	1 μHz – 40 MHz
Accuracy		± 2 ppm (1 year)	
Resolution		1 μHz	
Arbitrary Characteristics			
Built-in Waveforms		36	
Waveform Length		Ch1: 16,000 points, Ch2: 512,000 or 16,000 points	
Vertical Resolution		14 bits	
Sampling Rate		500 MSa/s	
Minimum Rise/Fall Time		6 ns (typical)	
Jitter (pk-pk)		2 ns (typical)	
Non-volatile Memory Storage		8 x 512 kpts waveforms and 24 x16 kpts waveforms	
Output Characteristics			
Amplitude Range (into 50 Ω)		1 mVpp – 10 Vpp, ≤ 40 MHz 1 mVpp – 5 Vpp, ≤ 100 MHz 1 mVpp – 1.5 Vpp, ≤ 160 MHz	
Amplitude Resolution		up to 4 digits	
Amplitude Accuracy (100 kHz)		± (0.3 dBm + 1 mVpp)	
Amplitude Flatness (relative to 100 kHz Sine, 1 Vpp)		≤ 10 MHz ± 0.2 dB ≤ 80 MHz ± 0.5 dB ≤ 160 MHz ± 0.8 dB	
Cross Talk		< -65 dBc	
Offset Range (DC)		± 5 V into 50 Ω ± 10 V into open circuit	
Offset Resolution		up to 4 digits	
Offset Accuracy		± (|offset setting value| x 1% + 1 mV)	
Output Impedance		50 Ω, high impedance	
Output Protection		short-circuit protection	
Waveform Characteristics			
Harmonic Distortion (Sine)		DC – 1 MHz, < -54 dBc 1 MHz – 10 MHz, < -46 dBc 10 MHz – 100 MHz, < - 35 dBc 100 MHz – 160 MHz, < -26 dBc	
Total Harmonic Distortion (Sine)		DC – 20 kHz at 1 Vpp, < 0.2 %	
Spurious (non-harmonic)		DC – 1 MHz, < -70 dBc 1 MHz – 10 MHz, < -65 dBc	
Phase Noise		100 kHz offset, - 116 dBc/Hz (typical)	
Rise/Fall Time (Square)		< 8 ns (10 % - 90 %) at full amplitude into 50 Ω	
Variable Duty Cycle (Square)		20% - 80% to 10 MHz 40% - 60% to 40 MHz 50% > 50 MHz	
Asymmetry (50% duty cycle)		1% of period + 5 ns (typical,1 kHz, 1 Vpp)	
Jitter (Square)		100 ps rms (typical)	
Ramp Symmetry		0% - 100%	
Linearity (Triangle, Ramp at 1 kHz, 1 Vpp, 100% Symmetry)		< 0.1% of peak output (typical)	

Dual Channel Function/Arbitrary Waveform Generators
4060 Series

Model	4063, 4064 & 4065
Pulse	
Pulse Width	12 ns minimum, 100 ps resolution, 1,000,000 s max
Rise/Fall Time	6ns – 6s[1], 100 ps resolution
Duty Cycle Range	0.0001 % to 99.9999 %
Overshoot	< 3%
Jitter (pk-pk)	< 100 ps rms (typical)
Burst	
Waveform	sine, square, ramp, pulse, arbitrary (except DC)
Type	cycle (1 – 1,000,000 cycles), infinite, gated
Start/Stop Phase	0 ° – 360 °
Internal Period	1 μs – 1000 s ± 1%
Gated Source	external trigger
Trigger Source	internal, external, manual
Phase Offset	
Range	-360 ° – 360 °
Resolution	0.1 °
Trigger Characteristics	
Trigger Input	
Input Level	TTL compatible
Slope	rising or falling, selectable
Pulse Width	> 50 ns
Input Impedance	> 5 kΩ, DC coupling
Maximum Frequency	1 MHz
Input Latency	< 380 ns
Trigger Output	
Voltage Level	TTL compatible
Pulse Width	> 60 ns (typical)
Output Impedance	50 Ω (typical)
Maximum Frequency	1 MHz
AM, FM & PM Modulation Characteristics	
Carrier	sine, square, ramp, arbitrary (except DC)
Source	internal, external
Modulation Waveform	sine, square, ramp, noise, arbitrary (1 mHz – 50 kHz)
AM Modulation Depth	0% - 120%, 0.1% resolution
FM Frequency Deviation	0 – 0.5 x bandwidth, 1 mHz resolution
PM Phase Deviation	0 – 360 °, 0.1 ° resolution
ASK & FSK Modulation Characteristics	
Carrier	sine, square, ramp, arbitrary (except DC)
Source	internal, external
Modulation Waveform	50% duty cycle square waveform (1 mHz – 1 MHz)
DSB-AM Modulation Characteristics	
Carrier	sine, square, ramp, arbitrary (except DC)
Source	internal, external
Modulation Waveform	sine, square, ramp, noise, arbitrary (1 mHz – 50 kHz)
PWM Modulation Characteristics	
Source	internal, external
Modulation Waveform	sine, square, ramp, arbitrary (except DC)
External Modulation	- 5 V to + 5 V (max. width deviation)
Duty Cycle Modulating Frequency	1 mHz – 50 kHz

(1) depending on pulse width

Sweep Characteristics	
Waveforms	sine, square, ramp, arbitrary (except DC)
Sweep Shape	linear or logarithmic, up or down
Sweep Time	1 ms – 500 s ± 0.1%
Sweep Trigger	internal, external, manual
Inputs and Outputs	
Output Impedance	50 Ω, high impedance
Sync Out	TTL compatible > 50 ns width, not adjustable 50 Ω (typical) output impedance 10 MHz max. frequency
Modulation In	± 5 V for 100% modulation > 10 kΩ input impedance max. voltage input: + 5 V
External Clock In and Out	10 MHz ± 100 Hz, TTL compatible for external unit synchronization
Ext Trig/Gate/FSK/Burst	TTL compatible max. voltage input: + 5 V
Frequency Counter	
Measurement	frequency, period, positive/negative pulse width, duty cycle
Measurement Range	100 mHz – 200 MHz
Frequency Resolution	6 bits
Voltage Range (non-modulated signal)	
DC Coupling	DC offset range: ± 1.5 VDC 100 mHz – 100 MHz, 50 mVrms - ± 2.5 V 100 MHz – 200 MHz, 100 mVrms - ± 2.5 V
AC Coupling	1 Hz – 200 MHz, 100 mVrms – 5 Vpp
Pulse Width/Duty Cycle Voltage Range	50 mVrms – 5 Vpp
Input Impedance	1 MΩ
Coupling	AC, DC
Trigger Level Range	-3 V to +1.8 V
Environmental and Safety	
Temperature	operating: 32 ºF – 104 ºF (0 °C – 40 °C) storage: -4 ºF – 140 ºF (-20 °C – 60 °C)
Humidity	< 95º F (< 35 °C), ≤ 90 % RH 95 ºF – 104 ºF (35 °C – 40 °C), ≤ 60 % RH
Altitude	operating: below 9,842 ft (3,000 m) storage: below 49,212 ft (15,000 m)
Electromagnetic Compatibility	EMC Directive 2004/108/EC, EN61326:2006, EN61000-3-2:2006+A2:2009, EN61000-3-3:2008
Safety	low voltage directive 2006/95/EC, EN61010-1:2001, EN61010-031:2002+A1:2008
General	
Display	4.3" TFT-LCD display, 480 x 272
Interfaces	USBTMC (standard), GPIB (optional), USB host port
Storage Memory	10 instrument settings, 32 arbitrary waveforms
AC Input	100 – 240 VAC ± 10%, 50 / 60 Hz ± 5% 100 – 120 VAC ± 10%, 45 – 440 Hz
Power Consumption	30 W max.
Dimensions (W x H x D)	10.3" x 4.1" x 13.5" (261 x 105 x 344 mm)
Weight	6.1 lbs (2.8 kg)
Three-Year Warranty	
Standard Accessories	Getting started manual, full instruction manual on CD, AC power cord, USB type A-to-type B cable, certificate of calibration
Optional Accessories	USB-to-GPIB adapter (model AK40G)

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