Data Sheet

20 MHz DDS Sweep Function Generator with Arb Function

Model 4045B

The model 4045B is a high-performance 20 MHz DDS (direct digital synthesis) function generator with arbitrary waveform capability. Generating stable and precise sine, square, triangle, and arbitrary waveforms, this instrument provides variable output voltages from 0 to 10 Vpp into 50 Ω (up to 20 Vpp into open circuit), linear and logarithmic sweep, AM/FM modulation, a built-in counter, and a continuously variable DC offset that allows the output to be injected directly into circuits at the correct bias level. Separate output amplitude and DC offset amplifiers let you set a large DC offset (e.g. ± 4.99 V) with a small amplitude output signal (e.g. 10 mV), a feature typically found in more expensive generators.

The 4045B combines a traditional DDS and a true arbitrary generator in one unit, giving users the benefits of both technologies. Using DDS technology, waveforms can be generated with high frequency resolution at a low price. Due to the inherent limitations of this architecture, not all points from the waveform memory are used, and points may be skipped at higher frequencies. This leads to significantly more jitter and higher distortions on non-repetitive waveforms and sometimes small details of the waveforms stored internally will be missing from the output signal. The true arbitrary waveform section generates point by point waveforms with lower jitter, high resolution, and true representation of the required waveform.

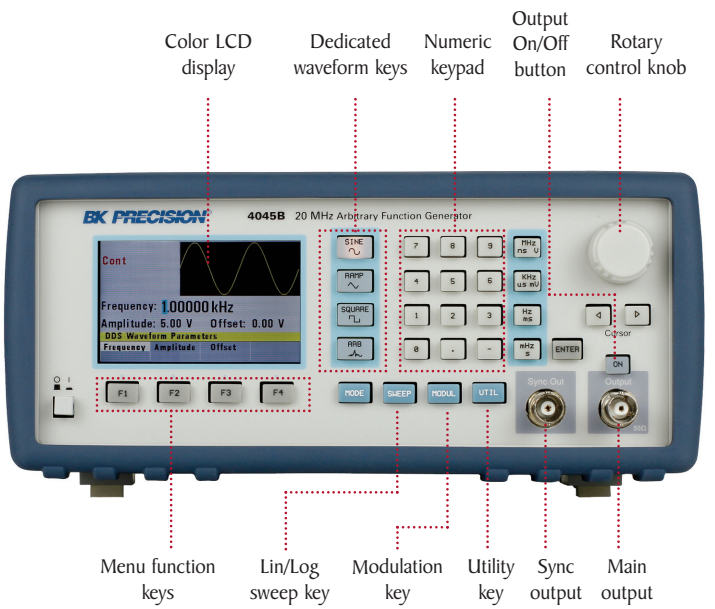
Due to the arbitrary waveform capability of the 4045B, the instrument is able to generate low-jitter square waves with greater edge stability. The improved signal integrity allows these generators to be used for simulating reliable clock signals, generating triggers, or validating serial data buses.

This model is suitable for education and other applications that require DDS function generators with sweep, modulation, and arbitrary waveform capabilities.

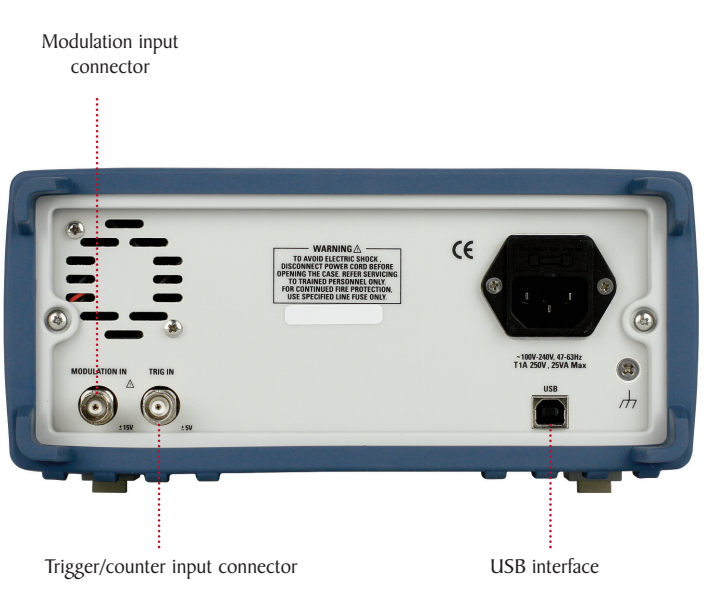
Features & Benefits

- 12-bit, 50 MSa/s, 1k point arbitrary waveform generator
- Sine and square waveforms up to 20 MHz
- Triangle/ramp waveforms up to 2 MHz
- Bright color display with waveform preview
- Linear and logarithmic sweep
- AM/FM modulation
- Independent output and DC offset amplifiers allow for small amplitude output signals with large DC offsets
- Low-jitter square wave generation
- Adjustable duty cycle
- Output ON/OFF button
- Internal/external triggering
- Gate and burst mode
- Built-in counter
- USB interface
- SCPI-compliant command set
- Arbitrary waveform editing software and remote control application software provided
- Short circuit and overvoltage protection on all inputs and outputs

Front panel



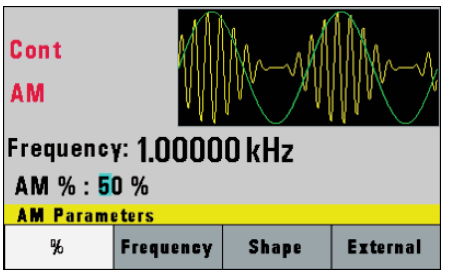
Rear panel



Intuitive user interface

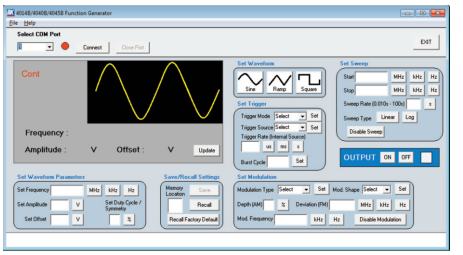
Easily change all waveform parameters using the intuitive menu-driven front panel keypad, rotary control knob, and large color LCD display that shows a preview of the output waveform. Convenient waveform and range selection buttons let users make quick and precise adjustments to the output signal.

Versatile tools



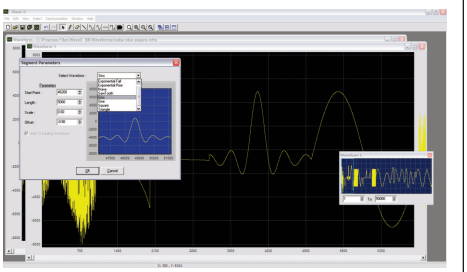
The 4045B provides AM and FM modulation along with linear/logarithmic sweep and built-in counter capabilities. Internal and external sources can be used for triggering and modulating the signal.

Easy PC connectivity



The signal generator can be programmed remotely via the USB (virtual COM) interface using SCPI commands. B&K Precision also offers application software (available for download at www.bkprecision.com) that provides virtual front panel emulation, allowing users to remotely control their instrument without the need for programming.

Generate waveforms with ease



Use waveform editing software to easily generate, edit, and download custom arbitrary waveforms. Generate waveforms by importing a text file, or define via freehand, point draw, or waveform math. Waveforms can also be loaded from the generator for documentation purposes.

Specifications	4045B
Frequency Characteristics	
Sine	0.01 Hz to 20 MHz
Square	0.01 Hz to 20 MHz
Triangle	0.01 Hz to 2 MHz
Resolution	6 digits* or 10 mHz
Accuracy (Sine)	0.002% (20 ppm) at < 500 Hz: 0.001% + 0.006 Hz
Output Characteristics	
Amplitude Range	10 mVpp to 10 Vpp (into 50 Ω); 20 mVpp to 20 Vpp (open circuit)
Amplitude Resolution	3 digits (1,000 counts)
Amplitude Accuracy	± 2% ± 20 mV of programmed output from 1.01 V – 10 V
Flatness	± 0.5 dB to 1 MHz ± 1 dB to 20 MHz
DC Offset Range	-4.99 V to 4.99 V (into 50 Ω)
DC Offset Resolution	10 mV, 3 digits
DC Offset Accuracy	± 2% ± 10 mV (into 50 Ω)
Output Impedance	50 Ω ± 2%
Output Protection	Protected against short circuit or accidental voltage applied to the main output connector
Waveform Characteristics	
Harmonic Distortion (for sine wave at 5 Vp-p into 50 Ω)	0 – 1 MHz, < -60 dBc 1 MHz – 5 MHz, <-50 dBc 5 MHz – 12 MHz, <-45 dBc 12 MHz – 20 MHz, <-50 dBc
Square Rise/Fall Time	≤ 20 ns (10% to 90% at full amplitude into 50 Ω)
Duty Cycle	Square: 20% - 80% to 2 MHz Triangle: 1% - 99% in 1% steps, up to 200 kHz
Symmetry Accuracy at 50%	± 1%
Jitter (square)	< 100 ps rms (cycle-to-cycle, typical)
Arbitrary Waveform Characteristics	
Sampling Rate	20 ns to 50 s
Vertical Resolution	12 bits
Accuracy	0.001%
Resolution	4 digits
Waveform Length	2 to 1000 points
Operating Modes	
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 waveform cycle is limited to 1 MHz.
Gate	Same as triggered mode, except waveform is executed for the duration of the gate signal. The last cycle started is completed.
Burst	2-65535 cycles
Trigger Source	Trigger source may be internal, external, or manual. Internal trigger rate 0.1 Hz – 1 MHz (1 us – 10 s)

*For square wave, resolution is up to 4 digits when frequency is > 20 kHz.

Modulation Characteristics	
Amplitude Modulation	
Internal	0.1 Hz – 20 kHz sine, square, or triangle waveform
External	5 Vp-p for 100% modulation, 10 kΩ input impedance
Frequency Modulation	
Internal	0.1 Hz – 20 kHz sine, square, or triangle waveform
External	5 Vp-p for 100% modulation, 10 kΩ input impedance
Sweep Characteristics	
Sweep Shape	Linear or Logarithmic, up or down
Sweep Time	10 ms to 100 s
Input and Output	
Trigger IN	TTL compatible Maximum rate 1 MHz Input impedance 1 kΩ Minimum width > 50 ns
Sync OUT	TTL pulse at programmed frequency; 50 Ω source impedance
Modulation IN	5 Vp-p for 100% modulation 10 kΩ input impedance DC to > 20 kHz minimum bandwidth
Counter Characteristics	
Range	50 Hz to 50 MHz
Resolution	Auto ranging, up to 8 digits
Accuracy	± 0.02% ± 2 digits
Sensitivity	25 mVrms typical
General	
Memory Storage	20 instrument settings
Arbitrary Memory	1,000 points in flash memory
Power Requirements	100 V – 240 V AC ± 10%, 47-63 Hz
Operating Temperature	32 °F to 122 °F (0 °C to 50 °C)
Storage Temperature	14 °F to 158 °F (-10 °C to 70 °C)
Humidity	95% R.H. 0 °C to 30 °C
Dimensions (W x H x D)	8.39" x 3.46" x 8.27" (213 x 88 x 210 mm)
Weight	5.5 lbs (2.5 kg)
Electromagnetic Compatibility	Meets EMC Directive 2004/108/EC, EN55011, EN55082
Safety	Meets Low Voltage Directive 2006/95/EC, EN61010
	Three-Year Warranty
Included Accessories	Power cord, USB (type A to B) interface cable, certificate of calibration

Note: All specifications apply to the unit after a temperature stabilization time of 15 minutes over an ambient temperature range of 23 ºC ± 5 ºC.
Specifications are subject to change without notice.