



# Models 4084, 4085, 4086 & 4087

## Programmable DDS Function Generator Series

### Data Sheet

Part Nos. 01BK4084DDS, 01BK4085DDS, 01BK4086DDS, 01BK4087DDS,

### Programmable DDS Function Generator Series

#### Models 4084, 4085, 4086 & 4087

The B+K Precision® models 4084, 4085, 4086 and 4087 are high performance laboratory grade synthesized function generators with a wide frequency range of up to 120 MHz. Direct digital synthesis (DDS) techniques are used to create stable, accurate output signals for all 27 built-in standard and complex (arbitrary) waveforms. The generators produce high purity, low distortion sine waves, square waves up to 40 MHz and provide a stable output of very small signals down to the 1mV - 10mV range. The instrument also provides a built-in 100 MHz Universal Counter with frequency measurement and totalize function.

The versatility and capabilities of this series make it an ideal tool for many general-purpose test and bench applications or for use in Training and Education.

#### Versatile modulation and trigger capabilities

The generators provide extensive modulation capabilities including AM, FM, FSK, PSK, pulse modulation and linear/logarithmic sweep. Internal and external modulation sources, as well as internal, external and gated trigger sources are supported. Modulation parameters can be set precisely and are

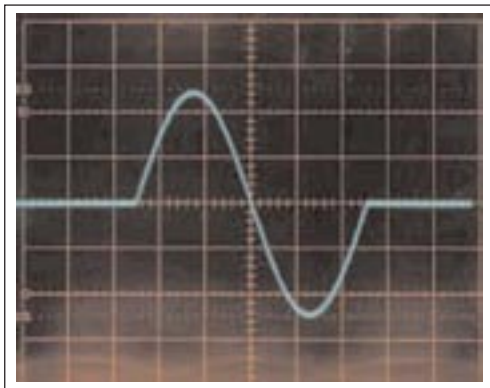


Fig1 Single cycle burst, start phase=0°



adjustable over a wide range. For instance burst count is programmable in 1 burst increments up to 10000 bursts and burst phase is adjustable in 0.1° increments.

#### Convenient user interface and operation

You can adjust parameters via knob or numeric keypad. Enter amplitude values directly in Vpp, mVpp, Vrms, mVrms or dBm and display the correct voltage by entering the actual output configuration used (terminated with 50 Ohm or open circuit). You can enter frequency in terms of frequency or seconds using time values s, ms, Hz, kHz or MHz. Submenus are used for modulation modes and other complex functions. The generators are fully programmable via the standard RS232 interface, using SCPI commands. The instrument also provides 10 memories to store and recall instrument settings. Additionally the current state is saved at power off and can be restored at power up.



Specifications subject to change without notice

Specifications	models			
	4084	4085	4086	4087
<b>Frequency Characteristics</b>				
Sine	1μHz ~ 20MHz	1μHz ~ 40MHz	1μHz ~ 80MHz	1μHz ~ 120MHz
Square	1μHz ~ 20MHz	1μHz ~ 40MHz	1μHz ~ 40MHz	1μHz ~ 40MHz
All Other waveforms	1μHz ~ 100kHz			
Frequency Stability	± 1x10 <sup>-6</sup> (22°C ± 5°C)			
Resolution	1μHz			
Accuracy	± 5x10 <sup>-6</sup> (22°C ± 5°C)			
Data entry Units	s, ms, Hz, kHz, MHz			
<b>Waveform Characteristics</b>				
Main Waveforms (Sine, Square)				
Amplitude resolution	12 bits			
Sample Rate	200MSa/s		300MSa/s	
Sine				
Harmonic Distortion of Sine Wave*	≤ - 50dBc (frequency ≤ 5MHz) ≤ - 45dBc (frequency ≤ 10MHz) ≤ - 40dBc (frequency ≤ 20MHz) ≤ - 35dBc (frequency ≤ 40MHz) ≤ - 30dBc (frequency > 40MHz)			
THD *	0.1% (20Hz ~ 100kHz)			
Square				
Rise and fall time*	≤ 15ns			
* = Note: Test conditions for harmonic distortion, sine distortion, rise/fall time Output Amplitude 2Vp-p, Environmental temperature: 25°C ± 5°C				
<b>Others built-in waveforms</b>				
27 build-in standard and complex waveforms	Sine, Square, Triangle, Positive Ramp, Falling Ramp, Noise, Pulse, Positive Pulse, Negative Pulse, Positive DC, Negative DC, Stair wave, Coded Pulse, Full wave rectified, Half-wave rectified, Sine transverse cut, Sine vertical cut, Sine phase modulation, Logarithmic, Exponential, Half-round, Sinx/x, Square root, Tangent, Cardiac, Earthquake, Combination			
Waveform Length	4096 dots			
Amplitude Resolution	10 bits			
Pulse				
Duty Cycle	0.1% ~ 99.9% (below 10kHz), 1% ~ 99% (10kHz ~ 100kHz)			
Rise/Fall Time	≤ 100ns (Duty Cycle 20%)			
<b>DC signal characteristics</b>				
DC range	≤ 10mV - 10V (high impedance)			
DC Accuracy	± 5% of setting + 10mV (high impedance)			
<b>Arbitrary</b>				
Non volatile memory	8 waveforms			
Waveform length	8~16000 points			
Amplitude resolution	10 bits			
Frequency range	1μHz~100kHz			
Sample rate	200MSa/s			
<b>Amplitude Characteristics</b>				
Amplitude Range				
For all models	Freq ≤ 40MHz: 2mV ~ 20Vpp (open circuit) , 1mV ~ 10Vpp (50Ω)			
4084, 4085, 4086	Freq > 40MHz: 2mV ~ 4Vp-p (open circuit), 1mV ~ 2Vpp (50Ω)			
4087	Freq > 40MHz: 0.1mV ~ 3Vpp (50Ω)			
Resolution	2μVpp (open circuit), 1μVpp (50Ω)			
Accuracy	± 1%+0.2mV (sine wave relative to 1kHz)			
Stability	± 0.5 % / 3 hours			
<b>Flatness</b>				
For amplitude ≤ 2Vpp	± 3% (freq ≤ 5MHz), ± 10% (5MHz < freq ≤ 40MHz)			
For amplitude > 2Vpp:	± 5% (freq ≤ 5MHz), ± 10% (5MHz < freq ≤ 20MHz) ± 20% (frequency > 20MHz) ± 1dBm (frequency > 40MHz)			
Output Impedance	50Ω			
Output Units	Vpp, mVpp, Vrms, mVrms, dBm			
<b>DC Offset Characteristics</b>				
Offset Range (open circuit)				
	Freq ≤ 40MHz: ± 10Vpk ac+dc (Offset ≤ 2 x pk - pk amplitude) Freq > 40MHz: ± 2Vpk ac+dc (Offset ≤ 2 x pk - pk amplitude)			
Offset Resolution	2μV (open circuit), 1μV (50Ω)			
Offset Error	± 5% of setting + 10mV (Ampl. ≤ 2Vpp into open circuit) ± 5% of setting + 20mV (Ampl. > 2Vpp into open circuit)			
<b>Modulation</b>				
<b>AM Characteristics</b>				
Carrier Waveforms	Sine or Square			
Modulation Source	Internal or external			
Internal Modulating Waveform	Sine, Square, Triangle, Rising/Falling Ramp			
Frequency of modulating signal	100μHz ~ 20kHz			

Specifications (Cont.)	Models 4084, 4085, 4086 & 4087
Distortion	≤ 2%
Modulation Depth	1% ~ 120%, 1% ~ 80% (frequency > 40MHz, Ampl > 2Vpp into open circuit)
Modulation Error	± 5%+0.2% (100μHz < frequency ≤ 10kHz) ± 10%+2% (10kHz < frequency ≤ 20kHz)
Max. Amplitude of ext. input signal	3Vp-p (-1.5V ~ +1.5V)
<b>FM Characteristics</b>	
Carrier Waveforms	Sine or Square
Modulation Source	Internal or external
Internal Modulating Waveform	Sine, Square, Triangle, Rising/Falling Ramp
Frequency of modulating signal	100μHz ~ 10kHz
Deviation	Max. 50% of carrier frequency for internal FM Max 100kHz (carrier frequency ≥ 5MHz) for external FM, with input signal voltage 3Vp-p (-1.5V ~ +1.5V)
<b>FSK Characteristics</b>	
Carrier Waveform	Sine or Square
Control Model	Internal or external trigger (external: TTL level, low level F1, high level F2)
FSK Rate	0.1ms ~ 800s
<b>PSK Characteristics</b>	
Carrier Waveform	Sine or Square
PSK	Phase 1 (P1) and Phase 2 (P2), range: 0.0 ~ 360.0°
Resolution	0.1°
PSK rate	0.1ms ~ 800s
Control Mode	Internal or external trigger (external: TTL level, low level P1, high level P2)
<b>Burst Characteristics</b>	
Waveform	Sine or Square
Burst Counts	1 ~ 10000 cycles
Time interval between bursts	0.1ms ~ 800s
Control Mode	Internal, single or external gated trigger
<b>Frequency Sweep Characteristics</b>	
Waveform	Sine or Square
Sweep Time	1ms ~ 800s (linear), 100ms ~ 800s (log)
Sweep Mode	Linear or Logarithmic
Start/ Stop Frequency	Same as frequency range of Sine & Square
External trigger signal frequency	DC ~ 1kHz (linear) DC ~ 10Hz (log)
Control Mode	Internal or external trigger
<b>Inputs/ Outputs</b>	
<b>Main Output</b>	
Impedance	50Ω
Protection	Short circuit and overload protected
<b>Output MOD OUT</b>	
Frequency	100Hz ~ 20kHz
Waveform	Sine, Square, Triangle, Rising/Falling Ramp
Amplitude	5Vp-p ± 5%
Output Impedance	600Ω
Modulation IN	3Vpp = 100% Modulation
External Input Trig/FSK/Burst	Level - TTL
<b>Universal Counter, Key Specs*</b>	
Frequency Range	
Frequency Measurement	1Hz ~ 100MHz
Totalize mode	50MHz max
* For the full specification of the counter section refer to <a href="http://www.bkprecision.com">www.bkprecision.com</a>	
<b>General</b>	
Power Supply	198~242V or 99~121V, Frequency: 47~ 63Hz
Power Consumption	< 35VA
<b>State Storage Memory</b>	
Storage Parameters	frequency, amplitude, waveform, DC offset values, modulation parameters
Storage Capacity	10 user configurable stored states
Dimensions (W x H x D)	10" x 3.93" x 14.56" (255 mm x 100 mm x 370 mm)
Weight	6.6lbs (3 kg)
Remote Interface	RS232
Safety designed according to	EN61010
EMC tested according to	EN55022, EN55024, EN61326, EN61000
<b>Accessories</b>	
<b>One Year Warranty</b>	
Accessories Included	BNC to alligator cable, BNC to BNC cable, RS232 communication cable, power line cord, test report, spare fuse

NOTE: Specifications and information are subject to change without notice. Please visit [www.bkprecision.com](http://www.bkprecision.com) for the most current product information.