

Data Sheet

Programmable DDS Function Generator Series

Models 4084, 4085, 4086 & 4087



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.

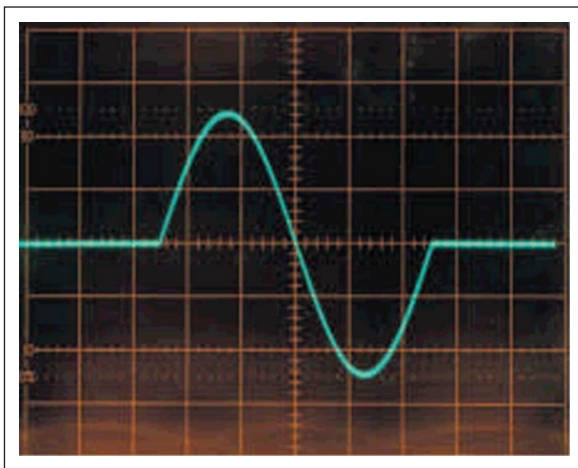


Fig.1 Single cycle burst, start phase=0°

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 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

| Models | 4084 | 4085 | 4086 | 4087 |
|--|---|--------------|--------------|---------------|
| Frequency Characteristics | | | | |
| 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 ⁻⁶ (22°C ± 5°C) | | | |
| Resolution | 1μHz | | | |
| Accuracy | ≤ ± 5x10 ⁻⁶ (22°C ± 5°C) | | | |
| Data entry Units | s, ms, Hz, kHz, MHz | | | |
| Waveform Characteristics | | | | |
| 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 | | | | |
| Others built-in waveforms | | | | |
| 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%) | | | |
| DC signal characteristics | | | | |
| DC range | ≤ 10mV ~ 10V (high impedance) | | | |
| DC Accuracy | ≤ ± 5% of setting + 10mV (high impedance) | | | |
| Arbitrary | | | | |
| Non volatile memory | 8 waveforms | | | |
| Waveform length | 8~16000 points | | | |
| Amplitude resolution | 10 bits | | | |
| Frequency range | 1μHz~100kHz | | | |
| Sample rate | 200MSa/s | | | |
| Amplitude Characteristics | | | | |
| 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 | | | |
| Flatness | | | | |
| 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 | | | |
| DC Offset Characteristics | | | | |
| 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) | | | |

| | |
|---|---|
| Modulation | |
| AM Characteristics | |
| 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 |
| 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) |
| FM Characteristics | |
| 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) |
| FSK Characteristics | |
| 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 |
| PSK Characteristics | |
| 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) |
| Burst Characteristics | |
| Waveform | Sine or Square |
| Burst Counts | 1 ~ 10000 cycles |
| Time interval between bursts | 0.1ms ~ 800s |
| Control Mode | Internal, single or external gated trigger |
| Frequency Sweep Characteristics | |
| 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 |
| Inputs/ Outputs | |
| Main Output | |
| Impedance | 50Ω |
| Protection | Short circuit and overload protected |
| Output MOD OUT | |
| 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 |
| Universal Counter, Key Specs* | |
| Frequency Range | |
| Frequency Measurement | 1Hz ~ 100MHz |
| Totalize mode | 50MHz max |
| * For full specification of the counter section, refer to online manual at www.bkprecision.com | |
| General | |
| Power Supply | 198~242V or 99~121V, Frequency: 47~ 63Hz |
| Power Consumption | < 35VA |
| State Storage Memory | |
| 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 x 100 x 370) mm |
| Weight | 6.6 lbs (3 kg) |
| Remote Interface | RS232 |
| Safety designed according to | EN61010 |
| EMC tested according to | EN55022, EN55024, EN61326, EN601000 |
| Three Year Warranty | |
| Included Accessories: BNC to alligator cable, BNC to BNC cable, RS232 communication cable, power line cord, test report, spare fuse | |