



Description

The CC-AFG20 is a 20 MHz function/arbitrary waveform generator module that has a control interface via the CalBench control centre. It offers 10 standard waveforms plus pulse and arbitrary waveform generation capabilities.

The module integrates an advanced Keysight unit with an AMM software bundle that provides various features and functionality for test and measurement applications. When used in the CalBench the interface is pre-loaded on the control centre module. It enables both basic control and automated testing capabilities. It simplifies test setups and configurations, making it ideal for on-bench product and device evaluation and diagnostics.

Direct digital waveform

The module adopts the latest direct digital synthesis (DDS) technology that digitally creates arbitrary waveforms and frequencies from a single and fixed frequency source. DDS offers the precision of digitally controlled logic, that reduces the complexity of the generator while increasing the stability. Thus, allowing you to have a stable, accurate output signal for clean, low distortion sine waves and square waves with fast rise and fall time up to 20 MHz and linear ramp waves up to 200 kHz.

Pulse generation

Generate pulses from 500 μ Hz to 5 MHz. With variable period, pulse width, and amplitude parameters, the module is ideally suited to a wide variety of applications requiring flexible pulse width signals.

Internal modulation

Internal AM, FM, PM, ASK, FSK, and PSK modulation makes it easy to modulate waveforms without the need for a separate modulation source. Linear and logarithmic sweeps are also built in, with sweep rates selectable from 1 ms to 500 s.

Features

- Function/Arbitrary Waveform Generator module
- Operated via CalBench control centre application
- Frequency range: 1 μ Hz to 20 MHz (1 μ Hz resolution)
- Sine, Square, Ramp, Triangle, Pulse, DC waveforms
- 14-bit, 50 MSa/s Arbitrary Waveforms customisable through the arbitrary waveform editor
- Built-in modulation: AM, FM, PM, ASK, FSK and PSK
- Pulse generation from 500 μ Hz to 5 MHz (1 μ Hz resolution)
- 40 mVpp to 5 Vpp amplitude range (into 50 ohm load)
- Suitable for electronic test and R&M applications
- Can be used with an external 10 MHz reference
- Compact 50 mm wide module

Software Interface Features

- Visualise multiple measurements simultaneously
- Easily log data, screenshots, and system state
- Rapidly prototype custom test sequences
- Recall past states of your USB Modular to replicate results
- Export measurement data in the desired format fast

**Technical Specifications**

Waveforms			
Standard	Sine, Square, Ramp, Triangle, Pulse, DC		
Built-in arbitrary	Exponential Rise, Exponential Fall, Negative Ramp		
Waveform characteristics			
Sine			
Frequency range	1 μ Hz to 20 MHz (1 μ Hz resolution)		
Amplitude flatness ¹ (relative to 1 kHz)	< 100 kHz	0.2 dB	
	100 kHz to 1 MHz	0.35 dB	
	1 MHz to 20 MHz	0.7 dB	
Harmonic distortion ²	Frequency range	< 1 Vpp	\geq 1 Vpp
	DC to 20 kHz	-70 dBc	-60 dBc
	20 kHz to 100 kHz	-65 dBc	-60 dBc
	100 kHz to 1 MHz	-50 dBc	-45 dBc
	1 MHz to 20 MHz	-40 dBc	-35 dBc
Total harmonic distortion ²	DC to 20 kHz	0.10%	
Spurious (Non-harmonic) output ³	DC to 1 MHz	-65 dBc	
	1 MHz to 20 MHz	-65 dBc + 6 dB/octave	
Phase noise (10 kHz offset)	-115 dBc/Hz (Typical)		
Square			
Frequency range	1 μ Hz to 20 MHz (1 μ Hz resolution)		
Rise/Fall time	< 18 ns, 10 to 90% terminated load (50 W)		
Overshoot	< 2%		
Variable duty cycle	<ul style="list-style-type: none"> • 20% to 80% (up to 10 MHz) • 40% to 60% (up to 20 MHz) 		
Asymmetry (@ 50% duty)	1% of period + 5 ns		
Jitter (RMS)	<ul style="list-style-type: none"> • > 50 kHz = 1 ns + 100 ppm of period • \leq 50 kHz = 10 ns + 100 ppm of period 		
Ramp, Triangle			
Frequency range	1 μ Hz to 200 kHz (1 μ Hz resolution)		
Linearity	< 0.2% of peak output		
Programmable symmetry	0% to 100%		



Pulse	
Frequency range	500 μ Hz to 5 MHz (1 μ Hz resolution)
Pulse width (period \leq 10 s)	40 ns minimum, 10 ns resolution
Overshoot	$<$ 3%
Jitter (RMS)	300 ps + 0.1 ppm of period
Notes: 1. Add 1/10th of output amplitude and offset specification per $^{\circ}$ C for operation outside the range of 18 $^{\circ}$ C to 28 $^{\circ}$ C. 2. DC offset set to 0 V. 3. Spurious output at low amplitude is -70 dBm, typical.	
Arbitrary	
Frequency range	1 μ Hz to 200 kHz (1 μ Hz resolution)
Waveform memory depth	64 kSa ¹
Amplitude resolution	14 bits/sample (including sign)
Sampling rate	50 MSa/s
Minimum rise/fall time	36 ns (Typical)
Linearity	$<$ 0.2% of peak output
Settling Time	$<$ 250 ns to 0.5% of final value
Jitter (RMS)	10 ns + 30 ppm
Common characteristics	
Amplitude	
Range	<ul style="list-style-type: none">• 40 mVpp to 5 Vpp (Into 50 Ω load)• 80 mVpp to 10 Vpp (Into open circuit)
Accuracy ² (across 50 Ω load at 1 kHz)	\pm 1% of setting \pm 5 mV (\pm 10 mV @ Hi-Z)
Units	Vpp, Vrms, dBm
Resolution	4 digits
DC offset	
Range (peak AC + DC)	<ul style="list-style-type: none">• \pm2.5 V (Into 50 Ω load)• \pm5 V (Into open circuit)
Accuracy ² (across 50 Ω load)	<ul style="list-style-type: none">• \pm2% of offset setting• \pm1% of amplitude• \pm5 mV (\pm10 mV @Hi-Z)
Amplitude Limit	Amplitude + Offset limit to within \pm 2.5 V range across 50 Ω load or \pm 5 V across an open circuit
Main output	
Impedance	50 Ω load (Typical)
Isolation	At least 42 Vpk to earth
Protection	Short-circuit protected, overload automatically disables the main output



Internal frequency reference	
Accuracy ³	±8 ppm in 1 year
External frequency reference	
Input	
Lock range	<ul style="list-style-type: none">• 10 MHz ±170 Hz
Amplitude level	<ul style="list-style-type: none">• 500 mVpp to 5 Vpp
Impedance	<ul style="list-style-type: none">• 50 Ω AC coupled
Lock time	<ul style="list-style-type: none">• < 2 s
Output	
Frequency	<ul style="list-style-type: none">• 10 MHz
Amplitude Level	<ul style="list-style-type: none">• 632 mVpp (Typical)
Impedance	<ul style="list-style-type: none">• Return loss 10 dB (Typical) at 10 MHz
Phase Offset	
Range	<ul style="list-style-type: none">• +360° to -360°
Resolution	<ul style="list-style-type: none">• 0.01°
Accuracy	<ul style="list-style-type: none">• 20 ns
Notes:	
1. Maximum at 16 k points for Arbitrary waveforms when using bundled software, Keysight Measurement Manager (KMM) and 64 k points when programmed in compatible application development environments like Keysight VEE, NI LabVIEW, and Microsoft Visual Studio.	
2. Add 1/10th of output amplitude and offset specification per °C for operation outside the range of 18 °C to 28 °C.	
3. Add 1 ppm/°C (average) for operation outside the range of 18 °C to 28 °C.	
Trigger characteristics	
Trigger input	
Input Level	TTL compatible
Slope	Rising and Falling, Selectable
Pulse width	> 100 ns
Input impedance	> 10 kΩ, DC coupled
Latency	< 500 ns
Jitter (RMS)	6 ns (3.5 ns for pulse)
Trigger output	
Output Level	TTL compatible into ≥1 kΩ
Pulse width	> 400 ns
Output impedance	50 Ω (Typical)
Fanout	4 TTL
Rise time	≤ 20 ns
Modulation	
Modulation scheme	Internal, AM, FM, PM, FSK, PSK, ASK



AM	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	Sine, Square, Ramp, Arbitrary (2 mHz to 20 kHz)
Depth	0.0% to 100.0%
FM	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	Sine, Square, Ramp, Arbitrary (2 mHz to 20 kHz)
Deviation	1 Hz to 500 kHz
PM	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	Sine, Square, Ramp, Arbitrary (2 mHz to 20 kHz)
Deviation	0.0° to 360.0°
FSK	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	50% duty cycle square (2 mHz to 100 kHz)
PSK	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	50% duty cycle square (2 mHz to 100 kHz)
Deviation	0.0° to 360.0°
ASK	
Carrier waveforms	Sine, Square, Ramp, Arbitrary
Source	Internal
Internal modulation	50% duty cycle square (2 mHz to 100 kHz)
Sweep Characteristics	
Waveforms	Sine, Square, Ramp, Arbitrary
Type	Linear or Logarithmic
Direction	Up or Down
Sweep time	1 ms to 500 s
Trigger	Single, External, or Internal

Due to continuous development Time Electronics reserves the right to change specifications without prior notice.