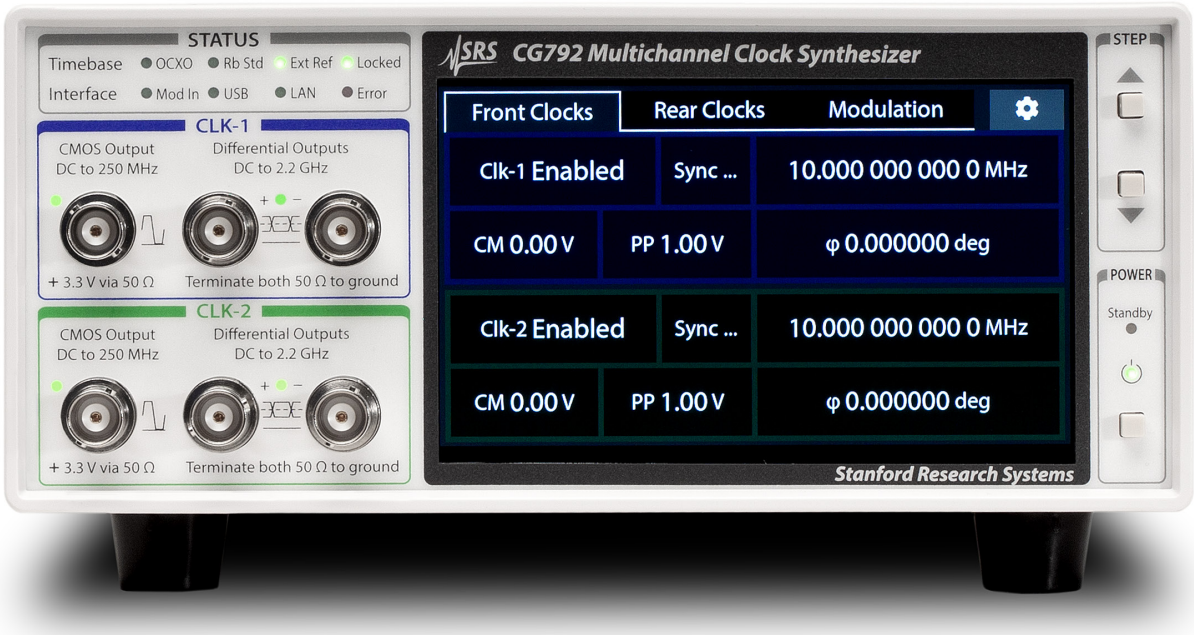
Multichannel Clock Synthesizer

CG792 — DC to 2.2 GHz low-jitter Clock Synthesizer



CG792 Multichannel Clock Synthesizer

- Clocks from 1 mHz to 2.2 GHz
- Up to four synchronizable channels
- Random jitter <1 ps rms
- 11 digits of frequency resolution
- <100 ps rise and fall times
- Frequency and phase modulation
- Phase control and time modulation
- OCXO and rubidium timebase (opt.)
- USB, Ethernet and RS-232 interfaces

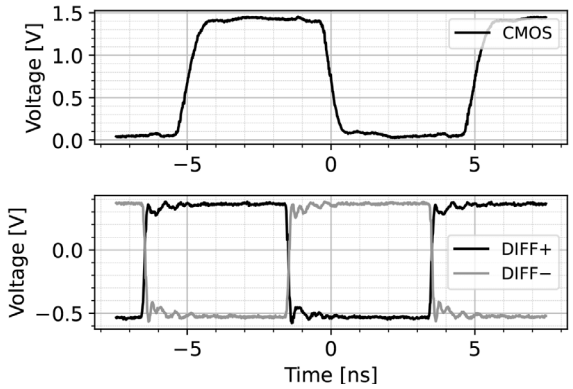
In communication systems and networks, jitter, wander, or frequency offsets can lead to high bit error rates or total loss of synchronization. The CG792 provides exceptionally clean, stable clocks required for the most critical applications while setting new standards for frequency accuracy, phase noise performance, and operational flexibility.

The CG792 extends precision clock synthesis capabilities with up to four independent ultra-low jitter channels from 1 mHz to 2.2 GHz. Reliable, low-jitter clocks help maintain signal integrity in systems using high-speed ADCs and DACs and other applications, minimizing artifacts caused by jitter and modulation.

Advanced New Architecture

At the heart of the CG792 lies a sophisticated dual analog PLL architecture utilizing state-of-the-art reference synthesizer phase locked loops. This design employs intelligent spur avoidance algorithms that automatically select optimal reference frequencies to eliminate integer boundary spurs. The system automatically chooses between several precision reference frequencies to maximize phase detector frequency while minimizing spurious content, maintaining decimal frequency resolution with seamless frequency transitions.

Clock Outputs



The trace shows a 100 MHz clock output. The 20 % to 80 % rise times are 75 ps and 0.6 ns respectively, for the differential and CMOS outputs.

Versatile Outputs

Each channel provides three synchronized outputs optimized for different applications. High-speed differential outputs provide square waves with programmable offset and amplitude and sub-100-ps transition times. The CMOS output delivers fixed 3.3 V logic levels optimized for high-impedance loads.

Precision Timebase Options

The CG792 accommodates diverse timing requirements with multiple timebase configurations. The standard crystal timebase provides excellent stability, while optional OCXO or rubidium frequency standards offer higher precision for demanding measurements. An external 10 MHz reference input with automatic detection ensures compatibility with existing laboratory standards.

Low Phase Noise and Jitter

With exceptionally low phase noise and high frequency resolution, the CG792 can replace RF signal generators in many applications. Front-panel outputs provide square waves up to +7 dBm — ideal for driving RF mixers.

Advanced Phase Control and Synchronization

The CG792's built-in phase measurement system enables automatic channel synchronization. Hardware-based channel coupling establishes deterministic phase relationships, while fast phase slew enables rapid timing adjustments.

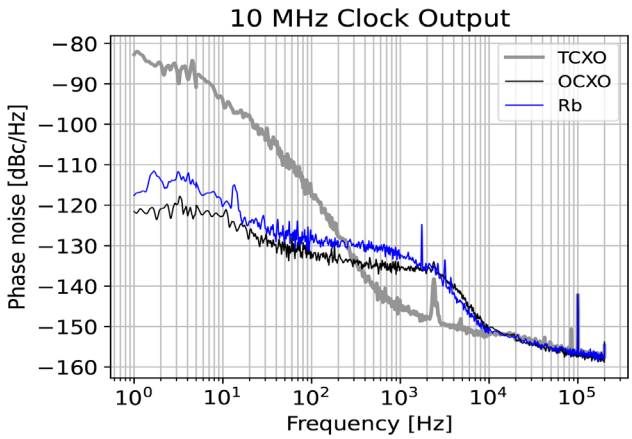
Comprehensive Modulation Capabilities

The built-in modulation system supports both phase and frequency modulation using a range of standard built-in waveforms as well as a user-applied analog signal via the rear-panel BNC input. In Jitter mode, the clock edges can be modulated with up to 3 ms of jitter. Additional capabilities include output blanking, polarity inversion, and pseudo-random bit sequence generation.

Intuitive Touchscreen Interface

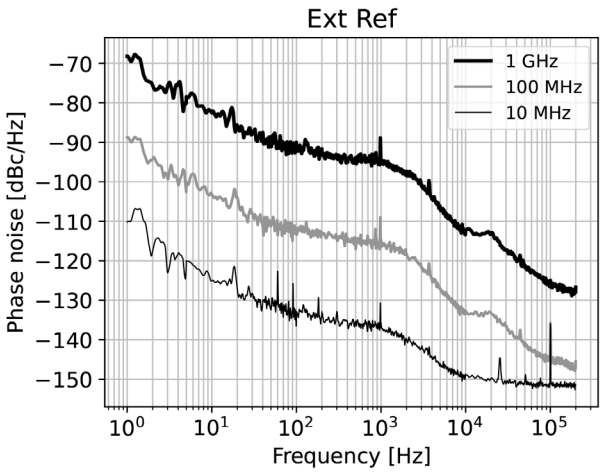
The CG792 features a 5-inch color TFT display with capacitive touch interface. The system organizes functions through intuitive tabs covering clocks, keypad entry, synchronization, modulation, and settings. Large numeric readouts combine with comprehensive parameter tables for an immediate visual feedback.

Phase noise



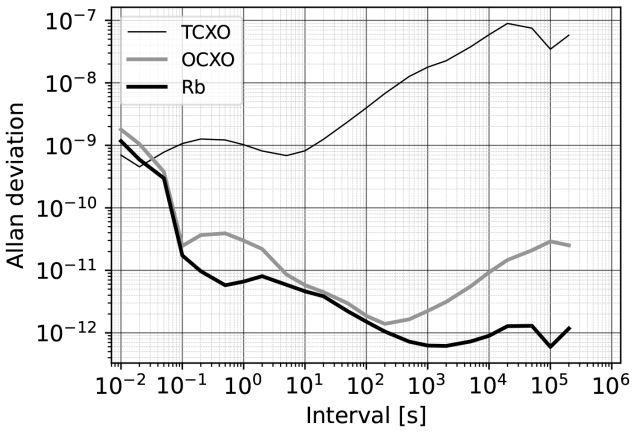
At low frequencies, the best performance is obtained using one of the optional timebases.

Phase noise with external reference



The CG792 preserves the low noise of the reference provided by an FS725 Rubidium Frequency Standard. The curves may be scaled by 20 dB/decade to estimate the phase noise at other frequencies.

Allan deviation



Allan deviation of three reference oscillators (TCXO, OCXO and rubidium). Lower values indicate better frequency stability; different slopes correspond to noise processes dominating at different averaging intervals.

Universal Connectivity

Standard Ethernet connectivity supports DHCP and static IP configuration, while USB and RS-232 interfaces provide flexible connection options. Command language based on SCPI ensures straightforward integration into automated test systems with IEEE 488.2 common command support.

Environmental Stability and Reliability

Designed for long-term laboratory and production use, the CG792 incorporates temperature-compensated control systems that minimize drift over varying operating conditions. Robust shielding and optimized PCB layout reduce susceptibility to crosstalk and electromagnetic interference, ensuring consistent performance even in electrically noisy environments.

Applications

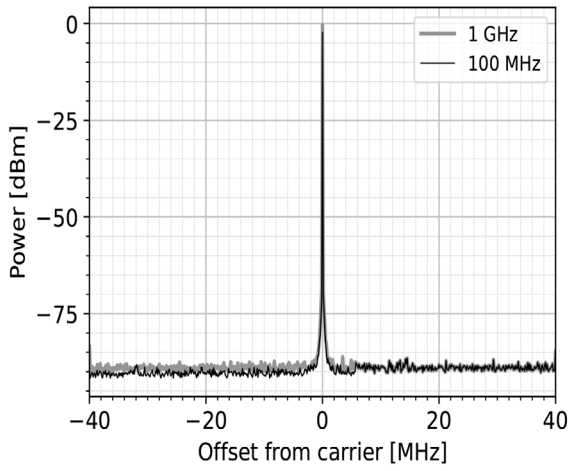
Digital Circuit Development: Provide stable clock references for FPGA, microprocessor, and ASIC testing with precise frequency and phase control.

Communications Testing: Generate complex clocking scenarios for network equipment validation, including multi-rate testing and protocol compliance verification.

Instrumentation Synchronization: Serve as a master timebase for test systems requiring multiple synchronized frequencies with deterministic phase relationships.

Precision Measurements: Support high-resolution timing measurements with ultra-low jitter reference signals and programmable modulation capabilities.

RF spectrum



This high-resolution scan shows an 80 MHz span around two clock signals at 100 MHz and 1 GHz. The only visible features are the clock tones and the spectrum analyzer noise floor, at about -85 dBm. The CG792's spur-free clock enables waveform acquisition and reconstruction with high SFDR.

Ordering Information

CG792	Multichannel Clock Synthesizer
Option A	Additional Clock channel (rear panel outputs, up to 2)
Option 02	OCXO Timebase
Option 03	Rubidium Timebase
O792RMD	Double rack mount kit
O792RMS	Single rack mount kit

Clock Outputs

Frequency

Range	DC, 1 mHz to 2.2 GHz
Resolution	11 digits
Setting time	<1 s (0.25 s above 100 Hz (typ.))

Phase

Range	±360 °
Resolution	
f < 200 Hz	Δφ ≤ 30 µdeg. × f
f ≥ 200 Hz	Δφ ≤ 0.01 µdeg. × f
Setting time	<2.0 s + 2/f (typ.)
Sync accuracy	<250 ps
Sync repeatability	<25 ps
Sync time	3 s + 2/f (typ.)

Differential Outputs

Outputs	BNC
Frequency range	1 mHz to 2.2 GHz
Common mode	–3.0 V to + 2.0 V
Amplitude (p-p)	0 V to 1.2 V
Level resolution	25 mV
Level error	<1.5 % ± 25 mV
Transition time	<100 ps (20 % to 80 %)
Asymmetry	<100 ps from nominal 50 %
Source impedance	50 Ω (±1 %)
Load impedance	50 Ω to ground on both outputs
Polarity inversion	Rear-panel BNC input
Blanking	Rear-panel BNC input
Protection	Continuous to ground, momentary to +5 VDC

CMOS Output

Output	BNC
Frequency range	1 mHz to 250 MHz
Levels	0 V and 3.3 V (unterminated) 0 V and 1.6 V (50 Ω termination)
Level error	<50 mV
Transition time	<1.0 ns (20 % to 80 %)
Asymmetry	<500 ps from nominal 50 %
Source impedance	50 Ω
Load impedance	50 Ω
Blanking	Rear-panel BNC input
Protection	Continuous to ground, momentary to +5 VDC

Timebase and Reference

Timebase *(+20 °C to +30 °C ambient)*

Stability	
Std. timebase	<5 ppm
OCXO (Opt. 02)	<0.01 ppm
Rb Std. (Opt. 03)	<0.0001 ppm
Aging	
Std. timebase	<5 ppm/yr
OCXO (Opt. 02)	<0.2 ppm/yr
Rb Std. (Opt. 03)	<0.0005 ppm/yr
Warm up time	
OCXO (Opt. 02)	20 m
Rb Std. (Opt. 03)	1 hr

External Reference

In	10 MHz (±10 ppm range), 50 Ω (>1 Vpp)
Out	10 MHz (2 Vpp sine into 50 Ω)

Noise & Spurs *(at 10 MHz)*

Phase noise	
100 Hz offset	<–90 dBc/Hz
1 kHz offset	<–100 dBc/Hz
10 kHz offset	<–100 dBc/Hz
100 kHz offset	<–110 dBc/Hz
Spurious	<–70 dBc (within 50 kHz of carrier)

* Spurs, phase noise, and residual FM scale by 6 dB/oct to other carrier frequencies.

Jitter and Wander

Jitter (rms)	<1 ps (1 kHz to 5 MHz bandwidth)
Wander (p-p)	<20 ps (10 s persistence)

Modulation

Internal Frequency Modulation (FM)

Waveforms	Sine, Square, Triangle, Noise
Period (Tmod)	0.1 ms to 5 s (except noise)
Dev. range	0 to 75 ppm of carrier
Dev. accuracy	< (±2 % of set value) ± 1 ppm
Sample rate	500 kSPS (fixed) for Sine, Square, and Triangle. 12 mSPS to 250 kSPS (adj.)

Internal Jitter Modulation

Dev. range	0 to 3 ms p-p
Dev. accuracy	<±10 % of set value

Rear Panel Analog Input

Connector	BNC, DC coupled, 1 MΩ
Input range	±1.0 V
Bandwidth	DC to 35 kHz (-3 dB)
Targets	FM or PM
Sample rate	1 kSPS to 250 kSPS (adj.)
Dev. range	
FM	0 to 75 ppm/V
PM	37.5 ns/V / Sample rate (kSPS)
Dev. accuracy	<(±5 % of set value ±1 ppm)

Phase Drift (at 135 MHz carrier)

FM	<1 ns/day (Sine, Square, Triangle)
Jitter	<1 ns/min. (Ext. PM)

Rear-Panel Digital Input

Connector	BNC, DC coupled, 1 MΩ
Input range	0 V to 3.3 V
Frequency range	DC to 35 MHz
Active	HIGH
Targets	Output Blanking, Polarity Inversion (Diff. only), Modulation ON/OFF

General

Interfaces	Ethernet, USB, RS-232
Line power	90 to 264 VAC, 47 Hz to 63 Hz
Standby power	
Std. timebase	<5 W
OCXO (Opt. 02)	<15 W
Rb Std. (Opt. 03)	<75 W
Operating power	
Std. timebase	<60 W
OCXO (Opt. 02)	<75 W
Rb Std. (Opt. 03)	<125 W
Operating	+5 °C to +40 °C
Storage	–20 °C to +70 °C
Humidity	Up to 80 % RH, non-condensing
Dimensions, weight	8” × 3.5” × 13.5” (WHL), 9 lbs.
Warranty	One year parts and labor on defects in materials and workmanship