



# CT501 50 MHz Function / Arbitrary Waveform Generator

Data Sheet



Chantil Technology

## Key features:

- 50 MHz bandwidth.
- 180 Msamples/sec max sample rate.
- 14 bits vertical resolution.
- 8 Msamples memory for long arbitrary sequences.
- Memory segmentation and sequencing for extra flexibility.
- Arbitrary and Direct Digital Synthesis modes.
- Sine, square, ramp, pulse, triangle, noise, DC.
- Flexible modulation modes (AM, FM, PM, ASK, FSK, BPSK, PWM).
- Flexible white noise addition.
- 10 mV<sub>pp</sub> to 10V<sub>pp</sub> into 50Ω.
- Burst, gated, triggered, sweep modes.
- USB based control, Windows based GUI or SCPI based remote control.
- Up to 2Msamples of non-volatile storage of arbitrary waveform segments.

## Overview:

The Chantil CT501 is a small, yet packed with functionality, affordable 50MHz Synthesizer/Arbitrary Waveform Generator.

### Dual Architecture:

The CT501 combines the functionality of a DDS based synthesizer with a truly Arbitrary Waveform generator, supporting the full 50MHz bandwidth in both modes. The architecture is optimized separately for each of those modes, with the synthesizer mode for periodical signals benefiting from the frequency agility, high frequency resolution and modulation support inherent in a DDS architecture, while the very large sample buffer and flexible sequencing assist generating long arbitrary waveforms spanning DC to 50 MHz.

### Flexible modulation schemes:

The CT501 accepts an external modulation input that can serve either as an analog input to for analog modulations, or as a digital input with programmable threshold, for digital modulations. The CT501 supports AM, FM, PM, ASK, FSK, PSK and PWM, and can generate a PRBS signal as well.

### Long arbitrary waveforms generation:

The CT501 really shines in the AWG mode, by combining a long 8 megasamples buffer with flexible segmentation and looping logic, without compromising on bandwidth, to generate complex test signals, potentially in synchronization to external triggering events.

### Low jitter digital signal generation:

The CT501 can generate low jitter signals for not just analog signals like sine waves, but for square waves as well (without suffering from the one clock jitter typical to many AWGs). Also, pulses can be generated with programmable slew rates, and thanks to a bypass-able low pass filter the slew rate times can be less than 4 nsec.

### Flexible clocking scheme:

The CT501 can use either its internal temperature compensated timing reference (TCXO) or an externally supplied 10MHz reference. Its internal reference is available externally, to optionally frequency lock multiple instruments together.

### Flexible noise addition:

The CT501 can generate white noise of 50MHz bandwidth at any level. The noise can also be added to any signal generated at the required SNR to simulate noise impairments.

### USB based control:

The CT501 is connected to a host PC through a USB cable. It can be controlled either from a flexible Windows based GUI application, provided with the CT501, or by issuing SCPI commands from a

automated test software.

**Small size and low power:**

The CT501 is amongst the smallest Arbitrary Waveform Generators in its class, consuming low power at less than 4 Watt, occupying a minimal footprint in the lab.

# Specifications\*:

This section contains the specifications for the ACT501 Synthesizer/Arbitrary Waveform Generator. Minimum and maximum values are guaranteed, typical values are what you can expect to typically get. Specifications are valid for 20°-30°, after 20 minutes of warm-up, 50Ω terminated (unless specified otherwise).

## Electrical:

### Operating modes:

Continuous, gated, triggered, burst, frequency sweep, modulated.

### Modulation types:

FM, AM, PM, PWM, BPSK, FSK, ASK.

### Waveforms:

Built-in synthesizer: Sine, square, ramp, triangle, Pulse, Gaussian noise, PRBS, DC.

User defined: Arbitrary waveform, up to 8M samples at 180Msps, with multi-segment sequencing.

## Waveform characteristics:

	min	typical	max	
<b>Sine:</b>				
Frequency range:	1mHz		50MHz	
Amplitude flatness (relative to 1KHz):			0.3dB	DC – 30MHz
			0.6dB	30MHz – 45 MHz
			1.3dB	45MHz – 50 MHz
Harmonic distortion(5Vp-p, 0V offset):		-70dBc		< 100KHz
		-60dBc		<1MHz
		-50dBc		<10MHz
		-40dBc		<50MHz
Non-harmonic distortion(5Vp-p 0V offset)		-60dBc		<10MHz
		-70dBc		<50MHz
THD (20Hz – 20KHz, 5Vp-p):		0.04%		
Phase noise (10MHz, 1Vp-p)		-105dBc/Hz		1KHz offset
		-115dBc/Hz		10KHz offset
		-125dBc/Hz		100KHz offset
<b>Square &amp; Pulse:</b>				
Frequency range:	1mHz		25MHz	
Resolution(normal mode):	1mHz			
Resolution(low jitter mode):		0.1PPM	1PPM	
Rise/fall times		3.7nsec		
overshoot		2%		
duty cycle	1%		99%	subject to limitations of pulse width
jitter, RMS(low jitter mode)		100psec		
<b>Ramp &amp; Triangle:</b>				
Frequency range:	1mHz		250KHz	
non-linearity:		0.1%		between 10% and 90% of signal amplitude
<b>Gaussian noise:</b>				
Bandwidth:	50MHz			

## Pseudorandom binary sequence (PRBS):

Sequence length:  $2^{63}-1$

## DC:

Amplitude:  $\pm 5V$  into  $50\Omega$

## Arbitrary Waveform Generator:

Sample rate: 180MSPS  
Sample resolution: 14 bit  
segment length: 80 samples 8M samples  
segment length resolution: 1 sample  
total volatile sample storage: 8M samples  
total non-volatile sample storage: 2M samples  
total sequences: 100  
maximum segment repeat: 255 or infinite segment loop

## Common signal output characteristics:

Amplitude range: 10 mVolt 10 Volt peak to peak,  $50\Omega$   
20 mVolt 20 Volt peak to peak, high impedance  
Amplitude accuracy (at 1KHz):  $\pm 1mV \pm 1\%$  of setting  
DC offset range:  $\pm 5$  Volt as long as  $0.5 * \text{signal} + \text{offset}$  is limited to  $\pm 5V$ .  
DC offset resolution: 1 mVolt  
DC offset accuracy:  $\pm 2mV \pm 1\%$  of setting  
Frequency accuracy(initial):  $\pm 1.5PPM$   
Aging of TCXO timebase:  $\pm 1PPM/\text{year}$   
Frequency resolution: 1mHz  
Frequency resolution for square wave in low jitter mode  
1PPM 0.1PPM

## External modulation input:

Amplitude range:  $-5V$   $+5V$   
input impedance (dc coupled):  $5K\Omega$   
Bandwidth: 100KHz

## Trigger/Gate input:

Input level: TTL  
input impedance:  $10K\Omega$

## Marker/Trigger output:

Output level: TTL  
Output impedance:  $50\Omega$

## Reference frequency input (rear panel):

Amplitude range: 100mVp-p 5Vp-p  
Frequency range: 9,999,500Hz 10MHz 10,000,500Hz  
Impedance (AC coupled):  $1K\Omega$

## Reference frequency output (rear panel):

Frequency: 10MHz  
Frequency aging: 1PPM/year  
Output level: TTL  
Impedance (DC coupled):  $50\Omega$

## Signal IO connectors:

BNC connectors

**Remote control:**

USB 2.0, mini B

**Physical dimensions:**

Weight:

9 Oz. (254 g)

Size (WxHxD):

4.3" x 1.2" x 4.7" (108.5mm x 29.5mm x 120mm)

**External power supply:**

Voltage:

5V

Power consumption:

4W

\* All specifications preliminary, and subject to change