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MODELS 5201/5300

125MS/s PXIBus / PCIBus Arbitrary Waveform / Function Generators



- 5201: Single Channel PXIBus waveform generator
- 5300: Single Channel PCIBus waveform generator
- Sine waves to 50MHz, Square to 30MHz
- SINE OUT to 125MHz, 1Vp-p
- 14 Bit vertical resolution
- 2M waveform memory
- 1 ppm clock accuracy and stability

- Extensive modulation capabilities AM, FM, Arbitrary FM, FSK, Ramped FSK and Sweep
- 14 digits sample clock frequency setting, limited by 1μS/s
- Waveform sequencing with up to 4096 segments and sequences
- Occupies a single slot only
- Ultra fast waveform downloads using DMA
- ArbConnection software for easy waveform creation

Model 5201/5300 is a Single-Channel Arbitrary Waveform / Function Generator that combines many powerful functions in one small package. Supplied free with the instrument is ArbConnection software, which is used for controlling the 5201/5300 and for generating, editing and downloading waveforms from a remote computer.

A Cost Effective Format

The 5201/5300 is a sensible alternative to a GPIB-based waveform generator when developing a PXI or PCI based test system. The 5201/5300 provides a synergistic combination of a function generator, arbitrary waveform synthesizer, programmable sequencer, pulse generator, and modulation generator in one instrument. The 5201/5300 delivers all this at a lower cost than comparable bench-type, or VXI-based instruments. This versatility ensures that the Model 5201/5300 will adapt to future testing needs as well as current ones.

Sample Rate

New technology requirements are driving communications systems to use increasingly narrow channel width. A sample rate of 125MS/s makes the 5201/5300 an ideal modulation source for troubleshooting new encoding schemes. The 5201/5300 also provides high-speed waveforms to simulate signal distortion, power line cycle dropouts, video signals, component failures and power supply transients.

14 Bit Resolution

The 14-bit resolution provides 16,384 output levels. This means that even audio waveforms can be generated with excellent fidelity. It also allows video - and other complex waveforms - to be generated with small details superimposed on large signals, in order to test the response of receiving systems.

2M Waveform Memory

The 5201/5300 provides 2M of waveform memory as standard, far more than competitive models. This waveform memory is accessible via a high-speed interface. Also, waveform memory is segmentable, allowing the storage of up to 4096 different waveforms of variable size. This allows test software to switch between many different waveforms rapidly and without having to download multiple times, enhancing test throughput in a way that cannot be duplicated by other competing products.

Sequences of up to 4096 Waveforms

Powerful sequencing capability allows linkage of up to 4096 waveform segments and/or bursts (repeated segments) into strings. A segment can be repeated up to 128k times in burst mode. Sequenced functions run continuously or are initiated by a trigger. It is also possible to mix continuous and triggered segments within one sequence. These sequencing features permit the creation of complex waveform or pulse patterns using minimal amounts of memory. Sequences are created by writing a sequence table. Sequence table download is extremely fast because ArbConnection writes to registers and does not require the overhead of an embedded controller.

Arbitrary Waveforms

The last but not least is flexibility of the 5201/5300 as an Arbitrary Waveform Generator. Combined with the power of ArbConnection, there is no limit to what you can create and generate. Waveform coordinates can be imported from a variety of sources such as MATLAB, ASCII files etc. Anything you can show on one of the composer screens is downloaded in a split of a second and generated by the main output.

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40 Years Celebration

Sample Clock Agility
The Model 5201/5300 has outstanding low phase noise characteristics and carrier stability. Such characteristics are very much needed for telecommunication and channel separation applications. On the other hand, the output of the 5201/5300 can be made extremely agile for applications needing sweep, FSK and FM. The sample clock of the instrument is derived from a DDS (Direct Digital Synthesis) circuit so controlling instantaneous frequency is a matter of changing its input bits. You, as a user, should not really care how it is done but the end result is magnificent: functions like wide-band FM, wander, linear and logarithmic sweep are easily created and executed by the generator.

A unique and extremely useful feature of ArbConnection is the FM Composer. The FM composer screen looks very much like the Wave Composer screen except the "Y" axis is given in units of frequency, so waveforms you create using the FM composer generate frequency change over time. You can create any arbitrary waveform shape or even use the equation editor to generate exotic shapes which eventually you can use to frequency modulate your main output.

Flexible Triggering Capability (5201 only)
Combining PXIbus trigger lines with the 5201 sync capability transforms the instrument into an Arbitrary Trigger Generator. In addition to continuous output, the instrument can also wait for a trigger to initiate a single waveform, a burst of waveforms or a sequence of waveforms. Triggers can also be used to advance a sequence of waveforms one segment at a time. The 5201 accepts the triggers from multiple sources: eight backplane trigger lines plus STAR trigger, front panel trigger input, and manual commands such as *TRG

Multi-Instrument Synchronization
Place 2 or more Model 5201/5300`s in a chassis and harness the power of multi-instrument synchronization to create multiple, phase-controlled output channels. Then vary module-to-module phase offsets to create multi-phase signal source. Really exciting!

ArbConnection
Unlimited Source of Arbitrary Waveforms. With the ArbConnection software you can control instruments functions, modes and features. You can also create virtually an unlimited variety of test waveforms. Freehand sketch allows you to draw your own custom waveform for quick analysis of analog signals. You can use the built-in equation editor to create your own exotic functions. Add or subtract components of a Fourier series to characterize digital or analog filters or, inject random noise into a signal to test immunity to auxiliary noise.

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Specification

CONFIGURATION

No. of Channels:	1
Interface:	
5201	PXIBus
5300	PCIBus

STANDARD WAVEFORMS

Waveforms:	Sine, Triangle, Square, Pulse, Ramp, Sine(x)/x, Gaussian, Exponential, Repetitive Noise, DC.
Frequency Range:	
Sine	100µHz to 50MHz
Square, Pulse	100µHz to 30MHz
All others	100µHz to 15MHz

SINE

Start Phase:	0 to 360°
Phase Resolution:	0.1°
Harmonics Distortion, 3Vp-p (typ.):	
DC to 2.5MHz	<-55dBc
2.5MHz to 25MHz	<-40dBc
25MHz to 40MHz	<-35dBc
40MHz to 50MHz	<-22dBc
Non-Harmonic Distortion (typ.):	
DC to 15MHz	<-70dBc
15MHz to 50MHz	<-60dBc
Total Harmonic Distortion:	
DC to 100kHz	0.1%
Flatness (1kHz):	
DC to 1MHz	1%
1MHz to 25MHz	5%
25MHz to 50MHz	20%

TRIANGLE, RAMP

Phase Range:	0 to 360°
Phase Resolution:	0.1°
Timing Ranges:	0%-99.9% of period

SQUARE, PULSE

Duty cycle:	1% to 99%
Timing Ranges:	0%-99.9% of period
Rise/Fall Time:	<8ns, typ.
Aberration:	<5%

SINC (SINE(x)/x)

"0" Crossing:	4 to 100 cycles

GAUSSIAN PULSE

Time Constant:	1 to 200

EXPONENTIAL FALL/RISING PULSE

Time Constant:	-100 to 100

DC

Range:	
5201	-4V to 4V
5300	-5V to 5V

ARBITRARY WAVEFORMS

Sample Rate:	100mS/s to 125MS/s
Vertical Resolution:	14 Bits
Waveform Memory:	2M points standard
Min. Segment Size:	16 points
Resolution:	4 points
No. of Segments:	1 to 4k
Download Rate:	5Mpoint per second

SEQUENCED ARBITRARY WAVEFORMS

Operation:	Permits division of the memory bank into smaller segments. Segments may be linked, and repeated in user-selectable fashion to generate extremely long waveforms.
Sequencer steps:	1 to 4k
Min. Seg. Duration:	1µs
Segment loops:	1 to 1M

ADVANCE MODES

Automatic:	No triggers required to step from one segment to the next. Sequence is repeated continuously through a pre-programmed sequence table.
Stepped:	Current segment is sampled continuously, external trigger advances to next programmed segment.
Single:	Current segment is sampled to the end of the segment including repeats and idles there. Next trigger advances to next segment.
Mixed:	Each step of a sequence can be programmed to advance either: a) automatic (Automatic mode), or b) with a trigger (Stepped mode)
Advance Source:	External (TRIG IN), Internal or software

MODULATION

COMMON CHARACTERISTICS

Carrier Waveform:	Sine, Triangle, Square, Pulse, Ramp, Sine(x)/x, Gaussian, Exponential, Repetitive Noise, DC and Arb
Carrier SCLK:	100mS/s to 125MS/s
Carrier Frequency:	Waveform dependent
Resolution:	14 digits, limited by 1µHz
Accuracy:	0.1%
Freq. Distortion:	<0.1%
Modulation Source:	
Internal	AM, FM, Arbitrary FM, Sweep
External	FSK (Through TRIG IN)

FM

Modulating Shape:	Sine, Square, Triangle / Ramp
Modulation Freq.:	1mHz to 100kHz
Deviation Range:	100mS/s to 50MS/s

ARBITRARY FM

Modulating Shape:	Arbitrary waveform, 10 to 20000 waveform points
Modulating SCLK:	1mS/s to 2MS/s
Deviation Range:	100mS/s to 50MS/s

AM

Envelope Freq.:	1µHz to 500kHz
Modulation Depth:	0% to 100%

FSK

Type:	Hop or Ramp
Low level:	Carrier sample clock
High level:	Hop frequency
Baud Rate Range:	1bits/sec to 10Mbits/sec
Min. FSK Delay:	1 waveform cycle + 50ns
Ramp FSK:	
Time	10µs to 1s
Resolution	3 digits

SWEEP

Sweep Time:	1ms to 1000s
Sweep Step:	Linear, Logarithmic or Arb
Sweep Direction:	Up or down

COMMON CHARACTERISTICS

FREQUENCY

Resolution:	14 digits limited by 1µS/s
Accuracy/Stability:	Same as reference

ACCURACY REFERENCE CLOCK

Internal	0.0001% (1ppm TCXO) initial tolerance over a 19°C to 29°C temperature range; 1ppm/°C below 19°C and above 29°C; 1ppm/year aging rate
External	10MHz TTL, 50% duty cycle

AMPLITUDE

Range:	
5201	80mV to 8Vp-p, into 50Ω
5300	100mV to 10Vp-p, into 50Ω

* Double into open circuit

Resolution:	4 digits
Accuracy (1kHz):	
100mV to 1Vp-p	±(1% + 1mV)
1Vp-p to 10Vp-p	±(1% + 10mV)

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OFFSET

Range:	
5201	0 to ±3.6V
5300	0 to ±4.5V
Resolution:	2.2 mV
Accuracy:	
500mV Window	±(1% of reading + 1% of amplitude + 2mV)
5V Window	±(1% of reading + 1% of amplitude + 20mV)

FILTERS

Type:	25MHz / 50MHz Elliptic

OUTPUTS

MAIN OUTPUT

Coupling:	DC coupled
Connector:	Front panel BNC
Impedance:	50Ω, ±1%
Protection:	Protected against temporary short to case ground

SYNC/MARKER OUTPUT

Connector:	Front panel BNC
Impedance:	50Ω, ±1%
Level:	>2V into 50Ω, 4V into 10kΩ
Validators:	BIT, LCOM
Protection:	Protected against temporary short to case ground
Position:	Point 0 to n
Width:	4 to 100000 points
Resolution:	4 points
Source:	Main output

SINEWAVE OUTPUT

Connector:	Front panel SMB
Impedance:	50Ω, ±1%
Level:	1V into 50Ω
Protection:	Protected against temporary short to case ground
Source:	Sample clock frequency
Frequency Range:	100mHz to 125MHz
Resolution:	Same as Sample clock
THD:	0.25% to 100kHz
SFDR:	<-30dBc to 125MHz

INPUTS

TRIGGER INPUT

Connector:	Front panel BNC
Input Impedance:	10kΩ, ±5%
Polarity:	Positive or negative
Threshold Level:	TTL
Min. Pulse Width:	20ns

EXTERNAL REFERENCE INPUT

Connector:	Front panel SMB
Frequency:	10MHz
Impedance & Level:	10kΩ ±5%, TTL, 50% ±5%

RUN MODES

Continuous:	Free-run output of a waveform
Triggered:	Upon trigger, outputs one waveform cycle. Last cycle always completed
Gated:	External signal enables generator. First output cycle synchronous with the active slope of the triggering signal. Last cycle of output waveform always completed
Burst:	Upon trigger, outputs a single or multiple pre-programmed number of waveform cycles from 1 through 1M

TRIGGER CHARACTERISTICS

System Delay:	1 Sample Clock+150ns
Trigger Start, Stop & Phase Control:	0 to 2M
Resolution:	4 points
Breakpoint Error:	±4 points
Breakpoint Source:	External, Manual, or command

EXTERNAL

Connector:	Front panel BNC
Level:	TTL
Slope:	Positive or negative
Frequency:	DC to 2MHz
Impedance:	10kΩ, DC coupled

INTERNAL

Range:	100mHz to 2MHz
Resolution:	14 digits, limited by 1µHz
Accuracy:	0.1%

MANUAL

Source:	Soft trigger command from the front panel or remote

MULTI-INSTRUMENT SYNCHRONIZATION

PHASE OFFSET (LEADING EDGE)

Range:	0 to 2M
Resolution:	4 point
Initial Skew:	<20ns, to the first master; 20ns cumulative to additional slaves

GENERAL

Power Consumption:	10W max
Current Consumption:	
+3.3V	1.4A max.
+5V	30mA max.
+12V	200mA max.
-12V	200mA max.
Interfaces:	
5201	PXIBus
5300	PCIBus
Dimensions:	Single Slot
Weight:	
Without Package	0.5Kg
Shipping Weight	1Kg
Temperature:	
Operating	0 - 50°C
Storage	-40°C to + 70°C.
Humidity:	
11°C to 30°C:	85%;
31°C to 50°C:	75%
Safety:	EN61010-1, 2nd revision
Calibration:	1 year
Warranty [1]:	3 years standard

ORDERING INFORMATION

MODEL	DESCRIPTION
5201	125MS/s Single Channel PXIBus Arbitrary Waveform Generator
5300	125MS/s Single Channel PCIBus Arbitrary Waveform Generator

[1] Standard warranty in India is 1 year.

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