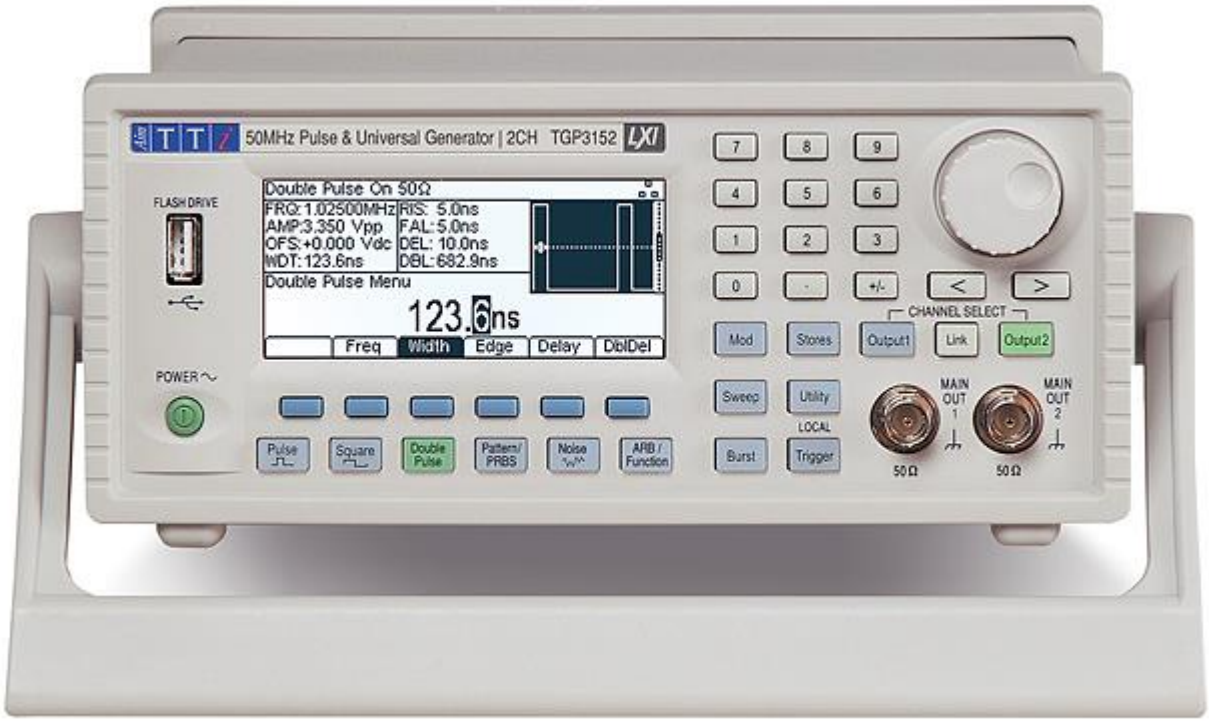
TGP3100 Series of Pulse & Universal Generators



The TGP3100 Series are true pulse generators using all digital techniques. They can replicate the capabilities of traditional pulse generators whilst adding many additional facilities such as pulse modulations.

Unlike DDS based function generators the TGP3100 Series can generate pulses with very high resolution of width and delay (100ps), and can operate in an asynchronously triggered mode with low jitter.

A high drive capability output stage enables up to 20 volts pk-pk to be driven into a 50 Ohm load.

As well as operating as pulse generators, the instruments can act as high performance noise generators and as function/arbitrary generators - making them truly universal waveform generators.

Single and dual channel models are available with a maximum frequency of either 50MHz or 25MHz

Model Range

TGP3151 – 1 channel, 50MHz

TGP3152 – 2 channel, 50MHz

TGP3121 – 1 channel, 25MHz

TGP3122 – 2 channel, 25MHz

Key Features

- Pulse waveforms from 1mHz to 50MHz [25MHz], minimum rise time 5ns [8ns]
- Pulse, double pulse, pulse pattern and PRBS waveforms
- Pulse period, width and delay resolutions of 100ps or 11 digits
- Independently variable rise and fall times from 5ns [8ns] to 800 seconds
- Low jitter asynchronous operation, externally triggered pulses or pulse reconstruction
- High drive capability output can provide 20V pk-pk into 50Ω (unmatched)
- Wide range of pulse modulations including AM.FM, PM, FSK, BPSK, SUM, PWM, PDM using internal or external modulation sources.
- Triggered (burst count) or gated operation using internal or external trigger sources
- Full Noise generator to 25MHz with selectable crest factor and user defined distribution
- Full Arbitrary/Function generator with 16 waveform types
- Sine waves up to 50MHz [25MHz]
- Arbitrary waveforms at 800MS/s sampling rate and 16-bit vertical resolution
- Extensive internal/external modulation of all waveform types
- Linear and logarithmic sweeps of all waveform types
- Front panel mounted USB Flash drive interface
- GPIB, USB and LXI compliant LAN interfaces

TECHNICAL SPECIFICATIONS

General specifications apply for the temperature range 5°C to 40°C. Accuracy specifications apply for the temperature range 18°C to 28°C after 30 minutes warm−up, at maximum output 50Ω source impedance into 50Ω load impedance. Typical specifications are determined by design and are not guaranteed.

TGP312x limits, where different, are shown in square brackets [ ] after the TGP315x limits. Options shown in curly brackets { } are only applicable for TGP31x2.

Waveforms

Standard Waveforms

Pulse, Square, Double Pulse, Pattern, PRBS (Pseudo Random Binary Sequence), Noise, Pre Defined Function Waveforms (Sine, Square (User Defined Duty Cycle), Triangle, Ramp (User Defined Symmetry), Negative Ramp, DC, Sin(x)/x (User Defined Zero Crossings), Exponential Rise (User Defined Time Constant), Exponential Fall (User Defined Time Constant), Logarithmic Rise (User Defined Time Constant), Logarithmic Fall (User Defined Time Constant), Haversine, Gaussian (User Defined Width), Lorentz (User Defined Width), D-Lorentz and Cardiac) and 4 User Defined Arbitrary Waveforms.

Pulse

Frequency Range:		1mHz to 50MHz [1mHz to 25MHz]
Frequency Resolution:		1mHz, 11 digits
Jitter RMS:		<30ps (cycle to cycle)
Period		Period can also be entered as frequency
	Range:	20ns to 1000s [40ns to 1000s]
	Resolution:	100ps
Width		Width can be entered as absolute width, duty cycle or fall time delay
	Range:	10ns to 999.99999999s [20ns to 999.99999998s]
	Resolution:	100ps
	Accuracy:	±200ps ±0.01% of period
Delay		Delay can be entered as absolute delay, phase or % of period
	Range:	0ns to 999.99999998s [0ns to 999.99999996s]
	Resolution:	100ps
	Accuracy:	±200ps ±0.01% of period
Transition (Rise/Fall) Time		Rise and Fall times can be independently varied or can be varied together simultaneously and can be entered as absolute rise/fall time or as a % of width
	Range:	5ns to 799.999999989s (10% to 90%) [10ns to 799.999999984s]
	Resolution:	100ps
	Accuracy:	±500ps ±0.01% of period

Double Pulse

Frequency Range:	1mHz to 25MHz [1mHz to 12.5MHz]
Frequency Resolution:	1mHz, 11 digits
Jitter RMS:	<30ps (cycle to cycle)
Period	Period can also be entered as frequency

	Range:	40ns to 1000s [80ns to 1000s]
	Resolution:	100ps
Width		Width can be entered as absolute width, duty cycle or fall time delay
	Range:	10ns to 499.99999999s [20ns to 499.99999998s]
	Resolution:	100ps
	Accuracy:	±200ps ±0.01% of period
Delay		Delay can be entered as absolute delay, phase or % of period
	Range:	0ns to 999.99999996s [0ns to 999.99999992s]
	Resolution:	100ps
	Accuracy:	±200ps ±0.01% of period
Transition (Rise/Fall) Time		Rise and Fall times can be independently varied or can be varied together simultaneously and can be entered as absolute rise/fall time or as a % of width
	Range	5ns to 399.999999989s (10% to 90%) [10ns to 399.999999984s]
	Resolution	100ps
	Accuracy:	±500ps ±0.01% of period
Double Delay		Double delay is the delay from the start of the first pulse to the start of the second pulse.
	Range:	20ns to 999.99999998ns [40ns to 999.99999996ns]
	Resolution	100ps
	Accuracy:	±200ps ±0.01% of period

Square

Frequency Range:	1mHz to 50MHz [1mHz to 25MHz]
Frequency Resolution:	1mHz, 11 digits
Jitter RMS:	<30ps (cycle to cycle)
Period	Period can also be entered as frequency
Range:	20ns to 1000s [40ns to 1000s]
Resolution:	100ps
Duty Cycle	
Range:	0.1% to 99.9%
Resolution:	0.1%
Transition (Rise/Fall) Time	5ns Fixed [10ns Fixed]

Pattern/PRBS

Bit Rate:	1mbps to 50Mbps [1mbps to 25Mbps]
Bit Rate Resolution:	1mbps, 11 digits
Pattern Source:	Internal from memory (memory size of 65536 bits with 1 bit resolution, user-defined). Up to 4 user-defined patterns may be stored in non-volatile memory. Patterns can be defined by downloading of pattern data via remote interfaces or from instrument's front panel. Internal PRBS: Sequence Length $2^m - 1$, where m = 7, 9, 11, 15, 20, 23, 29, 31

		External 1: Pattern is applied at External Modulation Input. Indefinite pattern length. Upto 5Mbps. Pattern is sampled at 50Mbps with user defined pattern threshold level.
		External 2 (External Width): Pattern is applied at External TRIG IN. Indefinite Pattern Length. Upto 50Mbps [25Mbps]. Fixed latency.
Transition (Rise/Fall) Time		Rise and Fall times are varied together simultaneously and can only be entered as absolute time
	Range:	5ns to 799.999999989s (10% to 90%) [10ns to 799.999999984s]
	Resolution:	100ps

Noise

Bandwidth		Defines the bandwidth in which the energy of the noise signal is concentrated
	Range:	1mHz to 25MHz [1mHz to 12.5MHz]
		Noise sampling rate is 3.2 times the specified bandwidth. DAC sampling rate is fixed at 800MSa/s. Intermediate points are calculated by interpolation. Frequency response follows Sin(x) / x (or Sinc) characteristic. Stopband attenuation of first aliasing / image band is 30dB, Typical.
	Resolution:	1mHz, 11 digits
Amplitude Distribution:		Gaussian or user-defined (user-defined waveform defines how often a level will occur relative to all others). Waveform memory size is 2048 points. Waveform is stored in non-volatile memory. Waveform can be defined by downloading of waveform data via remote interfaces or from instrument's front panel.
Crest Factor (Gaussian):		3.3, 4.8, 6.0, 7.0, Typical
Repetition Time:		> 10 years

Function

Waveforms		Sine, Square (User Defined Duty Cycle 1.0 % - 99.0%), Triangle, Ramp (User Defined Symmetry 0.0% - 100.0%), Negative Ramp, DC, Sin(x)/x (User Defined Zero Crossings 4 - 50), Exponential Rise (User Defined Time Constant 1.0% - 100.0%), Exponential Fall (User Defined Time Constant 1.0% - 100.0%), Logarithmic Rise (User Defined Time Constant 1.0% - 100.0%), Logarithmic Fall (User Defined Time Constant 1.0% - 100.0%), Haversine, Gaussian (User Defined Width 1.0% - 100.0%), Lorentz (User Defined Width 1.0% - 100.0%), D-Lorentz and Cardiac
Waveform Memory Size		4096 points
Vertical Resolution:		16 bits
Frequency Range:		1mHz to 50MHz [1mHz to 25MHz]
Frequency Resolution:		1mHz, 11 digits
Sampling Rate:		800MSa/s
Point to Point Jitter:		1.25ns Typical
Sine Amplitude Flatness (Relative to 1kHz):	<100kHz	0.1dB
	<5MHz	0.5dB
	<25MHz	1.25dB

	<50MHz 1.75dB		
Sine Harmonic Distortion:		<1 Vp-p	≥ 1Vp-p
	DC to 10MHz	-60dBc	-60dBc
	10MHz to 50MHz	-50dBc	-40dBc
Sine Non–Harmonic Spurii:	<–65dBc		
Sine Phase Noise (10kHz offset):	-113dBc/Hz, typical		
Ramp Linearity Error:	<0.1% to 200 kHz		

Arbitrary

Waveforms	Up to 4 user-defined waveforms may be stored in non-volatile memory. Waveforms can be defined by downloading of waveform data via remote interfaces or from instrument's front panel.
Waveform Memory Size	4096 points
Vertical Resolution:	16 bits
Frequency Range:	1mHz to 50MHz [1mHz to 25MHz]
Frequency Resolution:	1mHz, 11 digits
Sampling Rate:	800MSa/s
Point to Point Jitter:	1.25ns Typical

Internal Frequency Reference

Internal Setting Error:	< ± 2ppm
Oscillator Ageing Rate:	< ± 1ppm first year
Temperature Stability:	< 1ppm over the specified temperature range

Modulation

AM (Amplitude Modulation) Normal & Suppressed Carrier

Carrier Waveforms:	Pulse, Double Pulse, Square, Pattern/PRBS, Noise, Function, Arb
Modulation Source:	Internal / External / {Other Channel}
Internal Modulating Waveforms:	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac, PRBS-PN7, PN9, PN11, PN15, PN20, PN23, PN29, PN31 and User Defined Arbs
Internal Modulating Frequency:	1mHz to 10MHz, 1mHz resolution
Amplitude Depth:	0.0% to 100%, 0.1% resolution

FM (Frequency Modulation)

Carrier Waveforms:	Pulse (width, delay and edges are fixed when modulated), Double Pulse (width, delay, double delay and edges are fixed when modulated), Square (width is fixed when modulated), Pattern/PRBS (edges are fixed when modulated), Function (square duty cycle is fixed when modulated), Arb
Modulation Source:	Internal / External / {Other Channel}

Internal Modulating Waveforms:	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac, PRBS-PN7, PN9, PN11, PN15, PN20, PN23, PN29, PN31 and User Defined Arbs
Internal Modulating Frequency:	1mHz to 10MHz, 1mHz resolution
Frequency Deviation:	DC to Fmax/2, 1 mHz resolution

PM (Phase Modulation)

Carrier Waveforms:	Pulse, Double Pulse, Square, Function, Arb
Modulation Source:	Internal / External / {Other Channel}
Internal Modulating Waveforms:	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac, PRBS-PN7, PN9, PN11, PN15, PN20, PN23, PN29, PN31 and User Defined Arbs
Internal Modulating Frequency:	1mHz to 10MHz, 1mHz resolution
Phase Deviation:	-360.0 to +360.0 degrees, 0.1 degree resolution

FSK (Frequency Shift Keying)

Carrier Waveforms:	Pulse (width, delay and edges are fixed when modulated), Double Pulse (width, delay, double delay and edges are fixed when modulated), Square (width is fixed when modulated), Pattern/PRBS (edges are fixed when modulated), Function (square duty cycle is fixed when modulated), Arb
Source:	Internal / External (via TRIG IN)
Internal Modulation:	2mHz to 10MHz, 1mHz resolution (50% duty cycle square)

BPSK (Binary Phase Shift Keying)

Carrier Waveforms:	Pulse, Double Pulse, Square, Function, Arb
Source:	Internal / External (via TRIG IN)
Internal Modulation:	2mHz to 10MHz, 1mHz resolution (50% duty cycle square)

SUM (Additive Modulation)

Carrier Waveforms:	Pulse, Double Pulse, Square, Pattern/PRBS, Noise, Function, Arb
Modulation Source:	Internal / External / {Other Channel}
Internal Modulating Waveforms:	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac, PRBS-PN7, PN9, PN11, PN15, PN20, PN23, PN29, PN31 and User Defined Arbs
Internal Modulating Frequency:	1mHz to 10MHz, 1mHz resolution
Amplitude Depth:	0.0% to 100.0%, 0.1% resolution

PWM (Pulse Width Modulation)

Carrier Waveforms:	Pulse, Double Pulse
Modulation Source:	Internal / External / {Other Channel}
Internal Modulating Waveforms:	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac, PRBS-PN7, PN9, PN11, PN15, PN20, PN23, PN29, PN31 and User Defined Arbs
Internal Modulating Frequency:	1mHz to 10MHz, 1mHz resolution
Pulse Width Deviation:	0% to 100% of pulse width (subject to pulse width limits), resolution same as of pulse width

PDM (Pulse Delay Modulation)

Carrier Waveforms:	Pulse, Double Pulse
Modulation Source:	Internal / External / {Other Channel}
Internal Modulating Waveforms:	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac, PRBS-PN7, PN9, PN11, PN15, PN20, PN23, PN29, PN31 and User Defined Arbs
Internal Modulating Frequency:	1mHz to 10MHz, 1mHz resolution
Pulse Delay Deviation:	0% to 100% of pulse delay (subject to pulse delay limits), resolution same as of pulse delay

SPDM (Second Pulse Delay Modulation)

Carrier Waveforms:	Double Pulse
Modulation Source:	Internal / External / {Other Channel}
Internal Modulating Waveforms:	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac, PRBS-PN7, PN9, PN11, PN15, PN20, PN23, PN29, PN31 and User Defined Arbs
Internal Modulating Frequency:	1mHz to 10MHz, 1mHz resolution
Pulse Delay Deviation:	0% to 100% of double delay (subject to double delay limits), resolution same as of double delay

Gated Burst

Waveform will run while the Gate signal is true and stop while false. Starts synchronously with the input edge.

Carrier Waveforms:	Pulse, Double Pulse, Square, Pattern/PRBS, Noise, Function, Arb
Trigger Repetition Rate:	2mHz to 50MHz [25MHz] internal (10ns period resolution)
	DC to 50MHz [25MHz] external.
Gate Signal Source:	Internal from keyboard, trigger generator.
	External from TRIG IN or remote interface.

Gate Start/Stop Phase:	-360.0 to +360.0 degrees, 0.1 degree resolution (Phase offset cannot be set for Noise and Pattern / PRBS waveforms)

Triggered Burst

Selected active edge will produce one burst of the waveform

Carrier Waveforms:	Pulse, Double Pulse, Square, Function, Arb
	Pattern/PRBS: Selectable ‘Bit’ or ‘Block’ mode. In bit mode a fixed number of bits (specified as number of cycles) are generated at every trigger event. In block mode the whole pattern is generated at every trigger event.
	Noise is reset to its start condition at every trigger event. Allows generating same random noise sequence.
Number of Cycles:	1 to 4294967295 and infinite
Trigger Repetition Rate:	2mHz to 50MHz [25MHz] internal (10ns period resolution)
	DC to 50MHz [25MHz] external.
Gate Signal Source:	Internal from keyboard, trigger generator.
	External from TRIG IN or remote interface.
Gate Start/Stop Phase:	-360.0 to +360.0 degrees, 0.1 degree resolution (Phase offset cannot be set for Noise and Pattern / PRBS waveforms)

Sweep

Frequency sweep capability is provided for all standard (except noise) and arbitrary waveforms.

Carrier Waveforms:	Pulse (width, delay and edges are fixed when modulated), Double Pulse (width, delay, double delay and edges are fixed when modulated), Square (width is fixed when modulated), Pattern/PRBS (edges are fixed when modulated), Function (square duty cycle is fixed when modulated), Arb
Sweep Mode:	Linear or logarithmic, triggered or continuous.
Sweep Direction:	Up or Down
Sweep Range:	From 1mHz to 50MHz [25MHz]. Phase continuous. Independent setting of the start and stop frequency.
Sweep Time:	100µs to 500s
Hold Time:	100µs to 500s
Return Time:	100µs to 500s
Sweep Trigger Source:	The sweep may be free run or triggered from the following sources: Internal from keyboard or trigger generator. Externally from TRIG IN input or remote interface.

Trigger Generator

Internal source 2mHz to 50MHz [25MHz] square wave adjustable in 10ns steps, 11 digit resolution. Available for external use from the SYNC OUT socket.

Dual-channel Operations {applies only to TGP31x2}

Tracking

Independent (Off):	The channels are independent of each other.
Equal:	The two channels are identical and behave identically.
Inverse:	The two channels are identical except that the output of channel 2 is inverted. In this mode the two channels can be used together as a differential signal source.

Coupling

Frequency coupling:	The frequencies of the two channels can be coupled. Changing the frequency of one channel changes the frequency of the other channel, either by a fixed ratio or fixed offset.		
	Waveforms	Pulse, Double Pulse, Square, Function, Arb. Noise and Pattern / PRBS cannot be frequency coupled.	
	Type	Ratio	1 to 1000, resolution 0.001
		Offset	+/- 50MHz [+/- 25MHz] -1mHz, resolution 1mHz
Amplitude (and DC Offset) coupling:	Amplitude (and DC offset) of the two channels can be coupled. Changing the amplitude and offset on one channel changes the amplitude and offset of both channels.		
Output coupling:	Output On/Off can be coupled. Switching the output On/Off on one channel switches the output On/Off of both channels.		

Digital Channel Addition

Channel 2 can be added to Channel1 (using SUM modulation (modulation source: other channel) and vice versa. The maximum output voltage of the combined output remains unchanged. The uncombined channel still outputs the unchanged waveform.

Characteristics

Relative phase:	-360 to 360 degrees, 0.1 degree resolution (Phase offset cannot be set for Noise and Pattern / PRBS waveforms)
Channel to channel skew (typical):	<1ns (when performing identical operations)
Crosstalk (typical):	<-80db

Outputs

Main Output

Amplitude:	100mVpp to 10Vpp 50Ω into 50Ω 200mVpp to 20Vpp 5Ω into 50Ω or 50Ω into open circuit
Amplitude Accuracy:	1.5% ±5mV at 1kHz 50Ω into 50Ω
DC Offset Range:	±5V. DC offset plus signal peak limited to ±5V from 50Ω into 50Ω ±10V. DC offset plus signal peak limited to ±5V from 5Ω into 50Ω or 50Ω into open circuit
DC Offset Accuracy:	Typically 1% ±50mV.
Resolution:	3 digits or 1mV for both Amplitude and DC Offset.

Source Impedance	5Ω or 50Ω selectable

Amplitude can be specified open circuit (hi Z) or into an assumed load of 50Ω to 10kΩ in Vpp.

Sync Outs

Multifunction output automatically selected to be any of the following. User can choose Sync to always be carrier referenced, to output the currently used trigger signal or turn it off.

Carrier Waveform Sync:	Pulse / Square / Double Pulse / Function / Arbs	A square wave with 50% duty cycle at the waveform frequency.	
	Pattern / PRBS	Internal Source	A positive pulse which is 1 bit rate wide at the beginning of the sequence
		External Source	A square wave with same duty cycle and frequency as the external source.
	Noise	No sync associated with noise.	
Modulation Sync:	AM/FM/PM/SUM/ PWM/PDM/SPDM	A square wave with 50% duty cycle referenced to the internal modulation waveform when modulation source is internal, or a square wave referenced to the carrier waveform when modulation source is external. No sync is associated with noise as the modulation source.	
	FSK	A square wave referenced to the trigger rate. The sync is a TTL high when hop frequency is the output frequency and TTL low when carrier frequency is the output frequency for positive slope and vice versa for negative slope.	
	BPSK	A square wave referenced to the trigger rate. The sync is a TTL high when the hop phase is the output phase and TTL low when carrier phase is the output phase for positive slope and vice versa for negative slope.	
Sweep Sync:	Marker Off	A square wave that is a TTL high from the beginning of the sweep and a TTL low from the midpoint of the sweep	
	Marker On	A square wave that is a TTL high from the beginning of the sweep and a TTL low from the marker frequency	
Burst Sync:	Internal Trigger	A square wave with 50% duty cycle at the trigger frequency.	
	External Trigger	A square wave with same duty cycle and frequency as the external source.	
	Manual Trigger	A positive pulse which is approximately 18us wide at the beginning of the event.	
Trigger:	Selects the current trigger signal.		
Output Signal Level:	Logic level nominally 3V		
Output Impedance:	50Ω		

Ref Clock Output

Buffered version of the 10MHz clock currently in use (internal or external)

Output Level:	Nominally 3V logic level from 50Ω

Inputs

Trig In

For FSK, BPSK, triggered sweep, gated burst, triggered burst, external pattern (external width)

Threshold:	±3V
Maximum Input:	±10V
Minimum Pulse Width:	10ns [20ns]
Frequency Range:	DC to 50MHz [DC to 25MHz]
Polarity:	Selectable as high/rising edge or low/falling edge.
Input Impedance:	10kΩ
Trigger to Output Delay (Fixed)	448ns (Typical)
Trigger to Output Jitter	60ps RMS (Typical)
	Valid for externally triggered pulse, square, double pulse, internal pattern / PRBS, arb / function, external pattern (external width). Measured with 50Ω source impedance at main output. Trigger amplitude >500mV, transition time <10ns. Externally triggered noise, sweep, FSK and BPSK has peak to peak jitter of 5ns.

External Modulation Input

For AM, FM, PM, SUM, PWM, PDM, SPDM, external pattern

Voltage Range:	± 2.5V full scale
Input Impedance:	5kΩ typical
Bandwidth:	DC to 5MHz

Ref Clock Input

Input for an external 10MHz reference clock

Voltage Range:	1Vp-p – 5Vp-p
Maximum Voltage:	+5V
Minimum Volatge:	-1V

Interfaces

Full digital remote control facilities are available through LAN, USB and optional GPIB interfaces.

LAN Interface	Ethernet 100/10base – T hardware connection. LXI Core 2011.
USB Interface	Standard USB 2.0 hardware connection. Implemented as virtual-COM port.
USB Flash Drive	For waveform and set-up storage/recall.
GPIB (optional)	Conforming with IEEE488.1 and IEEE488.2

General

Display:	256 x 112 pixel monochrome graphics display. White LED backlight with adjustable brightness and contrast. Black-on-white or inverse modes.

Data Entry:	Keyboard selection of mode, waveform etc.; value entry direct by numeric keys or by rotary control.
Stored Settings:	Up to 9 complete instrument set–ups may be stored and recalled from non-volatile memory.
Size:	Bench Top: 97mm height; 250mm width; 295mm long
	Rack mount: 86.5mm (2U) height; 213.5mm (½–rack) width; 269mm long
Weight:	3.2kg
Power:	110-240VAC ±10% 50/60Hz; 100-120VAC ±10% 400Hz; 60VA max. Installation Category II.
Operating Range:	+5°C to 40°C, 20–80% RH.
Storage Range:	–20°C to + 60°C.
Environmental:	Indoor use at altitudes up to 2000m, Pollution Degree 2.
Options:	19 inch rack mounting kit.
Safety:	Complies with EN61010–1.
EMC:	Complies with EN61326

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