9530 Series
Digital Delay Pulse Generator

Our 9530 Pulse Generator provides the latest in laser timing and synchronization. Offering a unique 1U 19" rackmount package with all rear panel connections, it is well suited for integration into your rack timing and control systems.

Key Features
- 250 ps Timing Resolution
- < 50 ps Channel to Channel Jitter
- 1U Rackmount Ready
- Easy Programming Interface
- 4 or 8 Independent Channel Outputs
- Free LabVIEW Driver
- Ethernet, USB, RS232 Standard
- Full Customer Support
- 2 Year Warranty

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9530 Digital Delay/ Pulse Generator

The Model 9530 Digital Delay / Pulse Generator represents the latest in timing and synchronizing capabilities. With a unique 19" 1U form factor, the model 9530 is clearly our most innovative instrument to accurately synchronize any series of events.

The 9530's eight independent outputs, dual trigger/ gate inputs and external clock reference input make it ideal for laser system timing applications. The system can directly phase lock to an external timebase up to 100 MHz in frequency and down to 20 mV in amplitude. This allows synching directly to a laser photodiode signal and provides complete system timing relative to the laser timing with low jitter. The 9530 also provides a clock output that is capable of driving a 50 ohm load and can be used to provide a master timebase to other delay generators or equipment.

The core technology in precision timing of the 9530 offers 250 ps Delay & Width resolution and 50 ps internal jitter. Ethernet / USB interface, complex burst sequences, Divide-by-N, Setting Profiles, Clock Divider, Pulse Picking and Negative Delays allow users great flexibility in setting up an experiment or synchronizing multiple events. Complimentary NI certified LabVIEW drivers available.

Advanced Features/Options
• Clock input/output – allows master clock input from 10 MHz to 100 MHz with complete system timing relative to that signal with low jitter
• Field programmability–custom features, upgrades and fixes via fully programmable FPGA
• Settings / Programming saved on front panel power down

Channel Properties / Advanced Programming Modes
• Multiplexing - selectively combine the timing of any or all channels to one output
• Burst - Each channel can have a separate number
• Duty Cycle - N pulses on, M pulses off
• Channel Referencing - Any or all channels can reference the timing of any channel rather than T0
• Wait - The system will wait for a specified number of cycles before producing pulses

External Clock Synchronizing Example Setup

TTL BNC Electronics
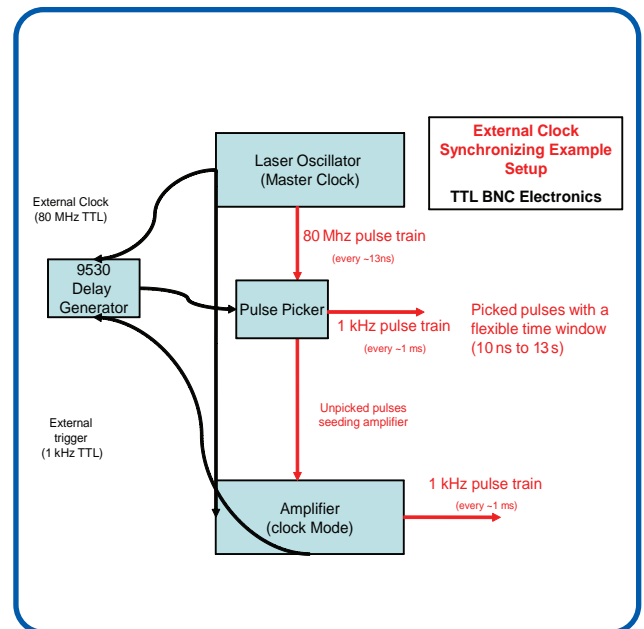
SYSTEM SPECIFICATIONS

I/O CONFIGURATION

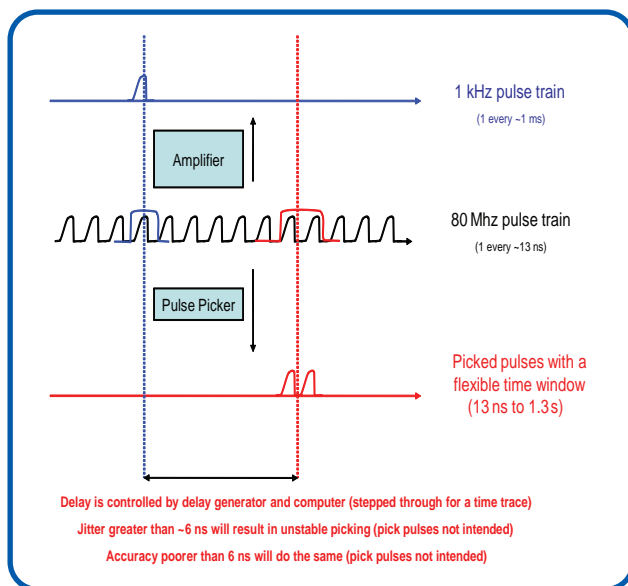|	
Models/Outputs	9534 - 4 independent channel outputs
	9538 - 8 independent channel outputs
Inputs	2 inputs - 1 trig input / 1 gate input
Memory	24 configuration storage slots

INTERNAL RATE GENERATOR

rate	0.0002 Hz to 10.000 MHz
resolution	10 ns
accuracy	1 ns + .0001 x period
jitter	50 ps RMS
settling	1 period
burst mode	1 to 9,999,999 pulses
timebase	100 MHz, low jitter PLL
oscillator	50 MHz, 25 ppm
system output modes	single shot, burst, duty cycle, continuous
pulse control modes	internal rate generator, external trigger, external gate

PROGRAMMABLE TIMING GENERATOR

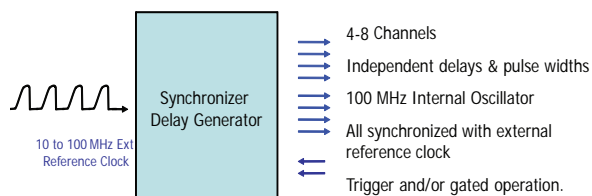|	
channel output modes	single shot, burst, duty cycle, normal
control modes	internally triggered, externally triggered and external gate each channel may be independently set to any of the modes
output multiplexer	any/all channels may be multiplexed to any/all outputs
delayed output	0 to 9,999,999 pulses
timebase	same as internal rate generator

DELAY

range	0 - 1000 s
accuracy	1 ns + .0001 x setpoint
resolution	250 ps

1 kHz pulse train
(1 every ~1 ms)

Amplifier

80 Mhz pulse train
(1 every ~13 ns)

Pulse Picker

Picked pulses with a
flexible time window
(13 ns to 1.3 s)

Delay is controlled by delay generator and computer (stepped through for a time trace)

Jitter greater than ~6 ns will result in unstable picking (pick pulses not intended)

Accuracy poorer than 6 ns will do the same (pick pulses not intended)

- Independent Channel Enable/Disable
- Delayed Channel Enable - allows flashlamp/ diodes to be fired, stabilizing the laser before the Q-switch or shutter is enabled.
- Single shot or Burst mode laser pulse bursts, controlling either just the Q-switch or entire laser.
- Duty cycle mode allows firing laser at an optimal rate, but picking pulses out at the user required rate.
- Output multiplexer allows the timing of any combination of channels to be output on any of the output ports, providing very complex pulse trains.

9530 EXTERNAL SYNC'D OPERATION

10 to 100 MHz Ext Reference Clock

Synchronizer Delay Generator

4-8 Channels

Independent delays & pulse widths

100 MHz Internal Oscillator

All synchronized with external reference clock

Trigger and/or gated operation.

External reference clock input of 50 mV to 2.5 V allows direct syncing to photo diode or high speed logic outputs.

Sync'd operation provides very low external jitter operation.

All modes (internal & external trigger, etc.) are available with the external clock.

MODULE SPECIFICATIONS

TTL/ADJUSTABLE CHANNEL OUTPUTS

oputput impedance	50 ohm

TTL/CMOS MODES

output level	4.0 V typ into 1 kohm
rise time	3 ns typ
slew rate	0.5 V/ns
jitter	50 ps RMS

ADJUSTABLE MODE

output level	2.0 to 20 VDC into 1 kohm
	1.0 to 10 VDC into 50 ohm
output resolution	10 mV
current	200 mA typical, 400 mA max (short pulses)
slew rate	> 0.1 V/ns
overshoot	< 100 mV + 10 % of pulse amplitude
rise time	15 ns typ @ 20 V (high imp)
	25 ns typ @ 10 V (50 ohm)
	(10 % - 90 %)

TRIGGER/GATE DUAL INPUT (STANDARD)

Standard dual channel input, providing one trigger input and one gate input. May be used with the dual trigger firmware option to provide two independent trigger sources.

threshold	0.2 to 15 VDC
maximum input voltage	60 V peak
resolution	10 mV
input impedance	1 Mohm + 40 pF or 50 ohm
insertion delay	< 180 ns
pulse inhibit delay	< 120 ns
output inhibit delay	< 50 ns
jitter	< 800 ps RMS

*Other custom modules available. Call with your request.

SYSTEM EXTERNAL TRIGGER/GATE INPUT(S)
TRIGGER INPUT

function	generate individual pulses, start a burst or continuous stream
rate	DC to 1/(200 ns + longest active pulse)
slope	rising or falling (maximum of 5 MHz)
behavior	used to control the internal rate

GATE INPUT

function	pulse inhibit or output inhibit
polarity	active high / active low
behavior	used to control the internal rate generator

STANDARD FEATURES & FUNCTIONS

communications	USB/RS232/Ethernet
external clock in	10 MHz - 100 MHz in 1 MHz increments
external clock out	5 MHz - 40 MHz
configuration storage	T0, Rate, Chan, 2x ExtPLL, 1 ExtPLL, ½ ExtPLL, ½ Ext, 40MHz, 20MHz, 10MHz, 5MHz, and Disabled

STANDARD OUTPUT MODULES

AT20	quad channel, TTL/CMOS & adjustable output module

OPTIONAL MODULE

TZ50	quad channel, high current TTL/CMOS (for driving 50 ohm loads) & adjustable output module

SYSTEM OPTIONS

I	incrementing (provides automatic high speed incrementing/decrementing of delay and/or pulsewidth for each channel)
DT15	dual trigger logic – provides additional trigger via gate input