Model 765 - HV
Digital Delay / Pulse Generator

BNC
Berkeley Nucleonics Corp
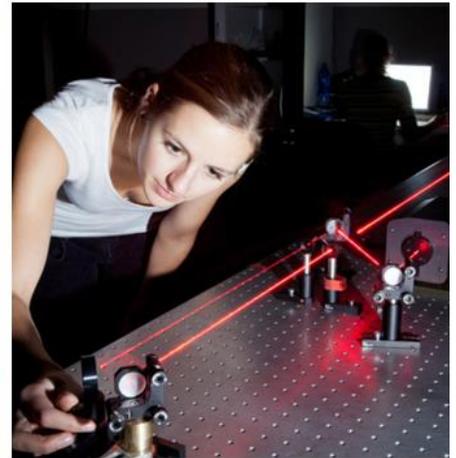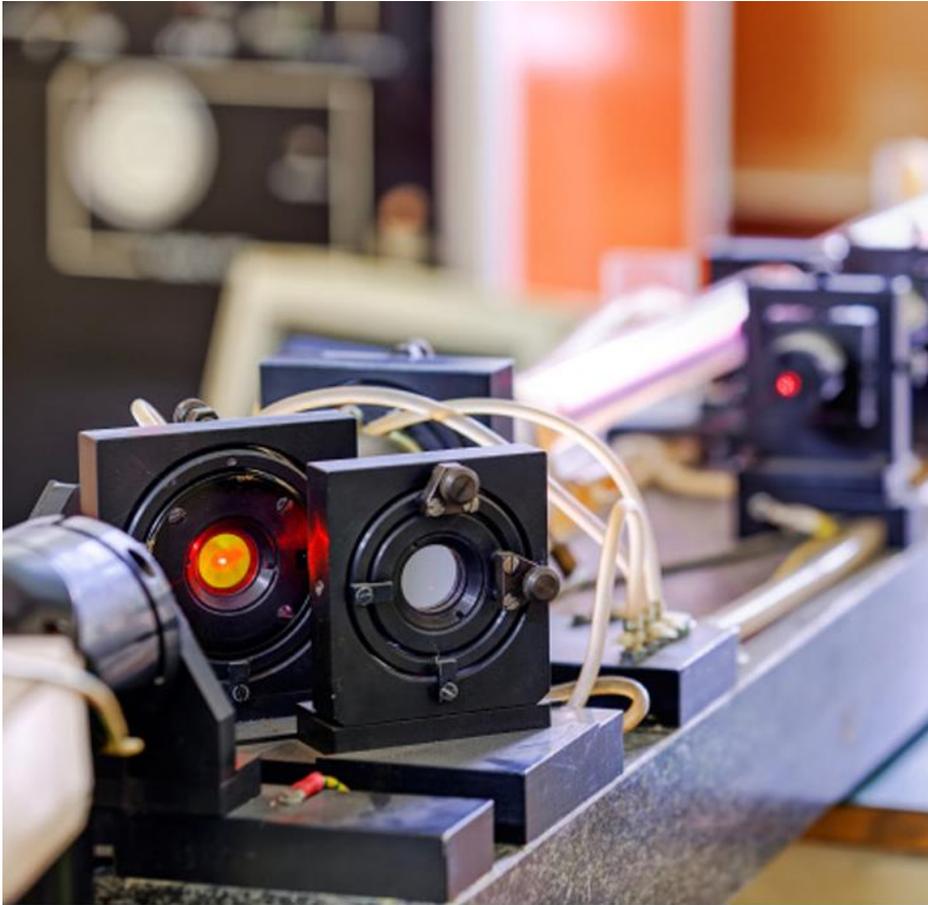
Features

- 400 ps Edge Time
- Up to 50 Vpp into 50 Ohm
- Narrow Widths (1 ns)
- Get started in 5 Minutes with Easy to use GUI

Applications

- Big Physics
- Experiments colliders
- Lasers modulations
- Radar and sonar systems
- Semiconductor tests

Model 765-HV

Fast Rise Time Pulse Generator

The Model 765-HV Pulse Generator is a feature-rich pulse and delay generator with 1 or 2 channels of completely programmable pulse and delay generation. The instrument offers many improvements over our previous design – faster transition times, narrow pulses, broader and more accurate amplitude control and a redesigned user interface. Take control of your time and amplitude domain!

Intuitive User Interface

The front panel controls for the Model 765-HV Pulse Generator include a 7" touchscreen and tactile controls for most operations. The touchscreen was designed to drive simplicity in operating and programming by giving users smartphone-like architecture complete with gesture control. The primary channel controls and programming options are easy to navigate, with a swipe gesture to move from channel to channel. Handy features like combining multiple pulses on one output can be graphically controlled and are easily identified on the screen. In addition, a rotary encoder and backlit pushbuttons provide an alternative yet familiar exerience to users needing front panel controls.

Rotary Encoder: The Model 765-HV front panel encoder is ideal for fine tuning pulse parameters on the fly. Dialing the encoder will change the value in continous, analog fashion. Pushing the encoder in will move the value adjustment from fine to coarse adjust, further simplifying setup and 'on-the-fly' adjustments.

Fast Rise Times and Plenty of Range

The Model 765-HV offers 630 ps Rise and Fall times (@ 50Vpp) over a large time domain. Our front end electronics circuit and new analog edge converter have been integrated into the pulse generator using a proprietary technology that virtually eliminates overshoot (< 5.0% typical) and ringing.

Measure	P1:ampl(C2)	P2:width(C2)	P3:rise2080(...	P4:rise(C2)	P5:fall8020(C2)	P6:fall(C2)	P7:ovsh+(C2)	P8:ovsh-(C2)	P9:- - -	P10:- - -	P11:- - -	P12:- - -
value	24.046 V	19.9700 ns	390 ps	577 ps	438 ps	656 ps	5.0 %	2.4 %				
mean	24.046 V	19.9700 ns	390 ps	577 ps	438 ps	656 ps	5.0 %	2.4 %				
min	24.046 V	19.9700 ns	390 ps	577 ps	438 ps	656 ps	5.0 %	2.4 %				
max	24.046 V	19.9700 ns	390 ps	577 ps	438 ps	656 ps	5.0 %	2.4 %				
sdev	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -				
num	1	1	1	1	1	1	1	1				
status	✓	✓	✓	✓	✓	✓	✓	✓				

C2 AVG DC50
5.00 V/div
0 mV offset
1.556 k#

Tbase   -10.0 ns   Trigger
5.00 ns/div   Auto   -2.00 V
2 kS   40 GS/s   Edge   Positive

Figure 1: Rise/Fall Time at 24Vpp

Programming

The Model 765-HV offers several userful remote programming options. In addition, the networking feature allows users to use a VXI-11 LAN protocol to network the instrument for printing, file sharing, internet access and remote login. The remote programming uses common SCPI commands, ensuring compatibility with a wide range of development environments. Visual Studio, .NET, LabView, LabWindows/CVI, Microsoft Visual Studio and MatLab are

all supported. Berkeley Nucleonics provides a comprehensive Software Development Kit (SDK) at no additional charge.

Inputs and Outputs

Pulse Out: The Model 765-HV offers inputs and outputs on the front and rear panel to accommodate users with rackmount or benchtop applications. The Pulse Out connectors are DC Coupled SMA connectors with 50 Ohm impedance and with strain-relief panel mounts. The pulse out settings can be independently positive or negative (0V to +/-25V, adjustable). The following table shows the parameter limits for pulse outputs:

Parameter	Min	Max
Voltage	-25.0 V	+25.0 V
Amplitude	100 mVpp	50 Vpp
Offset	-25V	+25V
Width	1 ns	Period – 1 ns
Period	5 ns	8 sec
Frequency	0.125 Hz	200 MHz
Delay	0 sec	Period

Table 1: Pulse Out Limits

Trigger In / Out: The Model 765-HV Trigger Input is a SMA connector with a programmable impedance and threshold (50 Ohm ±3.5V / 1k Ohm ±10V). The programmable trigger threshold has a resolution of 10mV, ensuring precise triggering. The Model 765-HV can trigger on signals down to 50 mV and as narrow as 1ns, and a convenient 'Autosense' function will measure the current trigger input level. The Model 765-HV also measures the Trigger In frequency and displays the result in the Trigger Setup Window. The Trigger Out is a SMA connector with 50 Ohm impedance and an output voltage range of 1.8 V to 3.3 V (Adjustable).

USB: There are 2 handy USB 3.0 Ports on the front panel for auxiliary equipment such as a keyboard, additional storage or other system requirements.

Rear Panel: Additional input and output connectors on the rear panel include PS/2 Mouse and Keyboard connectors (HDMI, VGA), LAN and Audio.

Multi-pulse Mode: The Model 765-HV allows users to combine four digitally programmed pulses on each output. This allows complex timing sequences, and repetition rates to 400 MHz. The graphical user interface allows users an easy representation of the outputs on a given channel. Below is a simple example showing different delay and width settings from a common trigger:

Figure 2: Output 1 (PULSE1 + PULSE2)

Application Idea – Semiconductor Test

The speed of modern Silicon is imposing high quality and high fidelity test systems. Today's patterns generators offer a good combination of performance but are limited in edge speed and dynamic range.

 The 765 series, for the first time, offers both high speed and high dynamic range, combined with an easy-touse interface and pulse mixing capabilities in one or multiple channels. This is excellent to test components and provide the right performance to test and prove specs to validate integrated circuits.

DTG functionality may be created by synchronizing one or more 765 series units (2 Channels each). We offers also, in the AWGs, digital outputs to be used for digital pattern generation simulators, high Power Microwave modulators.

Application Idea – Radar

Army/Navy may also require fast pulse generation for testing or emulation.

Radar or Sonar systems perfectly match with these generators to better test and prove complex detection systems. The 765 series is a good fit for areas where a large amount of channels is required and the cost of DAC solutions is too high and too complex to be managed.

ATI Electromagnetic systems largely used in military applications may be tested by 765 pulse generators. Pulses may be easily generated for applications such Pulse Electron Beam or X Ray Sources, Flash X-ray Radiography, Lighting pulse simulators, high Power Microwave modulators.

Ordering Information

Model 765-HV-1C	1 Channel HV Pulse Generator
Model 765-HV-2C	2 Channel HV Pulse Generator
P/N 765-RMKit	19: Rack Mount Kit for the 765-X

SPECIFICATIONS

⬡ Timing

Pulse Period	
Range (spec.)	5 ns to 8 sec.
Resolution (spec.)	10 ps
RMS Jitter[1]	15 ps
Pulse Frequency	
Range (spec.)	0.125 Hz to 200 MHz (Single pulse mode)
	0.25 Hz to 400 MHz (Double, Triple and Quadruple pulse mode)
Accuracy	± 2 ppm max
Pulse Width	
Range (spec)	1 ns to (period–1 ns)
Resolution (spec.)	10 ps
Accuracy	± (1 % + 0 ps)[2]
RMS Jitter[1]	< 10 ps
Pulse Delay Single/double/triple/quadruple	
Range (spec.)	0 ps to period
Resolution (spec.)	10 ps
Accuracy	± (0.1 % + 100 ps)

Output Specifications (50 Ohm load)

Impedance	50 Ohm nominal
Amplitude	
Range pk-pk (spec.)	100 mVpp to 50 Vpp
Resolution (spec.)	10 mV
Absolute accuracy (spec.)	±(2% of amplitude p-p + 2% of |DCOffset|+200 mV)
DC Offset	
Range (spec.)	0V or ± 25V adjustable
Resolution (spec.)	10 mV
Baseline Offset	
Range (spec.)	-25V, -12,5V, 0V,+12,5V,+25V (software selectable)
Resolution (spec.)	12.5 mV
Rise Time (20% to 80%, Offset=0V)	< 400 ps (up to 50Vpp amplitude)
Rise Time (10% to 90%, Offset=0V)	< 570 ps (up to 25Vpp amplitude)
	< 630 ps (up to 50Vpp amplitude)
Fall Time (20% to 80%, Offset=0V)	< 430 ps (up to 25Vpp amplitude)
	< 530 ps (up to 50Vpp amplitude)
Fall Time (10% to 90%)	< 640 ps (up to 25Vpp amplitude)
	< 840 ps (up to 50Vpp amplitude)
Overshoot	< 8 % (up to 25Vpp amplitude)
	< 5 % (25Vpp - 50Vpp amplitude)
Channel to Channel RMS Jitter[1]	< 15 ps
Initial Delay	0s to 8s (retriggerable delay off)
	0s to 2.5us (retriggerable delay on)

[1] All channels at the same frequency in Single Pulse mode and Continuous mode
[2] With Offset ≠ 0V the width can deviate from this specification depending on the Offset voltage and other parameters

Trigger

Trigger Input	
Impedance	50 Ohm or 1K Ohm programmable
Range (spec.)	± 3.5 V (50 Ohm input impedance)
	± 10 V (1K Ohm input impedance)
Minimum detectable amplitude (spec.)	< 50 mVpp
Threshold	
Range (spec.)	± 8V
Resolution (spec.)	10 mV
Accuracy	± 100 mV
Max. Input frequency (spec.)	40 MHz
Min. pulse width (spec.)	1 ns
Max. external width mode input frequency (spec.)	400 MHz
	(duty Cycle = 50%)
Edge selection	Positive, negative, both
Prescaler (for every channel)	0 to 65535
Trigger output	
Impedance	50 Ohm nominal
Amplitude (open load)	
Range (spec.)	1.8V to 3.3V adjustable
Resolution (spec.)	1 mV
Accuracy	± 1%
Delay (trigger in to trigger out)	< 100 ns
RMS jitter (trigger in to trigger out)	< 30 ps (Trigger IN Frequency ≤ 15 MHz)
Width	10 ns (single, burst mode)
	Period/2 (continuous mode)
Initial delay	0s to 8s (continuous mode)
	0s to 2.5us (single, burst, gated mode)
Internal timer	
Time range (frequency range)	25 ns to 42.9 sec (40Mhz to 23.3 mHz)
Time resolution	1 ps
Frequency accuracy	± 2ppm max
External Clock IN	

Connector Type	SMA on rear panel
Input Impedance	50 Ω, AC Coupled
Input voltage range	-5 dBm to 4 dBm sine or square wave (rise time T10-90 <1 ns and duty cycle from 40% to 60%)
Damage level	+8 dBm or ±15 VDC Max
Frequency range	10 MHz to 100 MHz
External clock OUT	
Connector type	SMA on rear panel
Output Impedance	50 Ω, DC Coupled
Frequency	10 MHz or External Clock IN Frequency
Accuracy	± 2ppm max
Aging	± 1.0 ppm/year max
Amplitude	Square wave: 0V to 1.25 V into 50 Ω, 0V to 2.5 V into High Z
Programmability	
Trigger modes	Single, continuous, burst, gated
Multiple pulse modes	Single, double, triple, guadruple, external width

Power

Voltage range	100-240 VAC ±10%
Frequency range	47-63 Hz
Max. power consumption	300 W

Environmental Characteristics

Temperature (operating)	+5 °C to +40 °C (+41°F to 104 °F)
Temperature (non-operating)	-20 °C to +60 °C (-4 °F to 140 °F)
Humidity (operating)	5 % to 80 % relative humidity with a maximum wet bulb temperature of 29 °C at or below +40 °C, (upper limit de-rates to 20.6 % relative humidity at +40 °C . Non-condensing.
Humidity (non-operating)	5 % to 95 % relative humidity with a maximum wet bulb temperature of 40 °C at or below +60 °C, (upper limit de-rates to 29.8 % relative humidity at +60 °C. Non-condensing.
Altitude (operating)	3,000 meters (9,842 feet) maximum at or below 25°
Altutude (non-operating)	12,000 meters (39,370 feet) maximum

EMC and Safety

Safety	EN61010-1
Main Standards	EN 61326-1:2013 – Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
Immunity	EN 61326-1:2013

General Characteristics

	765-HV-1C	765-HV-2C
Display	7 inch, 1024x600, capacitive touch LCD	
Operative system	Windows 10	
External dimensions	W 445 mm – H 135 mm – D 320 mm (3U 19" rackmount)	
Weight	21.4 lbs (9.7 Kg)	
	OUTPUT1 (SMA) TRG.IN (SMA) TRG.OUT (SMA) 2 USB 3.0 ports	OUTPUT1 (SMA) OUTPUT2 (SMA) TRG.IN (SMA) TRG.OUT (SMA) 2 USB 3.0 ports
Rear panel connectors	External Monitor ports (HDMI, VGA) 2 USB 2.0 ports	

	2 USB 3.0 ports 3 COM ports 2 Ethernet ports (10/100/1000BaseT Ethernet, RJ45 port) Audio In/Out ports 2 PS/2 keyboard and mouse ports External Clock IN (SMA) External Clock OUT (SMA)
Hard disk	128 GB SSD
Processor	Intel® Celeron J1900, 2 GHz (or better)
Processor Memory	8 GB

DOCUMENT HISTORY

Version	Date	Author	Notes
V1.1	4/29/24	AT	New format
V1.2	12/19/24	AT	Data changes
V1.3	3/27/25	AT	Split datasheet

Berkeley Nucleonics Corporation

2955 Kerner Blvd.
San Rafael, CA 94901

Phone: (415) 453-9955
Email: info@berkeleynucleonics.com

berkeleynucleonics.com
berkeleynucleonics.com/downloads