

# Model 745

## 250 fs Digital Delay Generator



## FEATURES

- 4 or 8 Channel Options
- 250 Femtosecond Resolution
- Jitter < 5 picoseconds rms internal mode
- External Clocking (10 MHz or 80 MHz)
- Front Panel, Ethernet or Embedded Browser

## APPLICATIONS

- Component Testing
- ATE
- Laser Timing
- Precision Pulse
- Instrument Triggering

### New Functionality:

burst, gate, trigger prescaler,  
1.25 ns resolution ATx, set/store parameter



**BNC**

**Berkeley Nucleonics**

Test, Measurement and Nuclear Instrumentation since 1963

**コーンズ テクノロジ 株式会社**

## Description

The Model 745 Digital Delay Generator provides four independent delay channels (T1 to T4). The delay resolution is 250fs and external trigger channel jitter is less than 5ps (only in internal mode rms jitter). BNC outputs deliver 5V with a 600ps typical rise time into 50ohms. Amplitude and width are independently adjustable for each output pulse.

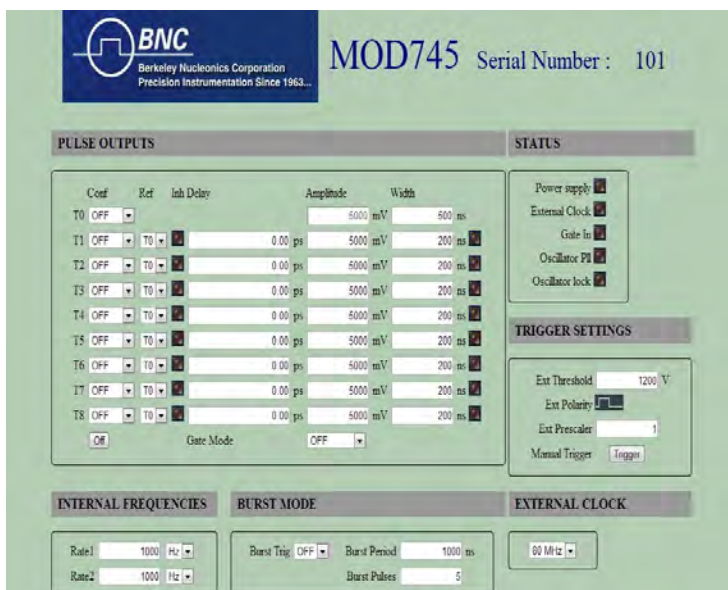
One input trigger (TRIG IN), or internal timer, or software command is used to trigger all output channels. A T<sub>0</sub> output pulse marks zero delay for each trigger.

The Model 745 also provides four optional delays channels, T5 to T8, at the rear panel. These optional rear panel delay channels have a resolution of 1.25 ns and trigger jitter less than 50ps rms.

## Control Panel Web Page

This web page from an embedded Web Server in the Model 745 provides a simple method to configure settings for each channel (delay, output amplitude, output width), trigger source, trigger mode, and to control operation and status of the instrument.

The configuration information of the instrument is stored and saved in the Model 745. BNC's DDG-MUC software will allow control of up to 8 Model 745's on one GUI page.



Example of Model 745 Control Panel

## Specifications

### Delays

Channels	4 or 8 independent delay outputs
Range	0 to 20 seconds
Resolution	250 fs
RMS Jitter	25ps rms + delay x 10 <sup>-7</sup> (external trigger to any output) 20ps rms + delay x 10 <sup>-7</sup> (channel to channel) < 5ps rms for short delay (channel to channel)
Accuracy	< 250ps + delay x 10 <sup>-7</sup>
Time base	200 MHz, 0.5 ppm stability

### Trigger source

Command	Front panel/ Ethernet
Internal Load	50Ω
Ext. Rep rate	< 1 MHz Trigger level, from 0.1 to 5V, Internal load: 50Ω

Trigger Slope	Positive or Negative, Selectable
Min Trigger Delay	< 60 ns

### Trigger mode

Output T <sub>0</sub>	One Shot, Repetitive
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### Output T<sub>0</sub>

Output T1 to T4	5 V/50Ω, 100 ns -10 us (rear panel)
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Amplitude	2 to 5 V, step < 0.1 V
Width	100 ns to 10 μs, step: 5 ns, 5 ns combined channel (optional)
Load	50 Ω
Rise Time	< 2 ns (600 ps typical)
Fall Time	< 5 ns
Connector	BNC on front panel

<b>Clock Input</b>	User Specified, settable at factory (between 10 MHz to 80 MHz)
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### External Time Base (CLK IN)

Frequency	10 or 80 MHz
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### General Specifications

Size	8.5 x 9.7 x 5.4 Inches
Power	50W, 110V-240V

### Interface Control

Front panel, Web page from embedded web server for IE, Firefox, Chrome and Ethernet network

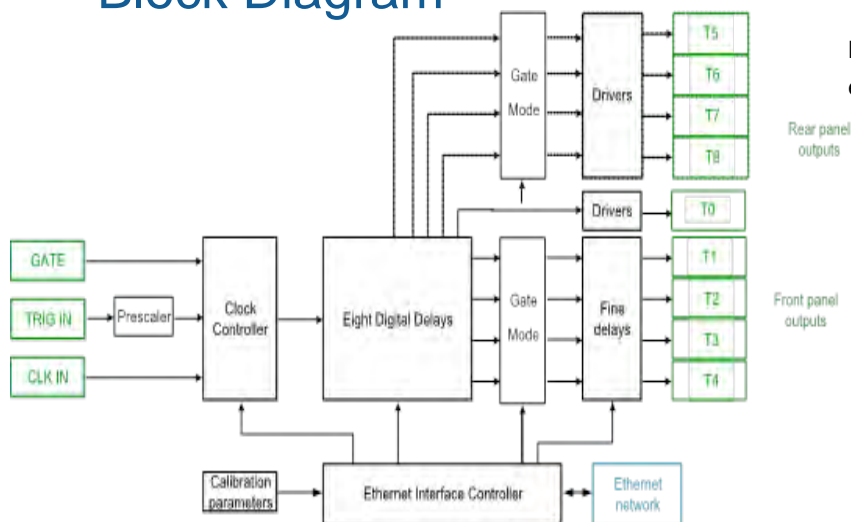
### Options

Option 8C - Additional Delay Channels (T5, T6, T7, T8)

Range:	0 to 20 seconds
Resolution:	1.25 ns
Jitter:	< 50 ps rms + delay x 10 <sup>-7</sup> (external trigger to any output)
Accuracy:	1 ns + delay x 10 <sup>-7</sup>
Amplitude:	2 - 5V
Width:	10 ns to 10 ms
Load:	50 Ω
Rise, Fall time:	< 5 ns
Connector:	BNC on rear panel

Option GOC - Gate input, clock output (10MHz 1V, Square), High Stability Timebase (50ppb)

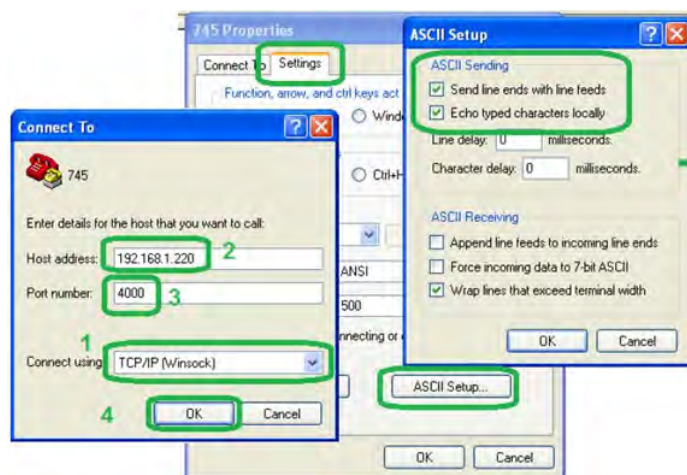
## Block Diagram



## Programming Options

**Direct Commands:** Hyper-Terminal, PuTTY, Telnet (Linux, Windows, etc). **Virtual Instrument:** Labview

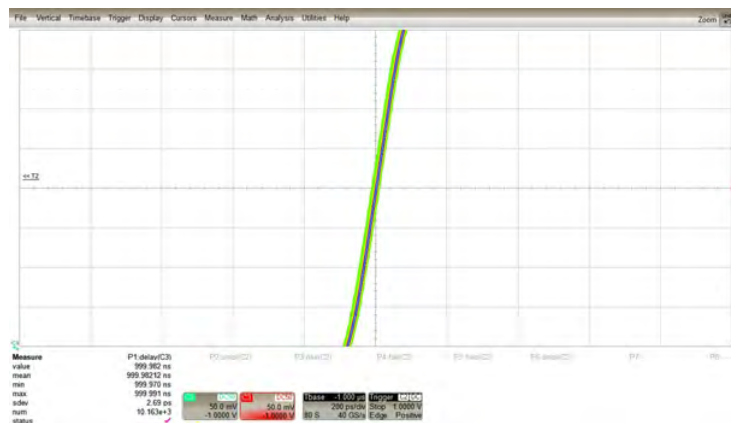
Image 1 745-hyper



## Jitter (internal)

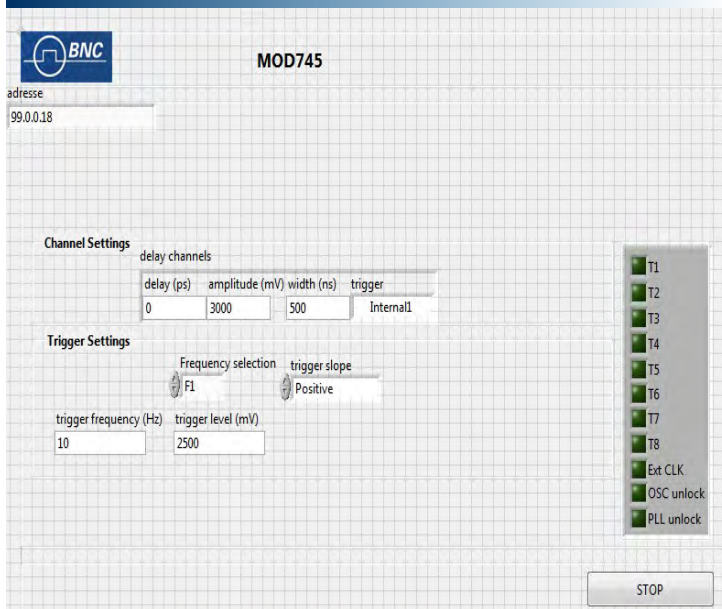
The Model 745 offers the worlds lowest jitter in a programmable digital delay generator. The jitter for various delays is shown below:

Delay Setting	Jitter (ps rms)
100 ns	2.6
500 ns	2.7
1000 ns	2.7
2000 ns	2.7

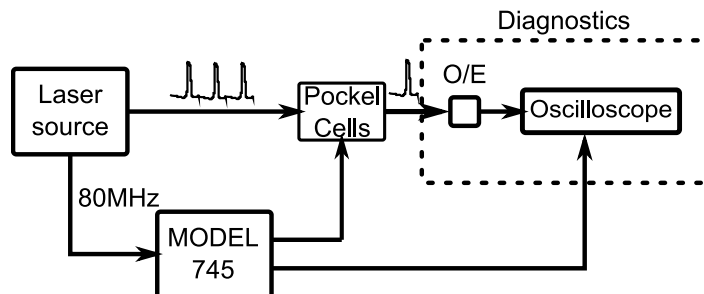


2.6ps Jitter Shown Above

Image 2 745-labview



## Applications in Laser Timing



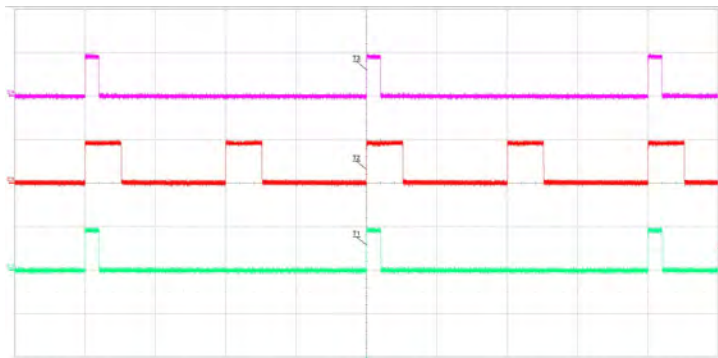
## Rate Divider

Use the handy rate divider function to generate various rates on different channels.

Shown below:

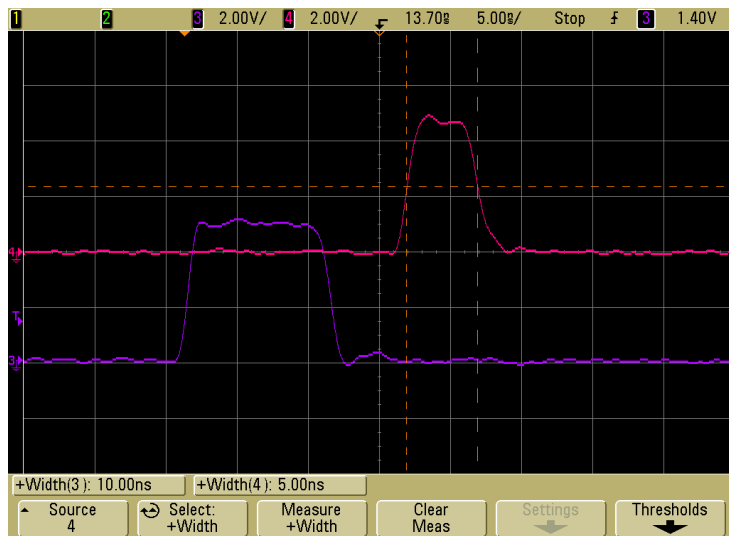
Channel 2 - 1.0 MHz internal rep rate

Channel 1, Channel 3 - 0.5 MHz internal rep rate

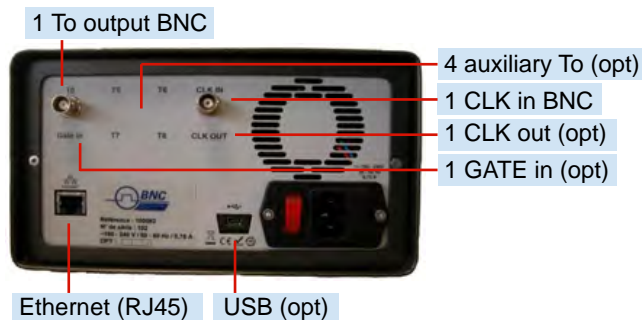
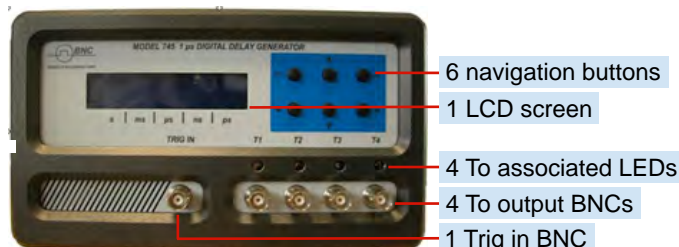


## Generate Narrow Widths

Use the Model 745 for narrow pulses in addition to precise delays. Pulse width resolution is 250 femtoseconds. Widths of 10ns and 5ns are shown below:



## 745 Front and Rear Panel



## Ordering Information

<b>Model 745-4C</b>	4 Channels Delay+Width (250fs)
<b>Model 745-4C-GOC</b>	Adds Gate Input, Timebase Stability, Clock Out
<b>Model 745-8C</b>	Adds 4 Auxillary Channels
<b>Model 745-8C-GOC</b>	Adds 4 Auxillary Channels, Gate Input, Timebase
<b>P/N 745R1</b>	19" Rack Mount Kit, Single Unit
<b>P/N 745R2</b>	19" Rack Mount Kit, Dual Units

## Compliance

EMC Testing: EN61326-1:2006, EN62311:2008, CE / UL