Model 745T 4/8 Channel Digital Delay Generator

Features of the 745T

- Four high resolution delay channels
  1 ps resolution
  < 5 ps RMS jitter (@ short delay)
  < 25 ps RMS jitter (External trigger)
  > 20 second delay range
- Tunable outputs (amplitude 2 to 5V and width 100 ns to 10 µs) with 1 ns rise time under 50 Ω
- Triggers: Burst, Gate, External trigger pre-scaler, Internal frequency generators

Applications of the 745T

- Components Testing
- ATE Applications
- Laser Timing Control
- Laser Pulse Picking
- Precision Pulse
- Instrument Triggering

Model 745T
4/8 Channel Digital Delay Generator

BNC

Model 745T

Description

The Model 745T generator provides four independent delay channels (A to D) on the front panel. The delay resolution is 1 ps, and external trigger-to-channel jitter is less than 25 ps. BNC output connectors deliver 5 V, 1 ns rise time, under 50 Ω. Amplitude and width are adjustable for each output pulse.

One input trigger (TRIG IN), or two internal synchronized timers, or software commands may be used to trigger all output channels.

A T0 output pulse marking zero delay reference is generated at each selected trigger.
The Model 745T also provides (as an option) four auxiliary delays channels (E to H) on the front panel. The delay resolution is 1.25 ns and trigger-to-channel jitter is less than 50 ps.

Control Panel Web Page

This web page, from an embedded web server, 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 745T.
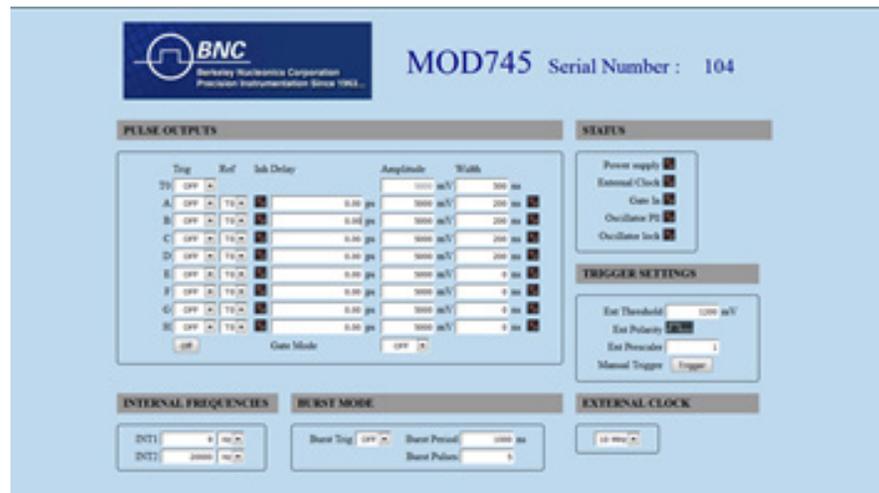
Example of Model 745T control panel

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Functional Overview

Block Diagram
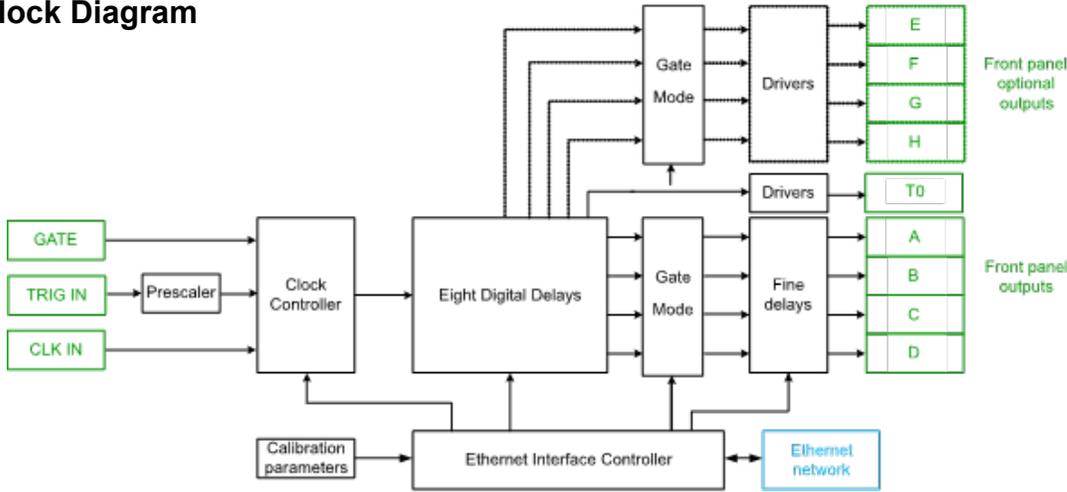
Time base

Time base is provided from an internal clock reference or an external 10 MHz clock (CLK IN). As an option, the external clock can be up to 100 MHz. The time base is accessed on the rear panel (CLOCK OUT)

Delay channel

There are four independent delay channels. The delay from the selected trigger source is adjustable up to 20 seconds in 1 ps increments.

Jitter: The following chart indicates typical RMS jitter at various delays:

Internal Trigger	External Trigger
Delays < 100 ns : 2 picosecond	Delays < 100 ns : 15 picoseconds
Delays > 100 ns : 15 picosecond + time base	Delays > 100 ns : 25 picosecond + time base

Triggering

The Model 745T offers users several methods for triggering delay channels:
- Externally trigger on the positive or negative slope of your trigger signal and select the threshold level from 0.1 V to 5.0 V.
- Two internal trigger generators are adjustable from 0.25 Hz to 1 MHz in 1 Hz increment.
- Software trigger from remote command

Trigger Modes

Burst mode: pulse number 1 to 2^{16}-1, period 1000 ns to 1 second (depending on the trigger rate)

Trigger Pre-scaler: pre-scaler value from 1 to 2^{16}-1 is applied to the external trigger.

Gate mode: can be set globally or to individual channels.

Outputs

On the front panel, each delay output channel can be independently adjusted in level and width. The outputs are designed to drive 50 Ω.

T0 Output pulse marks zero delay

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Interface Control

All parameters may be locally controlled via touch screen or remotely controlled via ethernet. Model 745T has an embedded control interface software that allows all parameters to be controlled by any PC with a browser. After connecting a cable from the ethernet port to your network, enter the 745T's IP address (as displayed on the front panel) into the browser. The browser automatically opens a virtual control panel on the PC.

Input / Output Interface
Front and Rear Panels

Connectors, Switches, Indicators

Front Panel		Rear Panel	
Touch screen	For local control	T0	T0 output : BNC connector
A, B, C, D	Pulse outputs: BNC connector	CLK IN	Clock input : BNC connector
E, F, G, H	Auxiliary outputs: BNC connector	CLK OUT	Clock output : BNC connector
RUN/STOP	Activate single-shot triggers	AUX	No function
GATE	Gate input : BNC connector	🖧	Ethernet: RJ45 connector
TRIG	Trigger input: BNC connector	⟜	USB interface: micro-USB connector
		PLUG	AC power plug (90-240 V)
		POWER	Power ON/OFF switch

Ordering Information

Model	Description
Model 745T	Base version: 4 high resolution delay channels
Model 745T-8C	Adds 4 auxiliary channels
Model 745T-RM1	19" Rack mount kit, Single unit
Model 745T-RM2	19" Rack mount kit, Dual units
Model 745T-OEM	OEM version (board level) of the Model 745T

Model 745T Specifications

Delay (channel A to D)	
Number	4 independent
Range	0 to > 20 seconds
Resolution	1 ps
RMS Jitter	25 ps + delay x 10^{-8} (External trigger to any output) 15ps + delay x 10^{-8} (Internal trigger to any output)
Accuracy	< 250 ps + delay x 10^{-8}
Time base	50 ppb stability

Output pulse (channel A to D)	
Amplitude	2 to 5 V, step < 0.1 V / 50 Ω
Width	100 ns to 10 µs, 5 ns resolution
Rise / Fall time	< 1 ns / < 3 ns
Connector	BNC on front panel

Trigger source	
Command	Front panel / Ethernet / USB
Internal	2 generators, F= 0.25 Hz to 1 MHz
External	Repetition rate < 1 MHz Trigger prescaler : 1 to 2^{16}-1 Trigger level, from 0.1 to 5 V / 50 Ω Positive or negative slope Minimum trigger delay < 65 ns

Trigger mode	Single, repetitive or burst

Burst Mode	
Pulse number	1 to 2^{16}-1
Period between pulses	
Range	1 µs to 1 s, 5 ns resolution

Output T0	5 V / 50 Ω, 200 ns width
Connector	BNC on rear panel

Gate input	
Threshold	1.5 V
Polarity	Active high
Function	Output inhibit (Global or individual channel)

Clock IN	
Frequency	10 MHz (up to 100 MHz as an option)
Min level	-3 dBm
Shape	Sinewave or square
Threshold	0 V, internal load, AC

Clock OUT	
Frequency	10 MHz
Level	+/- 1 V under 50 Ω
Shape	Square
Load	50 Ω external

User memory	Up to 4 sets of parameters can be stored/recalled via front panel, ethernet or USB

General specifications	
Size	215 x 245 x 135 mm
Power	50 W – 110 to 240 V
Interface Control	Front panel Web page from embedded web server. Compatible with IE, Firefox, Chrome USB (serial communication) and Ethernet link

Options	
Option 1: 4 auxiliary delay channels (E to H)	<u>Delay channel</u> Number: 4 independent Range: 0 to > 20 seconds Resolution: 1.25 ns Jitter < 50 ps rms + delay x 10^{-8} (external trigger to any output) Accuracy: 1 ns + delay x 10^{-7} <u>Output pulse</u> Amplitude: 5 V / 50 Ω, Width: 100 ns to 10 ms, 5 ns resolution Rise and fall time: < 5 ns Connector: BNC on front panel
Option 2: up to 100 MHz clock Input (or clock Output)	(request when ordering from factory)