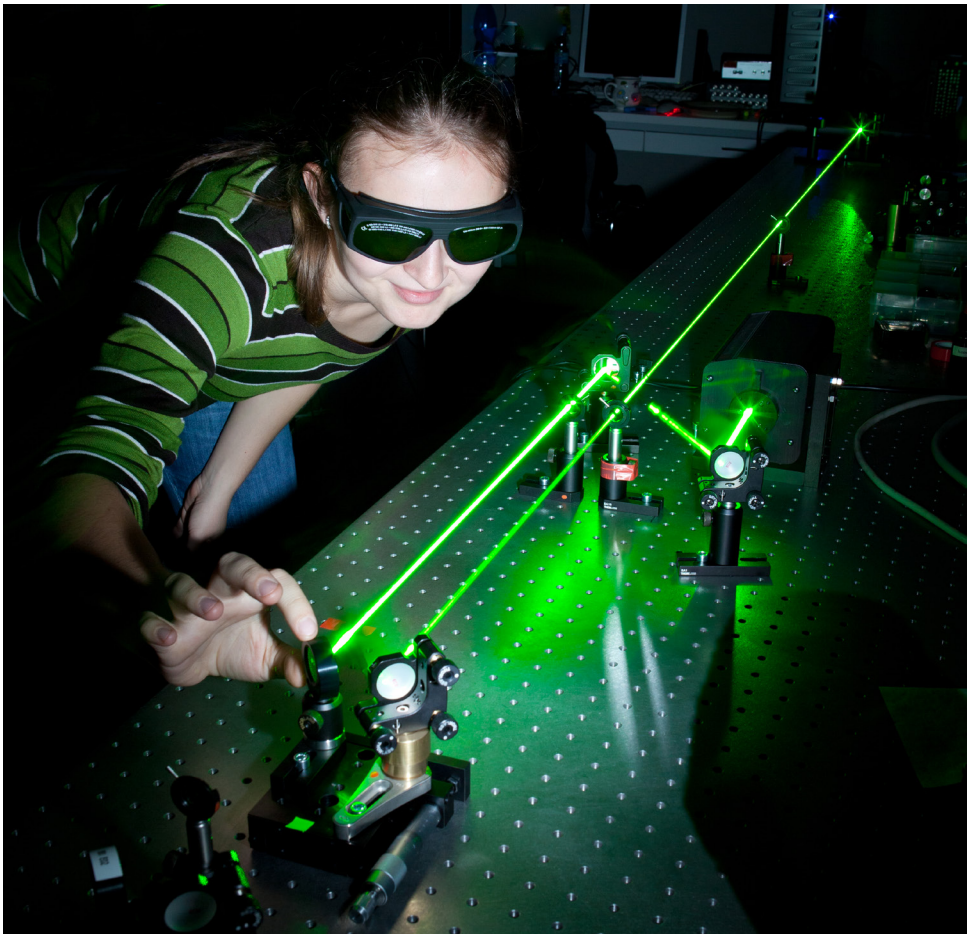
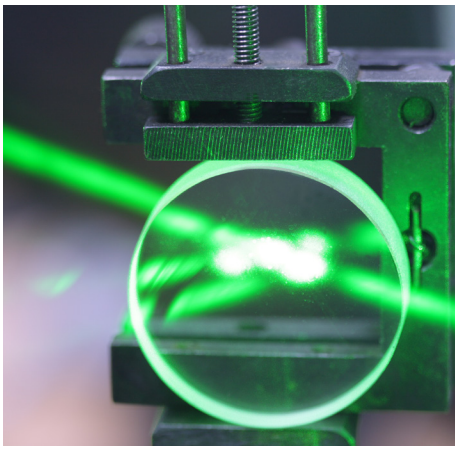
Model 745T-20C 20 Channel Digital Delay Generator





Features of the 745T-20C:

- 20 Independent delay channels
  - 100 ps resolution
  - 25 ps rms jitter
  - 10 second range
- Output pulse up to 6 V/50 Ω
- Independent trigger for every channel
- External Clock up to 100 MHz
- Controlled via Front Panel, Ethernet, Internet (webpage)

Applications of the 745T-20C:

- Picosecond Laser Timing Systems
- ATE Applications
- Components Testing
- Laser Pulse Picking
- Instrument Triggering

Model 745T-20C
20 Channel Digital Delay Generator

Berkeley Nucleonics Corporation
info@berkeleynucleonics.com | www.berkeleynucleonics.com
2955 Kerner Blvd, San Rafael, CA 94901 | 800-234-7858

Model 745T-20C 20 Channel Digital Delay Generator

Model 745T-20C

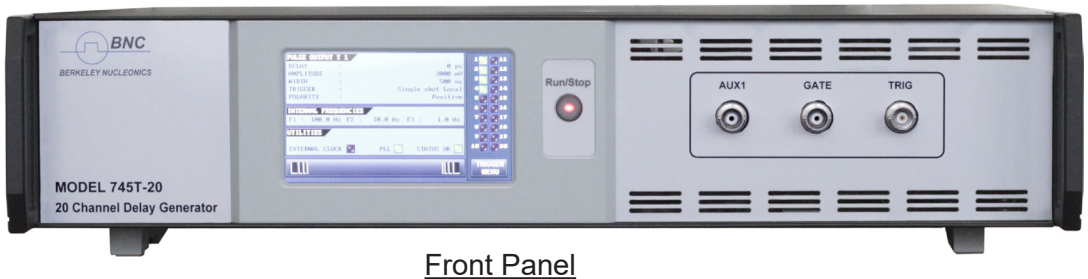
Description

The 745T-20C Digital Delay Generator provides twenty independently delayed pulse outputs on the rear panel. Delays up to 10 seconds can be programmed with 100 ps resolution (or 1 ps option) and channel-to-channel jitter less than 25 ps RMS. BNC output connectors deliver 6 V level under 50 Ω. Pulse amplitude and width are independently adjustable for each output pulse.

One input trigger (TRIG IN), or one of the three synchronized internal generators, or remote command can be used to trigger all output channels. A T0 output pulse marks zero delay for each trigger.

All parameters (delay/amplitude/width/trigger source for each channel …) may be locally controlled using the touch-panel and remotely controlled using ethernet and internet (internal web server) interface (10 / 100 Mb/s).

745T-20C Front and Back Panels



Front Panel

Back Panel

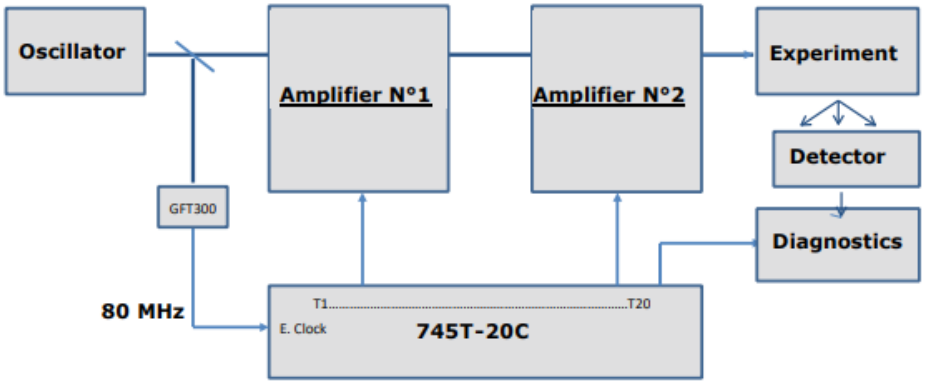
Front Panel		Back Panel	
Touch screen	For local control	**LAN**	LAN / ethernet: RJ45 connector
Push button	For single shot triggers	**T1 to T20**	T1 to T20 outputs: BNC connector
AUX1	Not connected	**T0**	T0 output: BNC connector
Gate	Gate input: BNC connector	**CLK IN**	Clock input: BNC connector
TRIG	Trigger input (external mode): BNC connector	**TRIG IN**	Trigger input (internal mode): BNC connector
		CLK OUT	Clock output: BNC connector
		PLUG	AC power plug (90-240 V)
		Power	Power ON/OFF switch

Berkeley Nucleonics Corporation
info@berkeleynucleonics.com | www.berkeleynucleonics.com
2955 Kerner Blvd, San Rafael, CA 94901 | 800-234-7858

Model 745T-20C 20 Channel Digital Delay Generator

Laser Pulse Picking Application:

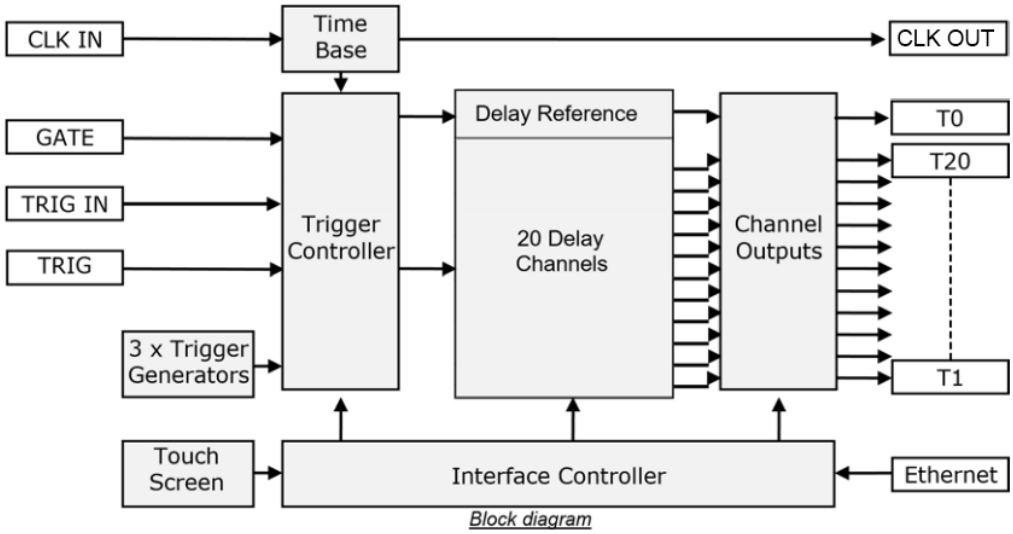
The 745T-20C is well suited to synchronize all the instruments involved in a Picosecond Laser System using only one compact unit and one GUI. In this application the external clock input (CLK IN) of the 745T-20C Delay Generator receives a 80 MHz signal from a laser oscillator. Each amplifier (pump-laser, Q-switch, Pockels cell, etc..), or various diagnostic instruments (photodiode, digitizer, oscilloscope, calorimeter, CCD camera, streak camera, etc…) can receive repetitive or single pulse (adjusted in rate, delay, amplitude, polarity and width) that are synchronized to the 80 MHz external clock with a very low jitter.



Picosecond laser timing system synchronization example

Functional Overview

Block diagram: The 745T-20C includes the five following functions: Time base, Trigger controller, Delay Channels, Channel Output and Interface controller.



Block diagram

Berkeley Nucleonics Corporation
info@berkeleynucleonics.com | www.berkeleynucleonics.com
2955 Kerner Blvd, San Rafael, CA 94901 | 800-234-7858

Time base: This function provides a 160 MHz time base from an internal clock or from an external 10 MHz clock (CLK IN). As an option, the external clock can be up to 100 MHz. The internal time base is accessible on the back panel (CLK OUT)

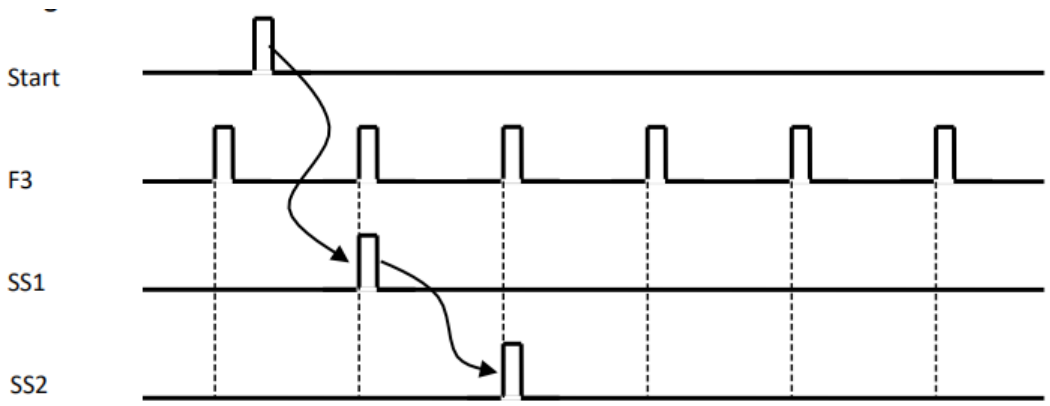
Trigger controller: This function provides two trigger modes: External or Internal

-External Trigger Mode: In this mode a rising edge on the TRIG input, triggers all delay channels. On each channel, the trigger rate can be single or repetitive.

-Internal Trigger Mode: This mode allows four trigger sources to trigger each delay channel.

Three are “Repetitive Triggers” from synchronous programmable “Trigger Generators” according to the following values: 10 kHz, 5 kHz, 2 kHz,1 kHz, 500 Hz, 200 Hz, 100 Hz, 50 Hz, 20 Hz, 10 Hz, 5 Hz, 2 Hz, 1 Hz, 0.5 Hz, 0.2 Hz or 0.1 Hz.

One is a double pulse “single-shot trigger”. Single-shot triggers (SS1 and SS2) are initiated from a pulse on the TRIG IN input, from the Front Panel, or from software command (ethernet or web page) Each single-shot is synchronous with the lowest Frequency Generator (F3).”SS1” is used to activate low frequency equipment very early in the event, and “SS2” is used to activate fast equipment during the event like a digitizer or streak camera for diagnostics.



Double Single-Shot triggers timing

Model 745T-20C 20 Channel Digital Delay Generator

Delay channel: There are twenty delay channels (T1 to T20). The delay of each channel is adjustable up to 10 seconds in 100 ps increments (or 1 ps in option). The "T0" output pulse, generated by one of trigger, marks zero delay.

Channel output: Each channel output provides a delayed pulse independently adjustable in amplitude, polarity and width. The outputs are designed to drive 50 Ω loads.

Interface controller: The interface controller manages internal functions (Time base, delay, Channel Output, etc..) front panel operation, ethernet network and web pages (via embedded web server)

Control & Software Tools

There are three ways to control the generator:

- Locally via the front panel touch-screen

- "Quick Remote Mode" via control panel web pages. This web page, from an embedded web server is a simple method to configure settings for each channel (delay, output amplitude, output width, trigger mode, trigger source) and to control operation and status of the instrument.

The configuration information of the instrument is stored and saved in the 745T-20C. The user can open a web page to control the 745T-20C via Internet Explorer, Mozilla Firefox or Google Chrome.

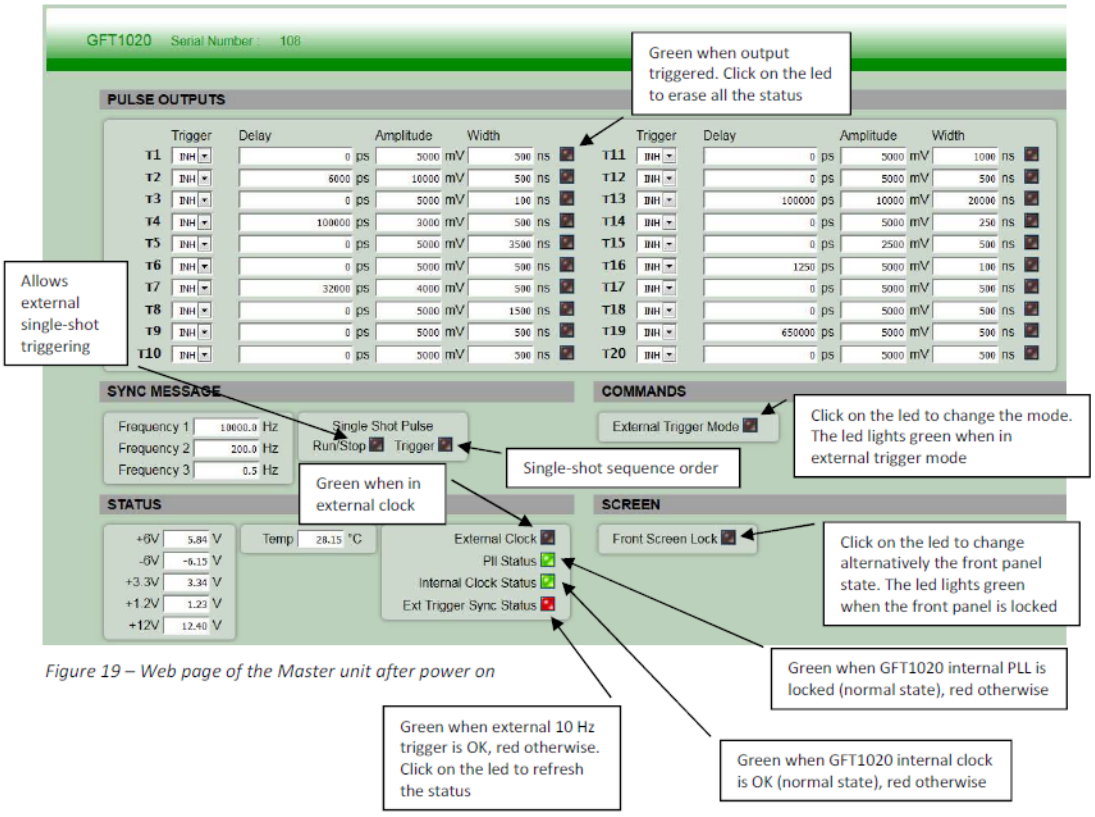


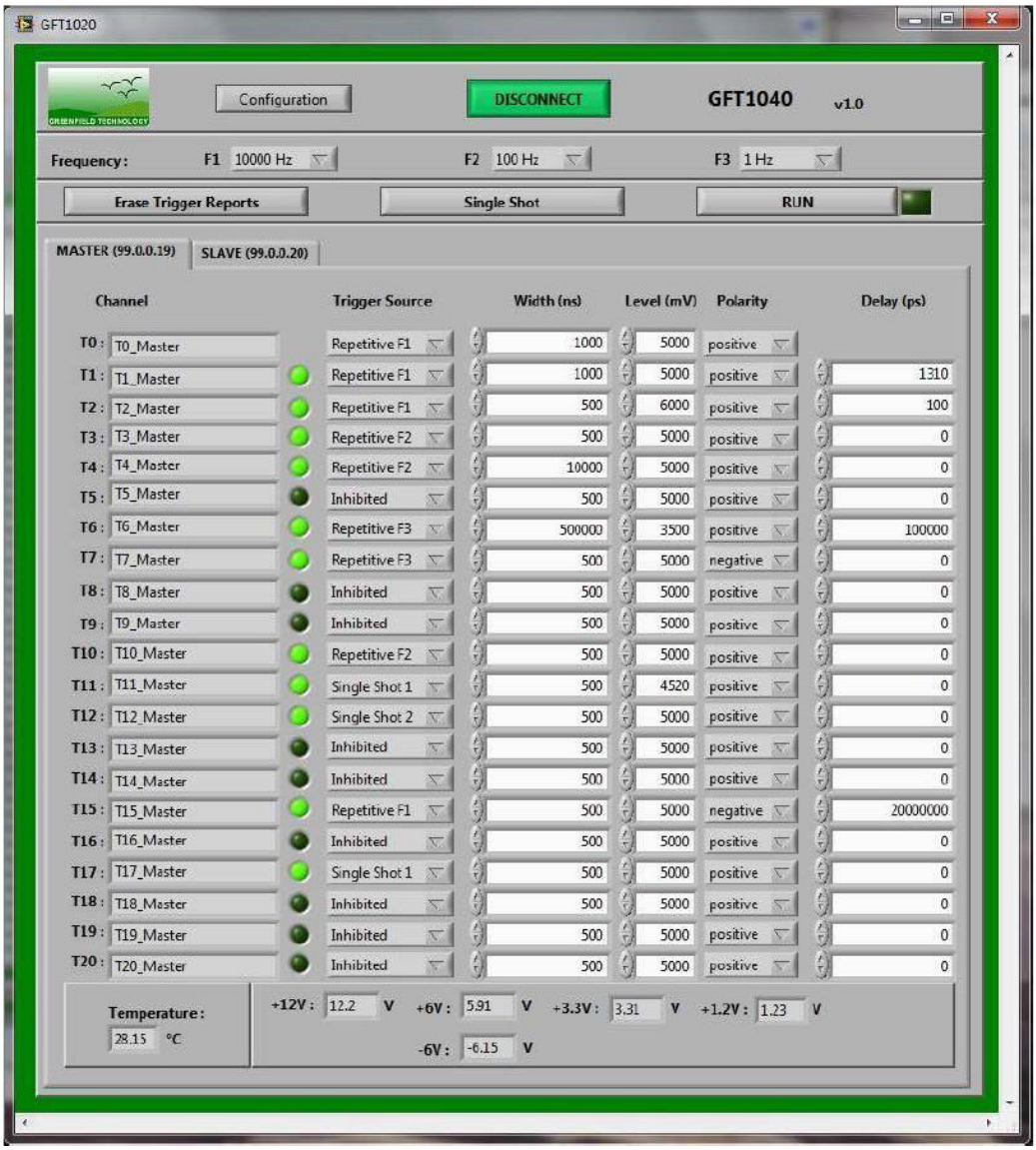
Figure 19 – Web page of the Master unit after power on

Berkeley Nucleonics Corporation
info@berkeleynucleonics.com | www.berkeleynucleonics.com
2955 Kerner Blvd, San Rafael, CA 94901 | 800-234-7858

Model 745T-20C 20 Channel Digital Delay Generator

Before connecting a cable from the 745T-20C's ehernet port to your computer network, enter the 745T-20C's IP address into your PC's browser. The browser will automatically open the control panel web page on your PC.

-“General Remote Mode” via LabVIEW software application (supplied with 745T-20C) or other PC software application



Berkeley Nucleonics Corporation
info@berkeleynucleonics.com | www.berkeleynucleonics.com
2955 Kerner Blvd, San Rafael, CA 94901 | 800-234-7858

Model 745T-20C Specifications

Delay Channel	
Number	20 Independent
Range	0 to 10 s
Resolution	100 ps
RMS Jitter	25 ps (external trigger or T0 to any output)
Accuracy	< 250 ps + delay x 10-7
Time base	160 MHz Frequency, 0.05 ppm stability
External Trigger Mode	
Input “TRIG”	Rate up to 50 kHz, 1 V / 50 Ω Threshold, slope positive, 5 ns minimum pulse width
Internal Trigger Mode	**Sources:**
Internal	3 generators 0.1 Hz to 10 kHz in 1-2-5 sequence
Input “TRIG IN”	Double Single Shots, 1V/50 Ω Threshold, Slope positive
Soft Command	Double Single Shots
Output T0	3 V to 6 V / 50 Ω width =100 ns to 300 ms
Outputs T1 to T20	
Amplitude	3 V to 6 V / 50 Ω
Rise / fall time	5 ns / 5 ns
Width	100 ns to 300 ms
Polarity	+/-
Connector	BNC

Clock Input (1)	
Shape	Sinewave or Square
Threshold	0 V, internal 50 Ω
Min Level	-3 dBm
Frequency	10 MHz (up to 100 MHz in option)
Clock Output	
Shape	Sinewave
Level	3 dBm under 50 Ω
Frequency	80 MHz (1/2 Time base frequency)
Spectral Purity	>-40 dBm
Gate Input	
Level	Active high, 1 V / 50 Ω
Rate	< 1kHz
General	
Interface Control	Front panel, Ethernet 10 / 100 MB/s,
Software Tools	Free Drivers for Win7 and LabView application
Size / Weight	19” W, 2U H, 300 MM D / 10 kg
Power	90 to 220 V / 0.5 A

Options

1- Output 10 V (2) amplitude = 2.5 to 10 V, rise time = 1 ns / fall time= 3 ns under 50 Ω, Width = 100 ns to 10 ms
2- Output 20 V (2) amplitude = 5 to 20 V, rise time = 1 ns / fall time= 3 ns under 50 Ω, Width = 0.1 µs to 10 µs
3- Output 32 V (2) amplitude = 32 V fixed, rise time = 1 ns / fall time= 3 ns, Width =1 µs fixed
4- 1 ps delay resolution
RMS Jitter: <10 ps (t) to T1...T10 Outputs)
<20 ps (T0 to T11....T20 Outputs)
Other Specifications are identical as basic version
5- Optical Output
Power / wavelength
Width 100 ns to 300 ms
Max link distance 1.5 km
Connector type ST
6- Clock Input / Output frequency can be up to 100 MHz (ask the factory)
7- Rack Mount Kit
8- 40 Digital Delay Channels (a system made with two synchronized 745T-20C units)
(1) User Specified, settable at factory
(2) This option can be independently applied to each output. Ask the factory for mixed output amplitude solutions.

Berkeley Nucleonics Corporation
info@berkeleynucleonics.com | www.berkeleynucleonics.com
2955 Kerner Blvd, San Rafael, CA 94901 | 800-234-7858