FTD 10000
7 GHz Transient Digitizer

Features

- 7 GHz bandwidth with slow roll off
- 50 ps rise time
- Up to 1800 GS/s sampling rate
- 13-bit vertical resolution
- 2000 V maximum input voltage without overload
- Controlled via front panel and Ethernet
- 19" Rack, 4U, 560 mm
- Fiducial input for time stamping

Applications

- Diagnostics for Laser research and High-Energy physics
- Recording of fast single shot pulses
- EMC/EMP simulators
- High-voltage breakdowns
- Test of high speed circuits
- Automatic Test Equipment (ATE)

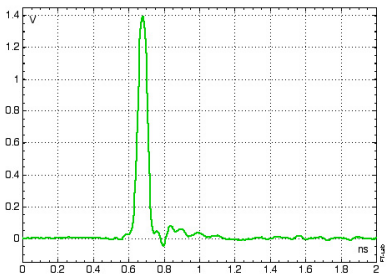
Description

Greenfield Technology's FTD10000 Fast Transient Digitizer is the fastest digitizer in the industry, specifically designed to record fast single short pulses down to 50 ps with 13-bit amplitude resolution. It has unique performance benchmarks such as a 7 GHz bandwidth with slow roll-off for great impulse response, a maximum input voltage of 2000 Volts without overload, and a low noise giving an FS/N ratio of >3000 (>70 db).

The new revision adds several new features and improvements. This new revision includes:

- An improved readout camera with 1800 x 1800 pixel resolution, 12-bit A/D and a cooling system.
- An improved digitizing resolution, by 78% (now up to 1800 GS/s on 1 ns duration… or 36 GS/s on 50 ns duration, etc.).
- Outstanding precision waveform processing
- An internal web server to control the instrument and analyze the sampling results via a standard web-browser, providing cursor and zoom capabilities.
- *Enhanced Ethernet speed up to 1000 Mb/s.*

Additional features include an input for timing fiducials, and a large front panel display for easy and precise viewing. The panel's GUI allows for local and remote control over all setup and digitizing features, as well as result readouts. As such the FTD10000 is an excellent solution for laboratory and automatic test applications. The FTD10000 is a licensed product developed under CEA (Commissariat à l'Energie Atomique) contract.



50 ps impulse response (0.2 ns/div)
Generator is PSPL 4015B pulser

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

FTD 10000
7 GHz Transient Digitizer

Main Characteristics

Signal Input									
Sensitivity	4.5 V into 50 Ω must be externally terminated								
Bandwidth	DC to 7 GHz (4 dB)								
Rise time	50 ps								
Input impedance	50 Ω								
Vertical position	+50 % to –50 %								
Maximum input	2000 V (at FWHM = 1 µs)								
External Trigger									
Input impedance	50 Ω (internal)								
Signal polarity	Positive or negative								
Signal duration	>0.5 ns								
Trigger level	0.5 V to 4 V								
Maximum input	500 V (at FWHM = 1 µs)								
Jitter RMS	5 ps								
Internal delay	40 + (10-¹ X analysis duration) to 540 ns								
Maximum rate	1 Hz (TBC)								
Soft Trigger									
Trigger Source	Ethernet/ Internet command								
Trigger output									
Function	Mark beginning of sweep								
Level / rise time	10 V / 5 ns into 50 Ω								
Shape	Impulse wave, with FWHM >100 ns								
Digitizing									
Analysis sweep duration (ns)	1	2	5	10	20	50	100	….	2000
Sampling rate (GS/s)	1800	900	360	180	90	36	18	….	0.9
Horizontal resolution	1800 samples								
Vertical resolution	13-bit								
Non-volatile memory	1 record & settings								
FSNR ratio	3000 (70 dB)								
Acquisition mode	Single shot or repetitive or electrical zero								
Waveform processing	Raw data (image) Fast (waveform) High (corrected waveform) Very High precision (corrected waveform) with PC software application.								
System control									
Command and Setting	Via Ethernet and Internet (Web pages)								
Data transfert	Via Ethernet(10/100/1000 Mb/s)								
Leds	For viewing instrument status								
Local viewing and control	With 8”2 LCD display, key board and knob								
Software	Lab view application for Windows XP / Seven								
Fiducial input									
Function	SMA connector provides a marker synchronous of recorded signal. The fiducial input signal is added to the signal input.								
Sensitivity	0 to 3 V amplitude adds 10% of FS								
Bandwith	0.1 MHz to 3 GHz								
Impedance	40 Ω								

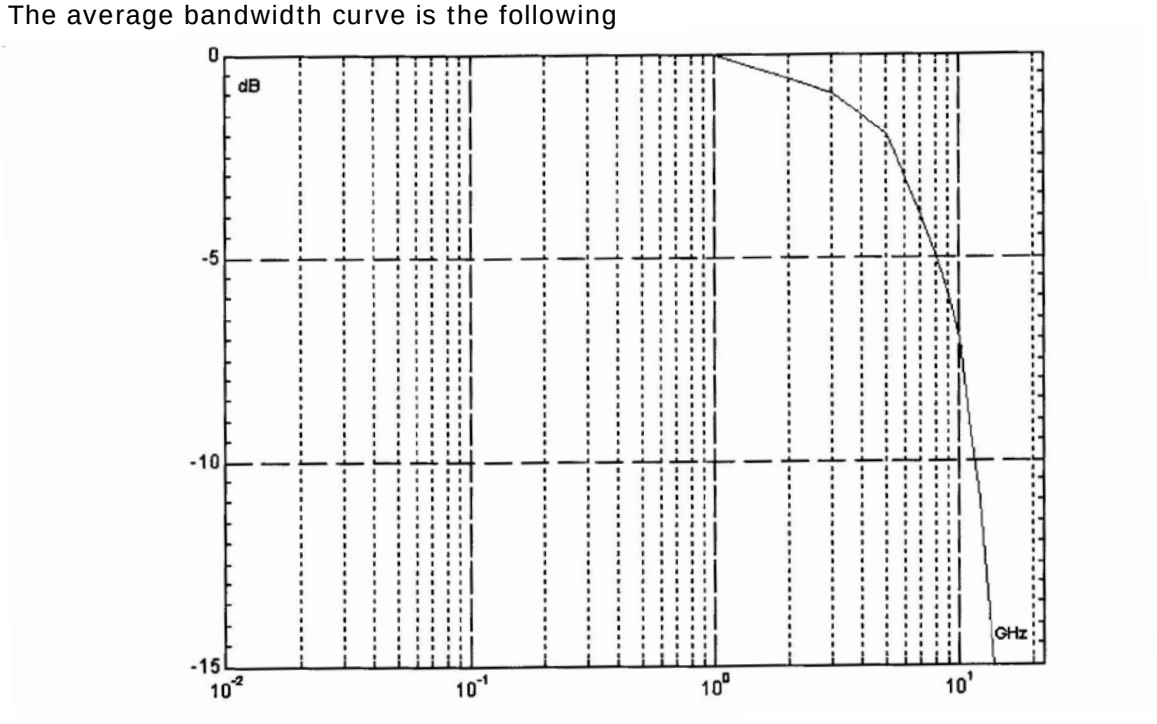
Berkeley Nucleonics Corporation
info@berkeleynucleonics.com | www.berkeleynucleonics.com
2955 Kerner Blvd, San Rafael, CA 94901 | 800-234-7858

Main Characteristics (cont'd)

Inputs / outputs (all are located at rear of the equipment)		
	Signal input and output	N connectors
	Trigger input	BNC connector
	Trigger output	BNC connector
	Fiducial input	SMA connector
	Ethernet port	RJ-45
Environment		
	Operating temperature	10 to 30 °C
	Humidity	85% non-condensed at 40°C
Power supply		
	Voltage	90 to 240 VAC
	Power	120 W
Physical characteristics		
	Dimensions	Width=19 inch Height= 173 mm (4 U) Depth= 560 mm (670 mm with handles)
	Weight	20 kg
Option 01: Equalizer		
	This module extends bandwidth up to 11 GHz	

Dynamic performance

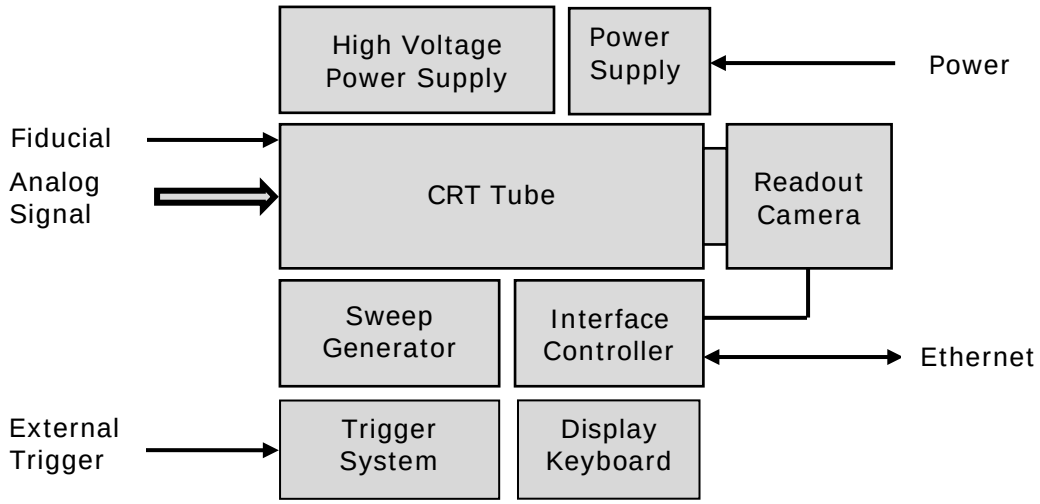
The average bandwidth curve is the following



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

Functional overview

Block diagram



Block diagram

Operating principle: The heart of the digitizer is a very large bandwidth Cathode Ray Tube (CRT) directly coupled to a CCD camera through two fibers windows.
The FTD10000 uses a scan conversion principle (fast in, slow out).

Phase 1: The digitizer records the signal in a fast analog memory (screen of the CRT).
Phase 2: The readout camera captures the fast memory slowly and digitizes it in order to store it in a video memory.

The signal is extracted from the video memory through image processing and defect correction. The acquired waveform can be viewed on local display and read via the LAN interface and exported to standard signal analysis tools.

Trigger system

A rear panel BNC connector allows an external trigger for synchronization. Delay of the trigger can be adjusted from 40 ns to 240ns for adjusting the record time to the signal.

Sweep generator

The sweep generator can be triggered from an external signal or Ethernet/ internet command. The sweep speed is adjustable from 1 ns to 2000 ns. To optimize performance each sweep has a specific settings saved in the instrument.

High Voltage Power Supply

Three High Voltage programmable Power Supplies are connected to Cathode, Grid and Focus electrodes of the CRT tube. In case of Voltage fault a high performance safety system stops the three High Voltage Power Supplies to avoid any damage on the CRT tube.

Interface Controller

It manages internal functions and user interfaces. All the parameters and data can be locally controlled or remotely controlled via Ethernet (10/100/1000 Mb/s) or Internet (Web page from internal Web server). All parameters values are automatically saved.

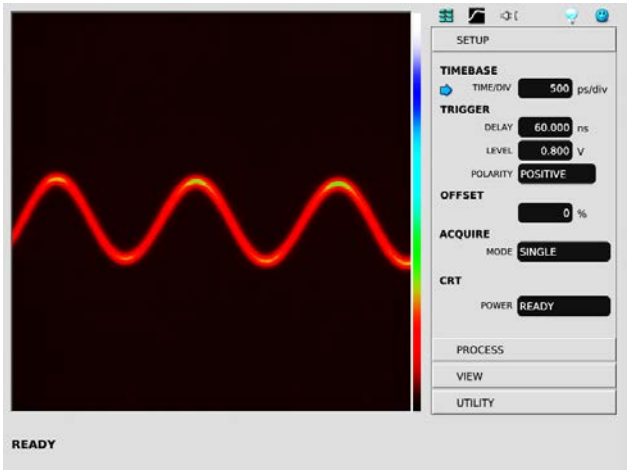
Berkeley Nucleonics Corporation
info@berkeleynucleonics.com | www.berkeleynucleonics.com
2955 Kerner Blvd, San Rafael, CA 94901 | 800-234-7858

Control and software tools

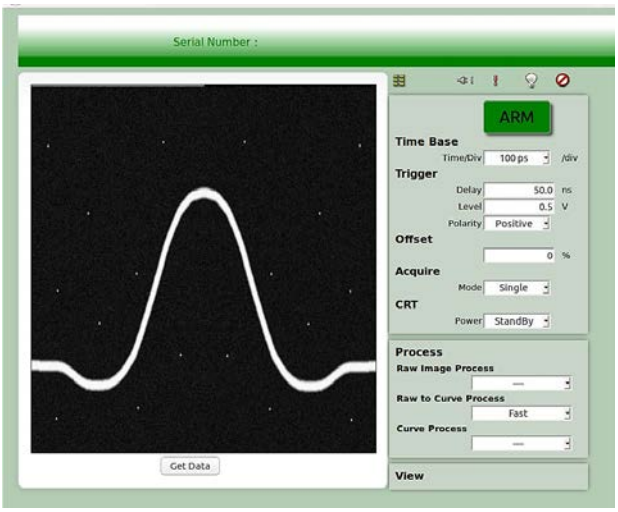
Local mode

The FTD10000 can be locally controlled via GUI on the local screen, key board and knob. The GUI is constituted of two parts.

- Left part to display the different record.
- Right part to select the settings and run the records



Easy remote way via internet and control panel web page (see below). Web page from embedded server, provides an easy and quick method to configure settings (Trigger, offset….processing) to control operation, to display data recorded and to save data for off-line analysis. With control panel web page the FTD10000 operates as a desktop oscilloscope but the user can be far from the instrument.

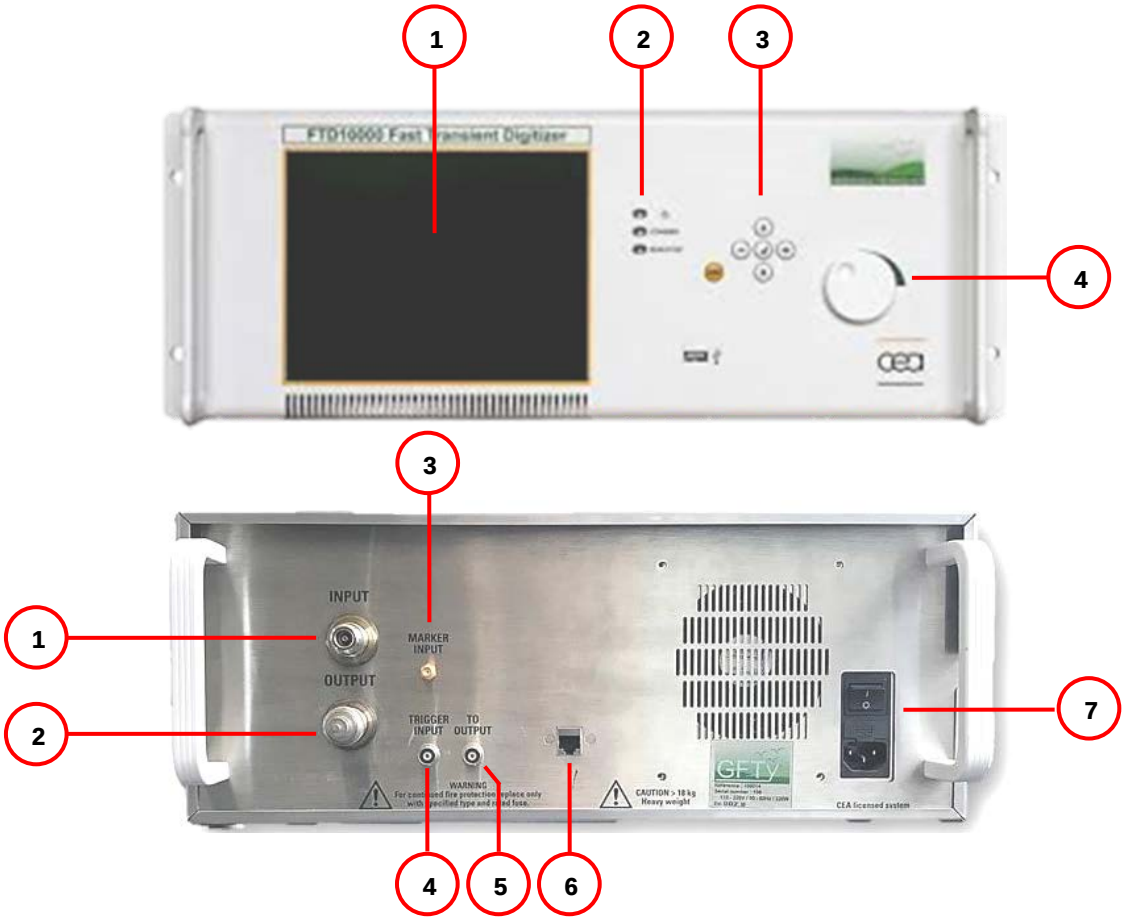


Web page

General remote way via labView application or other PC software application (see example in user' manual)

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

Front and Rear panels



Connector, switch, indicator

Front panel		Rear panel	
1	Display for local mode	1	Input for analog signal: N connector
2	Indicators for viewing instrument status O : Indicates power supply is on STAND BY: Indicates CRT power is off RUN/STOP: Indicates instrument is armed	2	Output for 50 Ω load: N connector
		3	Fiducial input: BNC connector
		4	Trigger input: BNC connector
		5	Trigger output: BNC connector
3	Key board for local mode	6	Ethernet network: RJ45 connector
4	Knob for local mode	7	Power on/off switch and plug

Ordering information

Digitizer part number is: FTD10000-XX (Where “XX” is option number)

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