

# FTD 10000

## 7 GHz Transient Digitizer

**NEW REVISION**



### 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 industry fastest digitizer specifically designed to record very fast single short pulses down to 50 ps with 13-bit amplitude resolution.

It features unique performances such as a 7 GHz bandwidth with slow roll off giving a very good impulse response, maximum input voltage of 2000 Volts without overload and low noise giving a FS/N ratio >3000 ( >70 db).

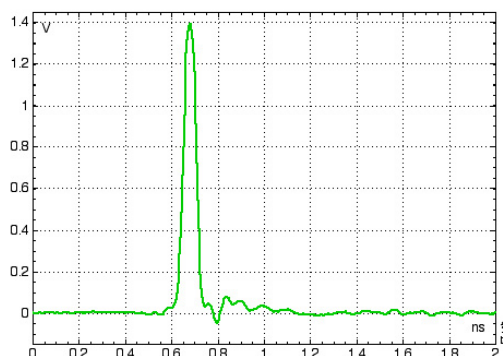
The **new revision** adds new feature and improve the performance of the instrument. The new revision includes:

- Improved readout camera with 1800 x 1800 pixels, 12-bit A/D and cooling system
- Improved digitizing resolution by 78% (now up to 1800 GS/s on 1 ns duration... or 36 GS/s on 50 ns duration or...)
- A "Very High" precision waveform processing
- An internal web server to control the instrument and analyze the sampling results (cursor and zoom), via a standard web-browser
- Extended 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.

A GUI allows local and remote control of all setup and digitizing features and viewing of results. As such the FTD10000 is an excellent solution for laboratory and automatic test application.

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



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### Main Characteristics

Signal Input	
Sensitivity	4.5 V into 50 $\Omega$ must be externally terminated
Bandwidth	DC to 7 GHz (4 dB)
Rise time	50 ps
Input impedance	50 $\Omega$
Vertical position	+50 % to -50 %
Maximum input	2000 V (at FWHM = 1 $\mu$ s )
External Trigger	
Input impedance	50 $\Omega$ (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 $\mu$ s)
Jitter RMS	5 ps
Internal delay	40 + (10 <sup>-1</sup> 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 $\Omega$
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 $\Omega$

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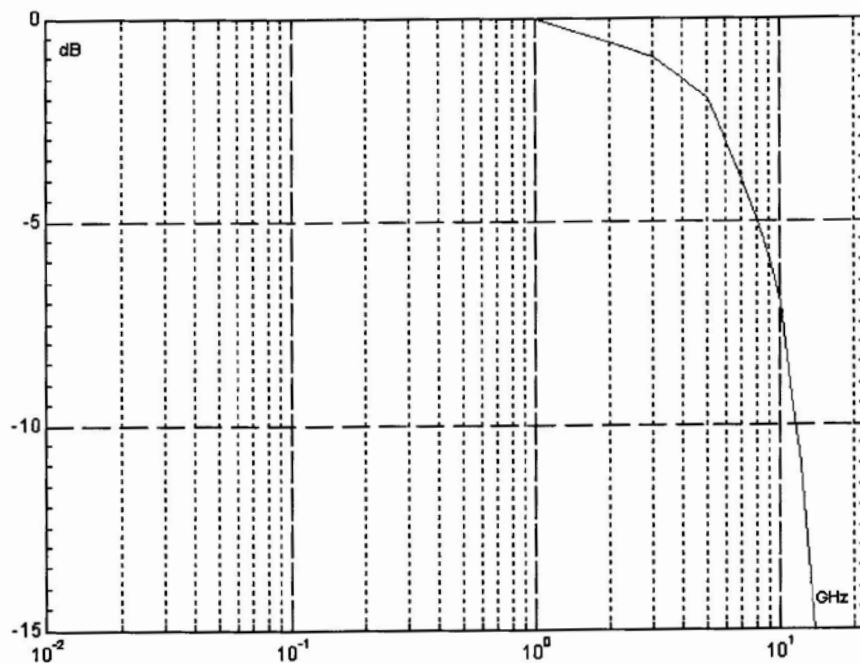
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### Main Characteristics (cont'd)

<b>Inputs /outputs</b> (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
<b>Environment</b>	
Operating temperature	10 to 30 °C
Humidity	85% non-condensed at 40°C
<b>Power supply</b>	
Voltage	90 to 240 VAC
Power	120 W
<b>Physical characteristics</b>	
Dimensions	Width=19 inch Height= 173 mm (4 U) Depth= 560 mm (670 mm with handles)
Weight	20 kg
<b>Option 01: Equalizer</b>	
This module extends bandwidth up to 11 GHz	

### Dynamic performance

The average bandwidth curve is the following

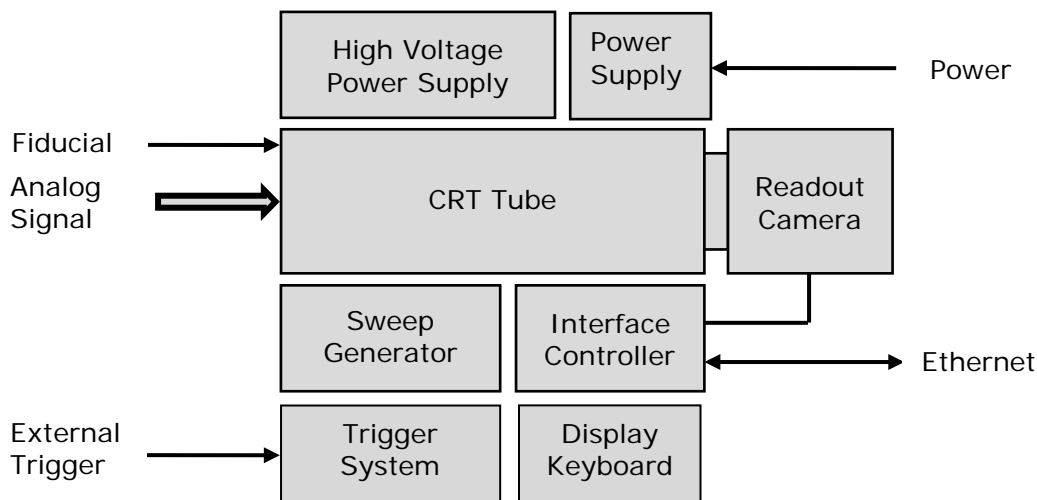


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### Functional overview

#### 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.

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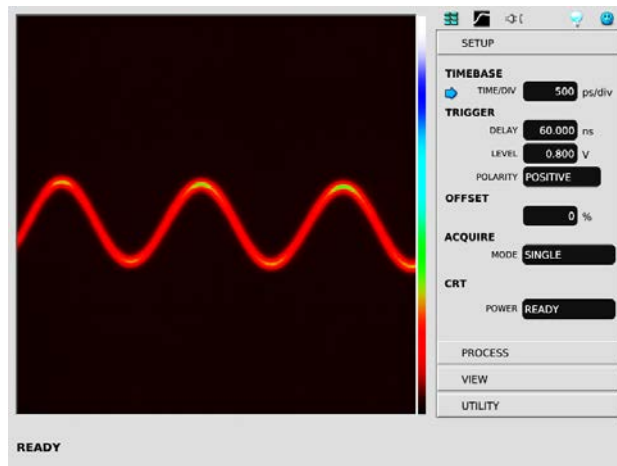
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### Control and software tools

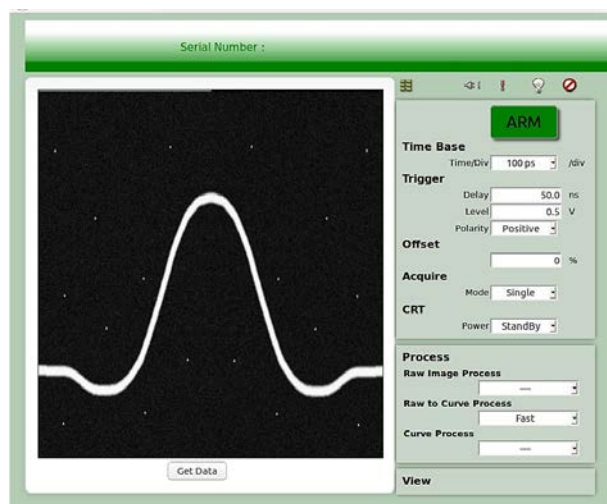
#### Local mode

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.



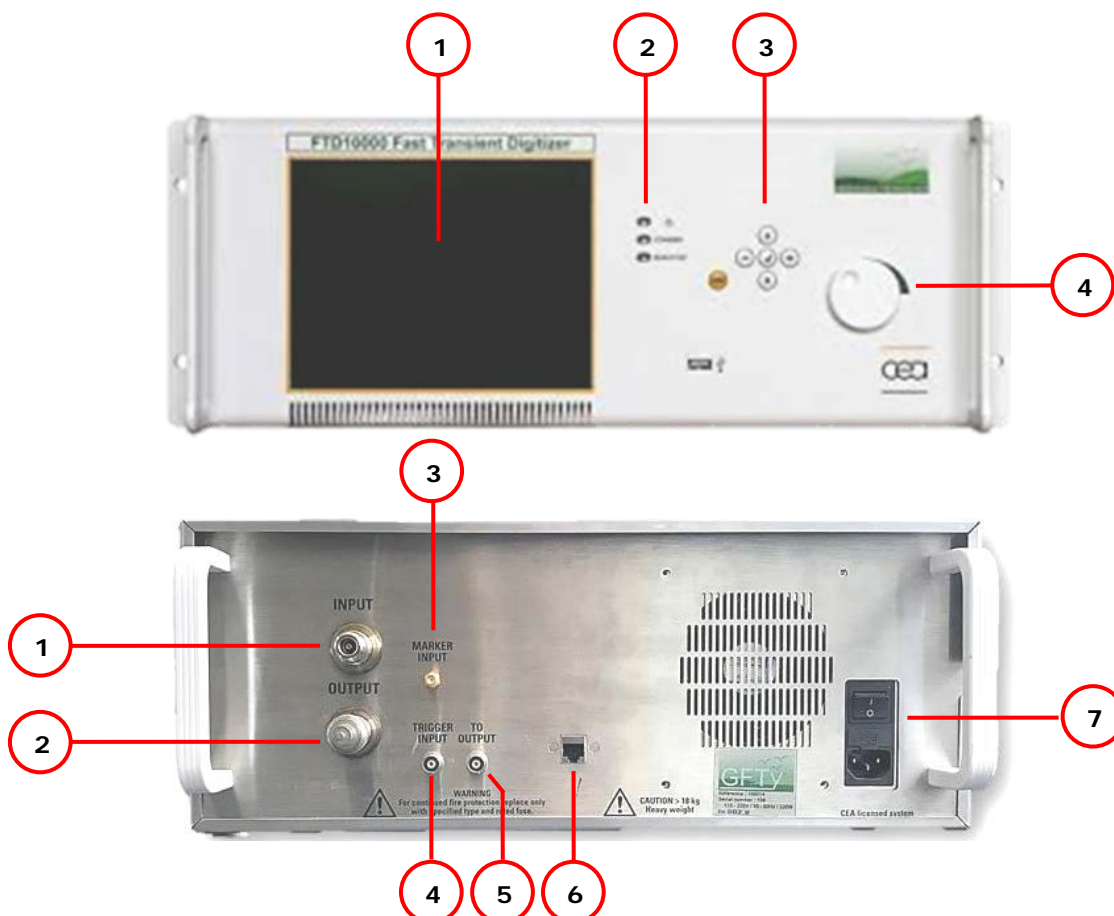
Web page

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

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### 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 $\Omega$ load: N connector
3	Key board for local mode	3	Fiducial input: BNC connector
4	Knob for local mode	4	Trigger input: BNC connector
		5	Trigger output: BNC connector
		6	Ethernet network: RJ45 connector
		7	Power on/off switch and plug

### Ordering information

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