

### Features

- Two Independent Delay Channels (Four channels available as an option)
  - 1 ps Time Resolution
  - < 5 ps RMS Jitter (Slave-to-Slave)
  - < 6 ps /°C Drift (Slave-to-slave)
  - 1 Second Range
- Output Pulse
  - Up to 10 V under 50 Ω
  - 1 ns Rise Time under 50 Ω
- Three Trigger Modes
  - Internal, External, or Timing System
- Controlled via Ethernet, Web Page and Front Panel
- Compact Packaging 2U, 19"

### Applications

- Picosecond Timing System
- Components Test
- ATE Application
- System Laser Timing Control
- Control Flash Lamps and Q-Switches
- Instrument Triggering
- Precision Pulse Application
- Timing Control of Diagnostics



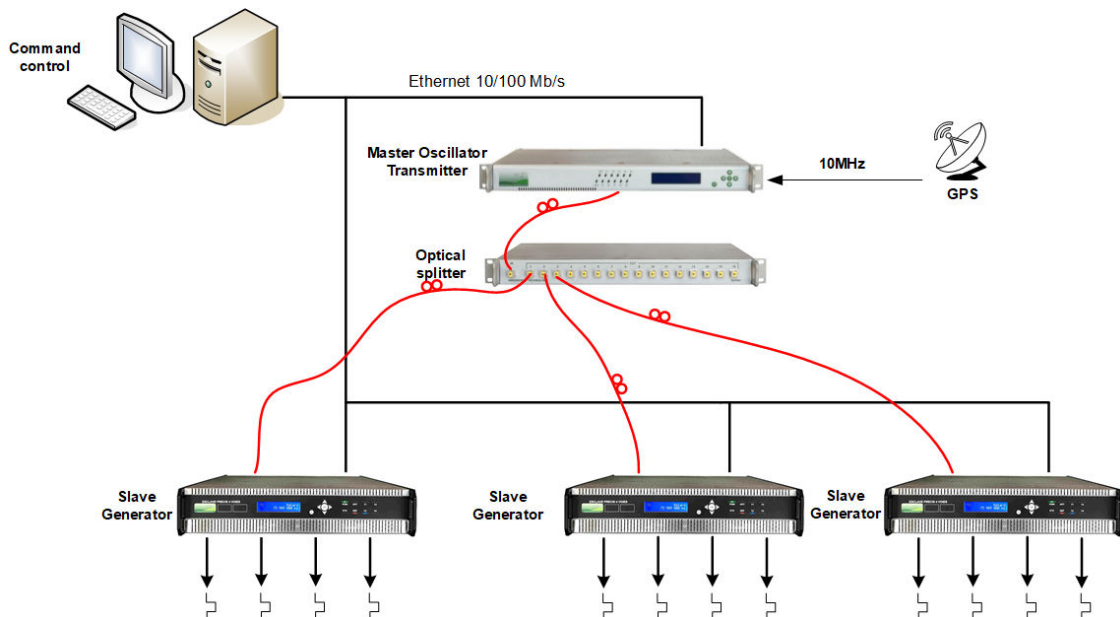
### Description

The GFT1012 Precise Slave Delay Generator is specially designed to provide precise pulses in Timing System applications where a Master delivers an optical data stream to synchronize Slave Delay Generators (see application below).

The GFT1012 provides two independently delayed pulses on the rear panel (four channels are available as an option). Delays up to 1 second can be programmed with 1 ps resolution, and channel-to-channel jitter is less than 5 ps RMS. BNC outputs deliver pulses up to 10 V with 1 ns rise time under 50 Ω.

The GFT1012 provides three trigger modes: External trigger mode from trigger input, Internal trigger mode from one synchronized timer or software command, Timing System mode from optical input linked to a Master. One T0 channel is used as a delay reference for all delay channel output pulses.

GFT1012 parameters can be locally controlled from the front panel keys and LCD display, and remotely controlled via Ethernet (10/100 Mb/s) or Internet (Web page from Internal Web server).



*Picosecond Timing System Application with 3 Slave Generators (12 delay channels)*

# GFT1012

## 2/4 Channel Precise Slave Generator

### Specifications

<b>Delay Channels</b>	
Number	2 independents ( or 4 in option)
Range	0 to 1 second
Resolution	1 ps
RMS Jitter (for short delay)	
Timing system mode	< 5 ps (Slave to slave)
External trigger	< 1.5 ns ( External trigger to T0 Output)
Drift (for short delay)	< 6 ps pp /°C @ 24 hours (Slave to Slave) < 10 ps pp /°C @ 7 days < 15 ps pp /°C @ 1 month
Accuracy	< ± 10 ps pp for a delay between 0 ns to 20 ns < ± 30 ps pp for a delay between 20 ns to 100 ns < ± 50 ps pp for a delay between 100 ns to 1 µs < ± 100 ps pp for a delay between 1 µs to 1s
Time base	155.52 MHz frequency
<b>Trigger Input</b>	
Repetition Rate	Up to 100 kHz
Trigger Level	+5 V /50 Ω
Slope	Positive
Connector	BNC
<b>Internal Trigger</b>	
One Synchronized Generator	Frequency= 1 Hz to 100 000 Hz
<b>Optical Input Trigger</b>	
Function	Input for Timing System Operation
Sensitivity	Between -10 to -25 dBm
Wavelength	1550 nm ± 10 nm
Connector	SC/APC
<b>Output Pulse T1 to T2 (and T1 to T4 in option)</b>	
Amplitude	10 V
Load	50 Ω ± 2%
Rise / Fall time	< 1 ns / 3 ns
Width	1 µs +/- 100 ns
Form	Square
Connector	BNC
<b>Output T0</b>	
Amplitude	10 V
Load	50 Ω
Rise / Fall time	< 1 ns / 3 ns
Width	1 µs +/- 100 ns
Form	Square
<b>Clock Output</b>	
Frequency	9.72 MHz (synchronized on time base)
Load	50 Ω ± 2%
Level	> ± 1 V pp / AC
Form	Square
Connector	BNC
<b>General</b>	
Software	Free Drivers for Windows7
User Interface	Front panel, Ethernet 10/100 Mb/s, Internet (Web page)
Power Consumption	90 to 240 V / 50 – 60 Hz / 1 A
Operating Temperature	20 to 25°C
Weight / Size	< 25 kg / 19", 2U, 503 mm (with handles)
<b>Option</b>	
Option 1	Extension to 4 channels

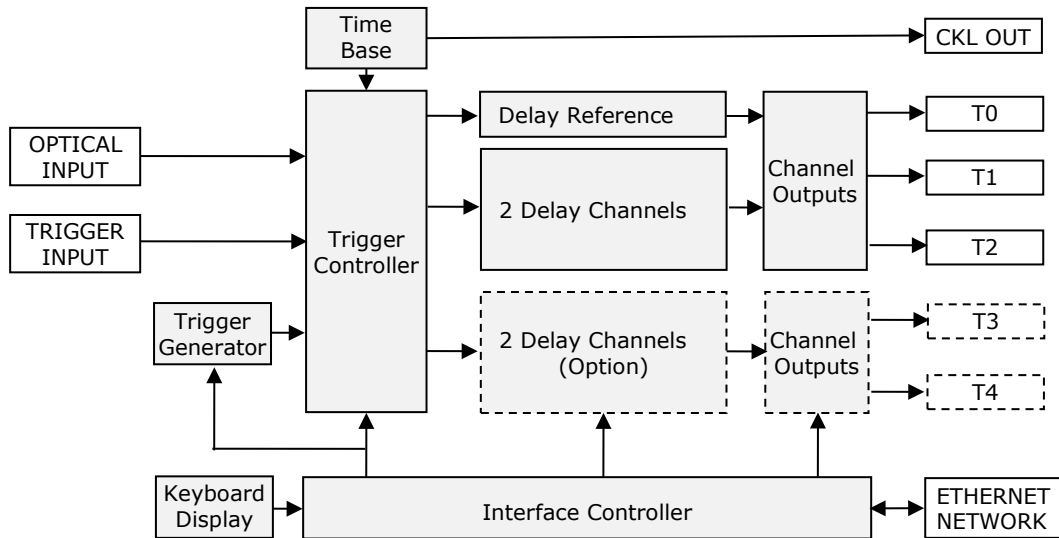
# GFT1012

## 2/4 Channel Precise Slave Generator

### Functional overview

#### Block diagram

The GFT1012 includes the five following functions: Time Base, Trigger Controller, Delay Channel, Fine Delays and Interface Controller.



*Block Diagram*

**Time Base:** This function provides a 155.52 MHz time base from an internal clock (10 MHz) or from an optical timing system. The time base (9.72 MHz) is available on a rear-panel (CLK OUT).

**Trigger Controller:** This function provides 3 Trigger modes to delay channels.

- External trigger mode

When the external trigger mode is selected, a rising edge on a "Trigger input" starts a delay channels.

- Internal trigger mode

In this mode delay channels can be started from an internal Trigger Generator, programmable between 1 Hz to 100 000 Hz.

- Timing System mode

In this mode the GFT1012 receives on "Optical Input" an optical data stream from a GFT3001 Master Unit. GFT3001 provides triggers and time base over an optical network to synchronize multiple Slave Delay Generators. Triggers can be repetitive or single-shot:

- **Repetitive Triggers:** Three triggers (F1, F2 and F3) are synchronous with the Time base and synchronous between each other. Their frequency of repetition is programmable according to 1 kHz to 1 Hz
- **Single Shot Triggers:** A burst of three triggers (DEC0, DEC1 and DEC3) are started by an external signal or a command in GFT3001 Master. The three triggers are synchronous with repetitive trigger F3.  
DEC0 is used to activate low frequency equipment very early in the event like, for example, high voltage power supplies. DEC1 and DEC3 are used to activate fast equipment near or during the event like digitizers, streak cameras, and calorimeters for diagnostics.

In timing system mode each channel can be started from one of 6 triggers (3 repetitive and 3 Single shot). After power on all trigger sources are automatically set off.

**Delay Channel:** There are two or four delay channels (T1 to T4). The delay of each channel is programmable up to 1 second in 1 ps increments.

The T0 output pulse is used as a delay reference for all delayed output pulses.

**Channel Output:** Each delay channel provides an output pulse. The outputs are designed to drive 10 V, 1 ns under 50  $\Omega$  loads.

**Interface Controller:** It manages internal functions (Time Base, Delay Channels, Front Panel operation) and user's interface (Ethernet network and Web pages via embedded web server).

# GFT1012

## 2/4 Channel Precise Slave Generator

### Software tools

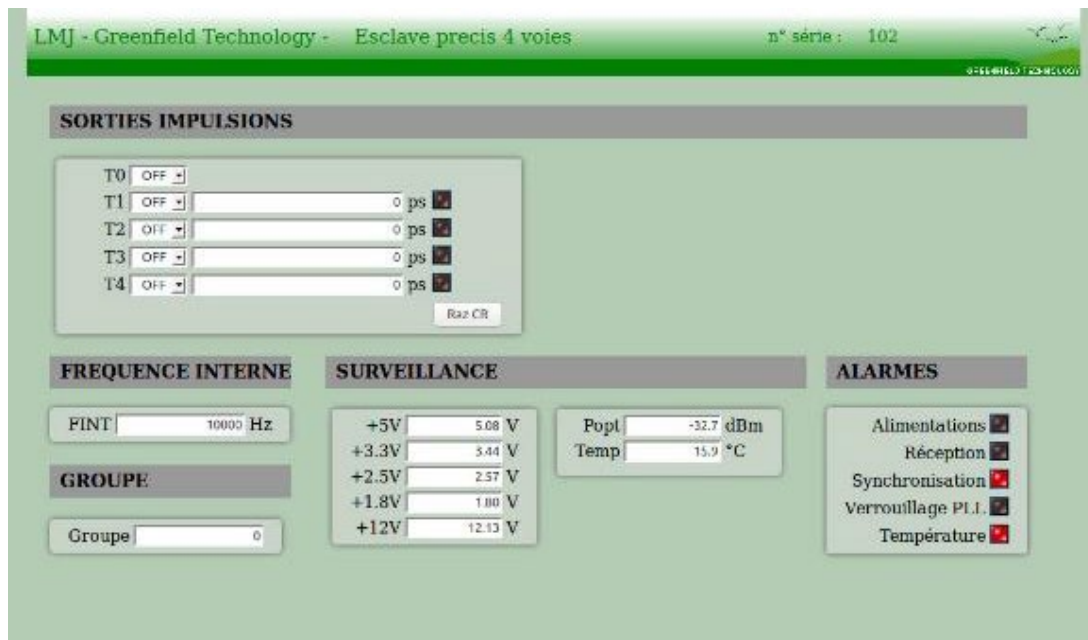
They are three ways to control the generator

- **Local way** via the front panel (Display, Keyboard, and Indicators)



*Front panel control*

- **Quick remote way** via Internet (Web page from Internal Web server)



*GFT1012 Main Web Page*

This web page, from an embedded Web server, provides a simple method to configure settings for each channel (delay, trigger mode, trigger source), to control operation, and to display status of the instrument.

The configuration information of the instrument is stored and saved in the GFT1012.

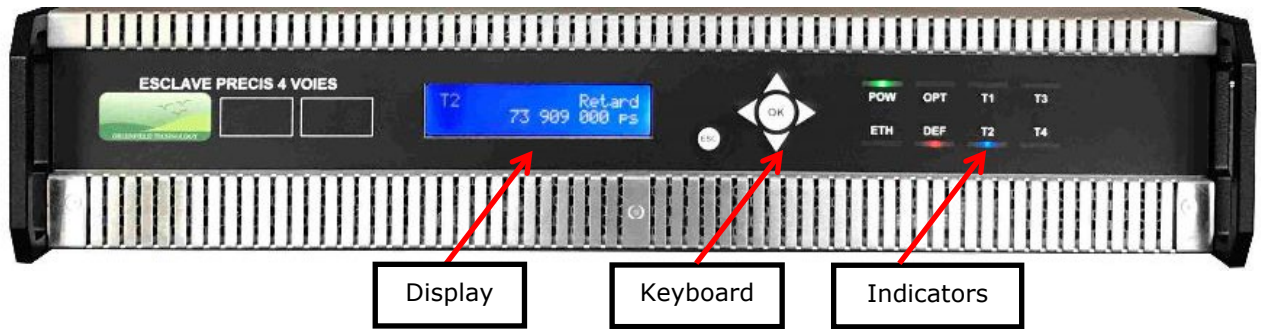
The web page can be opened via Internet Explorer, Mozilla Firefox or Chrome. After connecting a cable from the GFT1012's Ethernet port to your computer network, enter the GFT1012's IP address into your PC's browser (the IP address can be identified or assigned via the front panel). The browser will automatically open the control panel web page on your PC.

- **General remote way** via LabVIEW software application in or PC software application.

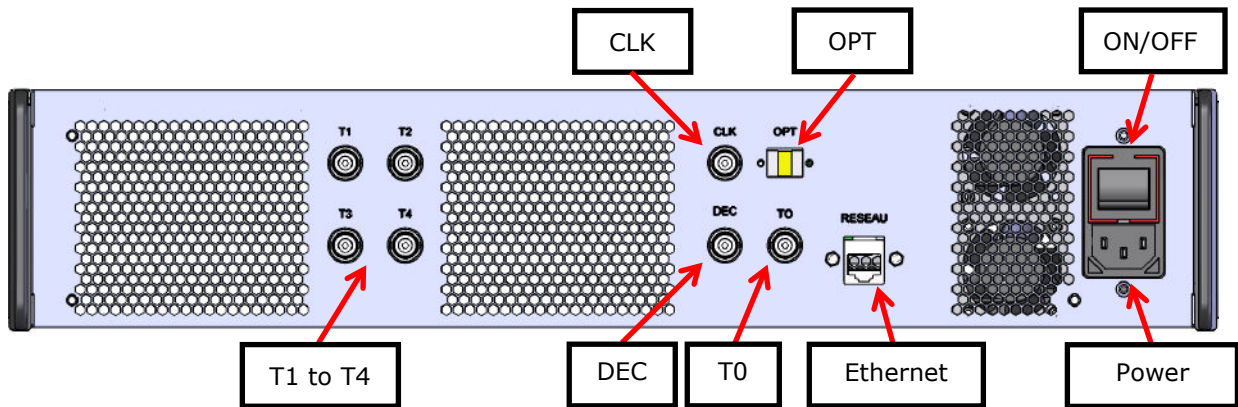
# GFT1012

## 2/4 Channel Precise Slave Generator

### Packaging



*Front panel*



*Rear panel*

### Connector, Switch, Indicators

Front Panel		Rear Panel	
<ul style="list-style-type: none"> <li>Indicators</li> </ul>		<ul style="list-style-type: none"> <li>Connectors</li> </ul>	
OPT	Synchronized by optical network	Ethernet	LAN connection: RJ45 connector
T1	Blinks at the trigger frequency of channel 1	OPT	Optical Input: SC/APC connector
T2	Blinks at the trigger frequency of channel 2	CLK	Clock output: BNC connector
T3	Blinks at the trigger frequency of channel 3	T0	T0 output: BNC connector
T4	Blinks at the trigger frequency of channel 4	T1 to T4	T1 to T4 outputs: BNC connector
PWR	Power supply ON	DEC	Trigger Input: BNC connector
ETH	RJ45 connected	Power	AC power plug (90-240 V) and
<ul style="list-style-type: none"> <li>Small keyboard for local control</li> <li>Display for local control</li> </ul>		<ul style="list-style-type: none"> <li>Switch</li> </ul>	
		ON/OFF	Power ON/OFF switch

### Ordering information

Model	Description
GFT1012	Precise slave generator base version
-4	Extension to 4 channels

Ordering example: GFT1012-4: 4 Channel Precise Slave Generator