



# GFT3001

## Master Oscillator Transmitter

### Features

- Synchronize up to 256 Delay Generators with less than 15 ps jitter
- Optical fiber interconnection enables up to 1 km distance between equipment
- Local front panel, Ethernet and Internet user interfaces
- 19", 1U compact packaging

### Applications

- Picosecond Timing System
- Laser Timing System
- Synchronous Multi-channel
- Synchrotron Timing System

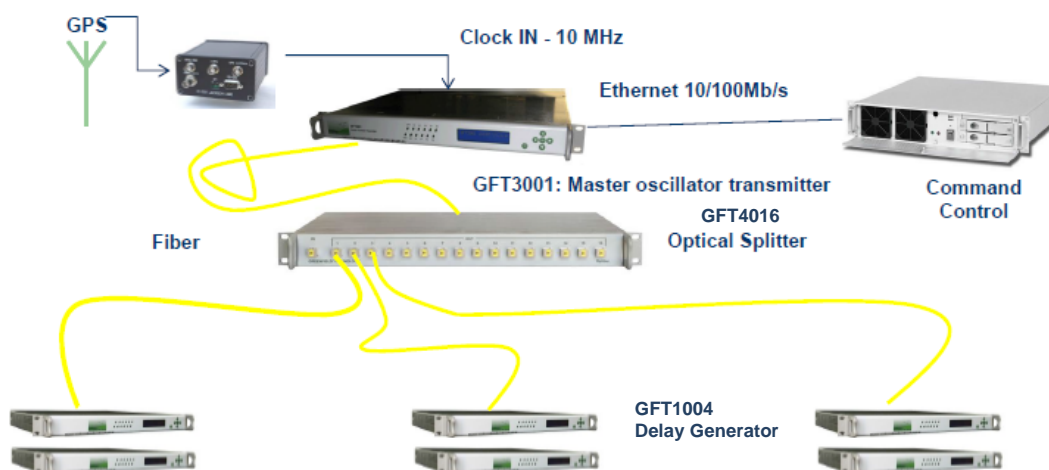


### Description

The GFT3001 synchronizes local delay generators over an optical network by generating an optical data serial data stream, as well as through master triggers and a time base. The clock reference of the GFT3001 can be external or internal. In some applications, the GFT3001 can also generate a clock to synchronize other devices (Laser, Oscillator, etc.). The GFT3001 can respond to an external hardware single-shot trigger, or generate an internal single-shot trigger. To prevent erroneous outputs, the user can stop the single-shot with a hardware-level preset.

An additional security measure is in place if the external clock reference is lost, returning the GFT3001 to a preset frequency. All parameters may be locally controlled over front panel, and remotely controlled over an Ethernet (10 / 100 Mb/s) or Internet (internal web server) interface.

The main application of the GFT3001 is in facilitating picosecond timing systems, generating several-hundred trigger pulses to equipment across the different situations encountered in large Laser timing Systems.



Picosecond Timing System Application with 6 Local Delay Generators



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### Specifications

<b>Timing System</b>	
Distance between equipment	>1 km (GFT3001 to local delay generator)
# of local delay generators	Up to 256
<b>Internal Time base</b>	
Frequency	160 MHz
Accuracy / stability	$10^{-9}$ / 0.05 ppm
<b>Trigger events source</b>	
Single-shot SS1, SS2 source	From front panel, Ethernet or Trigger input
Repetitive trigger events	From 3 counters. Each is programmable 1 kHz to 1/60 Hz
<b>Trigger input</b>	
Trigger active	Slope positive, Threshold = +1 V, Internal load 50 $\Omega$
<b>Inhibition Input</b>	
Inhibition active	Active high, Threshold = +1 V, Internal load 50 $\Omega$
<b>Clock Input</b>	
Shape	Sinewave or Square
Threshold	0 V, Internal 50 $\Omega$ load
level	-3 dBm min.
Frequency	10 MHz
<b>Optical data stream Output</b>	
Repetition rate	160 Mb/s (up to 200 Mb/s as an option)
Optical Power / Wavelength	4 dBm mean / 1550 nm
Rise and fall time	< 1 ns
Connector	SC with shutter
<b>T0 output</b>	
Source	Single or Repetitive trigger
Amplitude	2, 5, to 10 V under 50 $\Omega$
Rise / Fall time	< 2 ns, < 5 ns
RMS jitter	15 ps to local delay generator (T0 output)
Width	100 ns to 10 $\mu$ s
<b>General specifications</b>	
User Interface	Local PAV, Ethernet / Internet (Web page)
Size	Rack 19", 1U, 300 mm
Power	90 to 240 V / 1 A
Software tools	DLL, VI LabVIEW
<b>Options</b>	
Option 1:	Clock Output: Sinewave, 3 dBm, 80 MHz, >-40 dBm Spectral Purity
Option 2:	Specific Clock Input frequency (10 MHz to 100 MHz) ask when ordering
Option 3:	Programmable Single-Shot sequence (repetitive, single burst, repetitive burst)
Option 4:	More repetitive triggers (up to 3 with fixed frequency) ask when ordering

## Functional overview

### Block Diagram

The GFT3001 includes the five following functions: Clock Management, Timing Control, Data Stream Generator, Transmitter and an Interface Controller.

### Clock Management

Provides a 160 MHz time base from an internal clock or an external 10 MHz clock. As an option, the external clock can be up to 100 MHz

### Timing Control

This function provides 3 repetitive triggers (F1, F2, F3) and a pair of single-shot triggers (SS1 and SS2)

Every channel of local Delay Generator can be triggered by one of these 5 triggers.

Repetitive triggers (F1, F2, and F3) are made with three synchronous counters. The frequency of each repetitive trigger is programmable by the user according to the following values:

$F0 = 1 \text{ kHz}$  (fixed frequency)

$F1 = F0 / M$

$F2 = F0 / N$

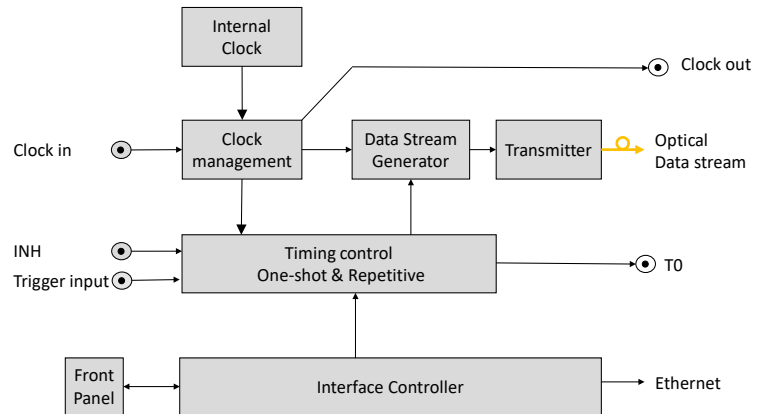
$F3 = F0 / O$

M, N, O are adjustable from 1 to 60 000 with  $F1 > F2 > F3$

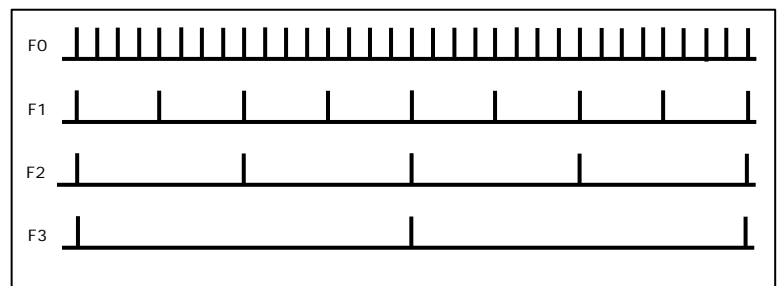
Single-shot triggers (SS1 & SS2) This pair of triggers is synchronized with the F3 repetitive trigger and started by a user command, or by external signal on the Trigger Input.

In a single-shot experiment application:

- SS1 is used to activate low frequency equipment very early in the experiment like for example a high voltage power supply.
- SS2 is used to activate fast equipment near or during the experiment like a digitizer for diagnostics.

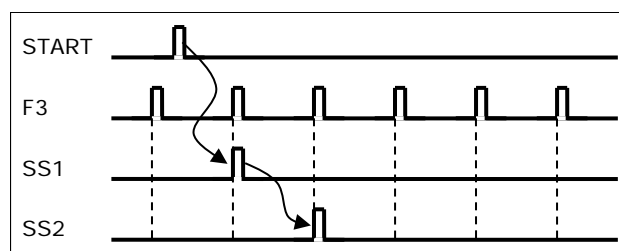


*Block Diagram*



*Example of Repetitive Triggers:*

$F1 = 250 \text{ Hz}$ ,  $F2 = 125 \text{ Hz}$ ,  $F3 = 75 \text{ Hz}$



*Single Shot Trigger*

INH Input inhibits single-shot triggers with an external voltage level for safety management.

### Data Stream Generator

This function organizes the timing control events (Repetitive Triggers, Single Shot, Inhibition) in a serial data stream.

### Transmitter

Encodes the data stream, converts the electrical signal to optical signal and delivers a serial optical data stream to synchronize local delay generators.

### Interface Controller

This function manages internal functions, front panel operation and Ethernet network. This function is configurable for custom application.



## Connector, Switch, Indicators

## Ordering Information

GFT3001-1 (GFT3001 with Clock Output option)