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

GFT3001 provides master triggers and time base while generating an optical serial data stream over an optical network to synchronize local delay generators. The clock reference of the GFT3001 can be external or internal. In some applications the GFT3001 can also generate a clock to synchronize others 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 enabled 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 Ethernet and Internet (internal web server) interface (10 / 100 Mb/s). The main application of the GFT3001 is in picosecond timing systems to provide several hundred trigger pulses to equipment distributed over important areas encountered in large Laser timing Systems.
# Specifications

## Timing System
- **Distance between equipment**: >1 km (GFT3001 to local delay generator)
- **# of local delay generators**: Up to 256

## Internal Time Base
- **Frequency**: 160 MHz
- **Accuracy / stability**: $10^{-9}$ / 0.05 ppm

## Trigger events source
- **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

## Trigger input
- **Trigger active**: Slope positive, Threshold = +1 V, Internal load 50 Ω

## Inhibition Input
- **Inhibition active**: Active high, Threshold = +1 V, Internal load 50 Ω

## Clock Input
- **Shape**: Sinewave or Square
- **Threshold**: 0 V, Internal 50 Ω load
- **level**: -3 dBm min.
- **Frequency**: 10 MHz

## Optical data stream Output
- **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

## T0 output
- **Source**: Single or Repetitive trigger
- **Amplitude**: 2, 5, to 10 V under 50 Ω
- **Rise / Fall time**: < 2 ns, < 5 ns
- **RMS jitter**: 15 ps to local delay generator (T0 output)
- **Width**: 100 ns to 10 μs

## General specifications
- **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

## Options
- **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 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.

**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.
Front and Rear Panel Interfaces

![Diagram of front and rear panel interfaces]

**Front Panel**
- INH
- TRIG IN
- LAN
- T0
- OPT
- CLK IN
- POWER, I/O

**Rear Panel**
- INH
- TRIG IN
- LAN
- T0
- OPT
- CLK IN
- POWER, I/O

**Connector, Switch, Indicators**

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<th>Front panel</th>
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**Ordering Information**

**GFT3001 Master Oscillator Transmitter part numbering**

GFT3001-X-X-X-X (Where X is option number)

**Ordering examples**

GFT3001-1 (GFT3001 with Clock Output option)