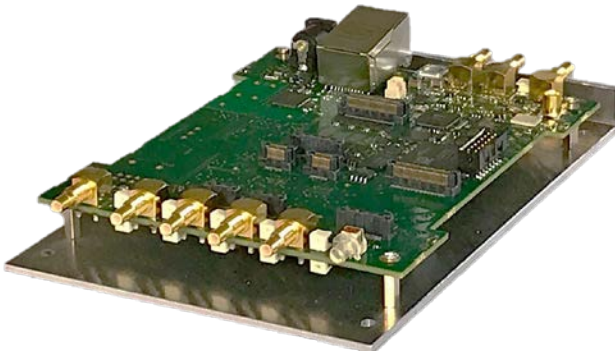


### Features

- 2 independent delay channels (or 4 or 8 in option)
- 100 ps delay resolution (1 ps in option)
- 50 ps channel to channel RMS jitter (5 ps in option)
- Output pulse 1.5 to 5 V / 50 Ω, 1 ns rise time with variable control of width, polarity, amplitude, and MUX mode
- Independent trigger rate (repetitive, single or burst) for every channel
- External trigger from two inputs with pre-scaler or internal trigger mode from three synchronous programmable timers and soft command.
- Gate (or second trigger) input
- External clocking up to 240 MHz (user programmable)
- Controlled via USB and Ethernet (Bluetooth in option)
- Ultra-compact packaging and low power
- DC +5 V power supply. An External AC (80 to 230 V) to DC compact power supply is furnished
- Channel output amplitude options: 3 to 10 V or 15 to 50 V or LVDS level



*GFT1804 view*

### Applications

- Laser Pulse Piking
- ATE Application
- System Laser Timing Control
- Precision Pulse Application
- Instrument Triggering
- Components Test

### Description

The GFT1804 Pulse & Delay Generator provides 2 (or 4 or 8 in option) independent delayed pulses. Delays up to 100 seconds can be programmed with 100 ps resolution and channel to channel jitter less than 50 ps RMS. An option allows to enhance delay resolution to 1 ps, and channel to channel jitter to 5 ps RMS.

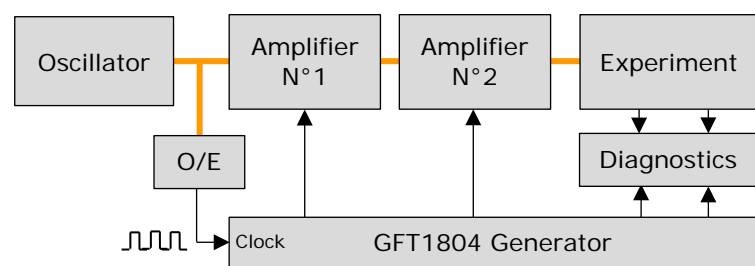
SMB outputs deliver 1.5 V to 5 V, 1 ns rise time pulses, under 50 Ω. Pulse amplitude, polarity and width are adjustable on each output channel. In option, pulse amplitude can be 3 V to 10 V or 15 V to 50 V under 50 Ω or LVDS level.

The model GFT1804 offer two inputs or three internal synchronized timers (adjustable from 0.1 Hz to 50 MHz) or software command for triggering all selected delay channel. The internal timers may be started by pushbutton or software command. Either trigger rate may be set as one-shot or repetitive. Gate input allows to inhibit quickly all selected channel Outputs. This input function can be selected as a second External Trigger.

The generator uses an internal 100 MHz TCXO clock reference, or an external user programmable (from 10 MHz to 240 MHz) clock (sine or square).

GFT1804 parameters can be remote controlled via Ethernet or USB to UART (or Bluetooth in option).

**Application example:** The GFT1804 is well suited to synchronize all the devices of a Picosecond Laser system with only one compact unit and one GUI. In this application the "Clock reference input" of the pulse and delay generator receives a signal (80 MHz for example) from laser oscillator via an O/E (optical to electrical converter).



*Picoseconde Laser System*

From the GFT1804 Generator each amplifier (Pump-laser, Q-switch, Pockel cell ...) or diagnostic instruments (Digitizer, Calorimeter, CCD camera ...) can receive repetitive or single pulses (adjusted in rate, delay, amplitude, polarity and width) synchronized on "Clock reference input" with a very low jitter.

From generator 4 GPIO (input or output) under software control allow command for security or control to low frequency devices.

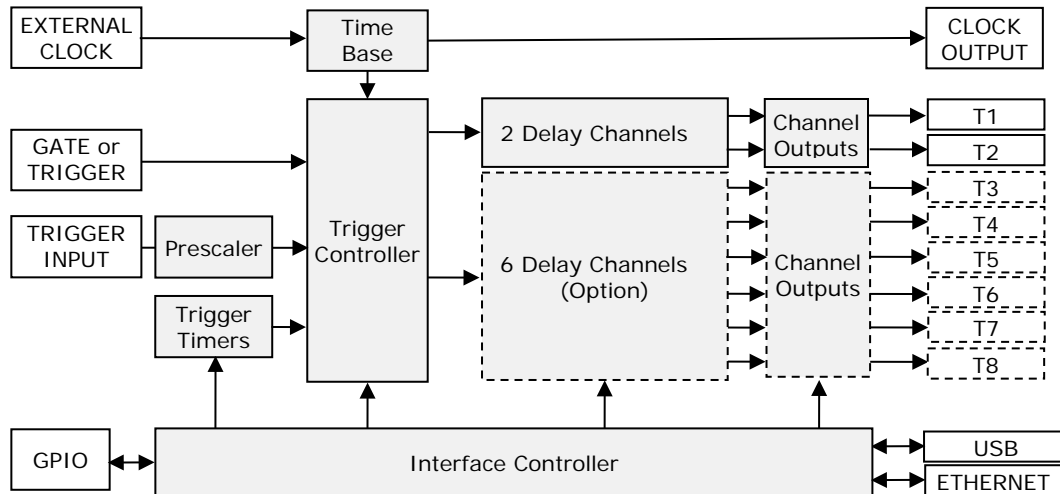


### Specifications

<b>Delay channels</b>	
Number	2 independents (or 4 or 8 in option)
Range	100 seconds
Resolution	100 ps (1ps in option)
RMS jitter	<50 ps + delay x 10 <sup>-7</sup> , channel to channel (< 5 ps + delay x 10 <sup>-7</sup> in option) <1 ns , external trigger to any channel
Accuracy	<500 ps + delay x 10 <sup>-6</sup>
Time base	Internal 200 MHz, ±5 ppm stability
<b>External Trigger Mode</b>	
Input "TRIG"	Rate single or repetitive up to 50 MHz, with prescaler, adjustable threshold, positive slope
Trigger delay	<85 ns (insertion delay)
<b>Internal Trigger Mode</b>	
Rate repetitive	From three Timers with frequency = 0.1 Hz to 50 MHz (in step of 5 ns)
Rate single trigger	From "Trigger input" or Soft Command
<b>Channel Output pulse T1 to T2 (and T3 to T8)</b>	
Amplitude	1.5 V to 5 V in step of 10 mV into 50 Ω or 3.0 V to 10 V in step of 20 mV into high impedance (>1 K Ω)
Rise/Fall Time	1/1 ns into 50 Ω or 2/2 ns into high impedance @ full scale range
Width	10 ns to 1 s in step of 5 ns
Pulse Polarity	Positive or Negative
Burst Mode	Burst count = 1 to 1 000 000 000, adjustable period in step of 5 ns
MUX Mode	Any channel may be ORed' to all outputs
<b>External Clock reference</b>	
Threshold	0 V, internal 50 Ω
Level / shape	Min -10 dBm, typical 6 dBm / Sine or square
Frequency	10 MHz to 240 MHz, user programmable in steps of 0.5 MHz
<b>Clock output</b>	
Level /shape	0 to 3 V under 50 Ω, Square
Frequency	10 MHz to 240 MHz
<b>Gate or second trigger</b>	
Input	Active high, adjustable threshold, positive slope, rate <10 MHz
Function	Gate or second External Trigger
<b>GPIO</b>	
4 x GPIO	Input or output, 0 or 3 V level, SMH-103-02-D Samtec connector
<b>General</b>	
Interface Control	USB to UART, Ethernet 10/100 Mb/s, Bluetooth in option
Software tools	Free Drivers for Windows 7/10, Linux
Power Voltage	+5 Volts, 2.5 W to 15 W according to configuration
Power supply	USB or External AC (80 - 264 V/47-63 Hz) to DC (5 V / 4 A)
Size / Weight	150 x 120 x 20 mm / <1 kg
<b>Options</b>	
Option 1:	Extension to 4 channels
Option 2:	Extension to 8 channels (available in Q4 2020)
Option 3:	1 ps delay resolution, channel to channel jitter < 5 ps, and min width of 5 ns (min width of 1ns, with option 2 + 5) (available in Q1 2021)
Option 4:	(bank of 2 channels) 3 V to 10 V channel output, width= 10 ns to 10 ms, rise/fall time = 2/3 ns typ. into 50 Ω (available in Q3 2020)
Option 5:	(bank of 2 channels) 15 V to 50 V channel output, width = 50 ns to 10 μs, rise/fall time = 3/15 ns into 50 Ω (available in Q1 2021)
Option 6:	(bank of 2 channels) LVDS outputs 400 mV to 800 mV, min width = 5 ns (or 1 ns, with option 2) to 1 s, rise/fall time = 500/500 ps under 50 Ω (available in Q1 2021)
Option 7:	(bank of 2 channels) pulse output replaced by one clock output (LVDS, 1 GHz max.) (available in Q1 2021)
Option 8:	Bluetooth (available in Q1 2021)
Option 9:	3" SMB to BNC cables

### Operating Information

#### Block diagram of the generator



**Time base:** This function provides a 200 MHz time base from an internal reference or an external 10 MHz to 240 MHz reference.

**Trigger controller:** This function provides 2 Trigger Modes,

-**External Trigger Mode:** In this mode, a rising edge on "Trigger Input", or "gate input", triggers all selected delay channel. On every channel trigger rate can be single or repetitive or burst or inhibited.

-**Internal Trigger Mode:** in this mode delay channels can be triggered from 3 frequency programmable synchronized Timers or command. On every channel trigger rate can be single or repetitive or burst or inhibited. "**Gate Input**" allows to inhibit quickly all selected channel Outputs. This input function can be selected as a second External Trigger.

	Trigger input	Gate	Timer N°1	Timer N°2	Timer N°3	Command
<i>Trigger sources</i>						
External mode	X	X				
Internal mode			X	X	X	X

**Delay Channel:** They are 2 independent delay channels (or 4 or 8 in option). The delay from selected trigger source is programmable up to 100 seconds in 100 ps increments (1 ps in option).

#### Channel Output

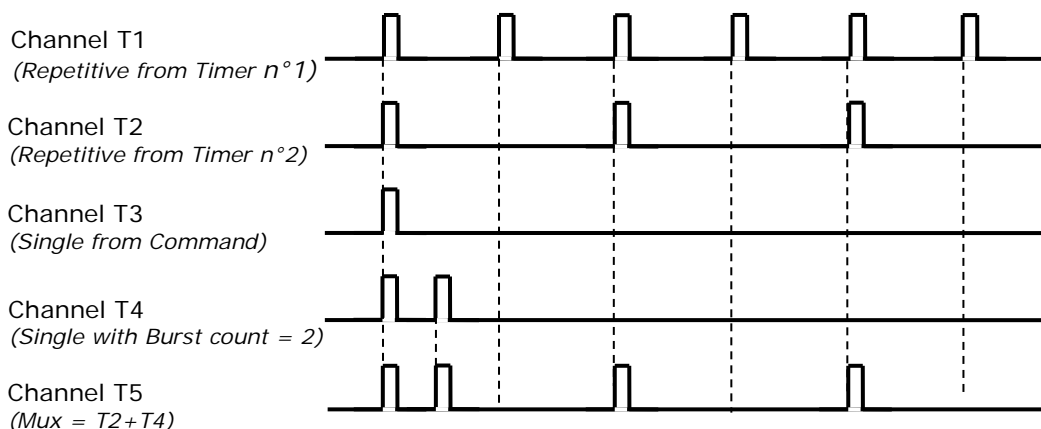
Each delayed output pulse (T1 to T2 or T3 to T8) can be independently adjustable in level (1.5 V to 5 V in 10 mV steps), width (10 ns to 1 s in 5 ns steps), and polarity, and may be OR' to all other outputs. The outputs are designed to drive 50 Ω load.

In option every channel output level can be 3 V to 10 V or 15 V to 50 V or under LVDS standard (ask to the factory for mixed channel output level configuration in bank of 2 channels).

**Interface Controller:** Manages internal functions and user interface. All the parameters can be remote controlled via USB to UART and Ethernet (10/100 Mb/s). A Bluetooth (v4.1) interface is available in option. All parameters values are automatically saved.

GPIO under software command allows to control other devices.

#### Example of channel output mode





### Control and software tools

There are two ways to control the generator

**Easy remote way** via Internet and control panel web pages.

Web page, from embedded Web server, provides easy method to configure settings.

A Main menu allows to display and control

- Trigger and clock system (trigger level, prescaler, Clock input/output, trigger generators F1 to F3 and RUN / STOP triggers)
- Delay channel (Trigger source, trigger rate, delay, amplitude / width/polarity of channel output pulse)
- Extended delay channel settings (burst mode, gate and MUX mode)

The configuration information (all the settings) of the instrument is stored and saved in the GFT1804.

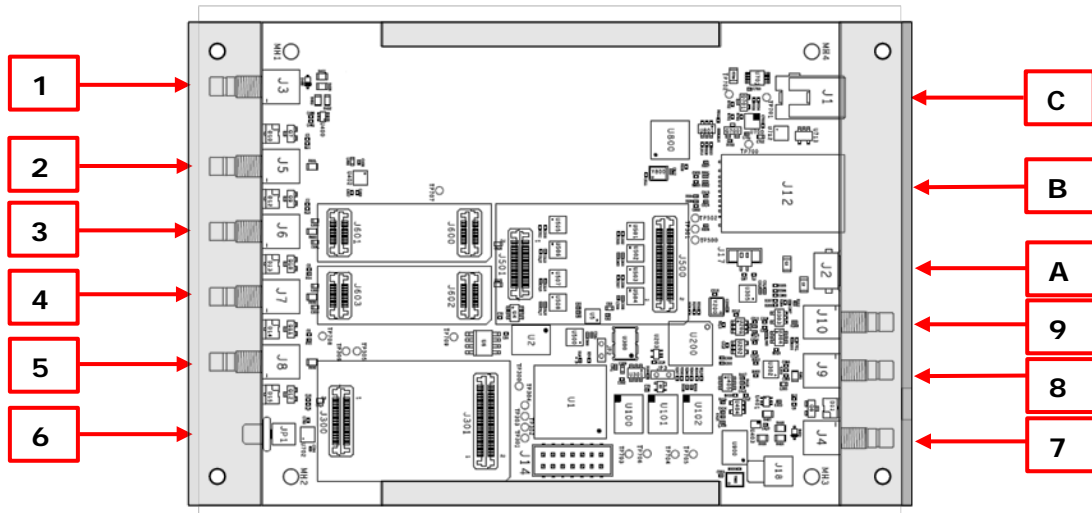
The web page can be opened via Internet Explorer, Mozilla Firefox or Chrome.

After connecting a cable from the GFT1804 Ethernet port to your computer network, enter the GFT1804 IP address into your PC's browser (the IP address can be identified in User's manual). The browser will automatically open the control panel web page on your PC.

*Control panel web page*

**General remote way** via Ethernet or USB and software application (see examples in the User's manual).

### Input & Output



*GFT1804 Top view*

#### Connectors, switch

• Connector	
1	Trigger input: SMB connector
2	T1 channel output: SMB connector
3	T2 channel output: SMB connector
4	T3 channel output: SMB connector
5	T4 channel output: SMB connector
• Switch	
6	Power ON/OFF and RUN/STOP triggers

• Connector	
7	Gate input: SMB connector
8	External Clock: SMB connector
9	Clock output: SMB connector
A	USB connection: micro AB connector
B	LAN connection: RJ45 connector (B-Top)
	GPIO: SMH-103 Samtec (B- Bottom)
C	+5 V DC power: Jack 2.10 mm

### Ordering information

#### Generator part number:

GFT1804-X-X-X-X (Where "X" is option number)

#### Ordering example

GFT1804-1-4 (GFT1804 with extension to 4 channels and 3 V to 10 V channel output amplitude)

### Accessories (Modules to provide specific output pulse shape)

Model	Description
GFT101	Electrical to optical Pulse Converter
GFT300	Sub nanosecond Pulse Stretcher
GFT400	500 ps (FMHM) width, 2 V into 50 Ω, Gaussian Pulse Generator
GFT500	200 ps rise time, 5 V amplitude into 50 Ω, Step Generator
GFT632	2 ns rise time, 15 to 70 V amplitude into 50 Ω, Pulse Generator