GFT2016

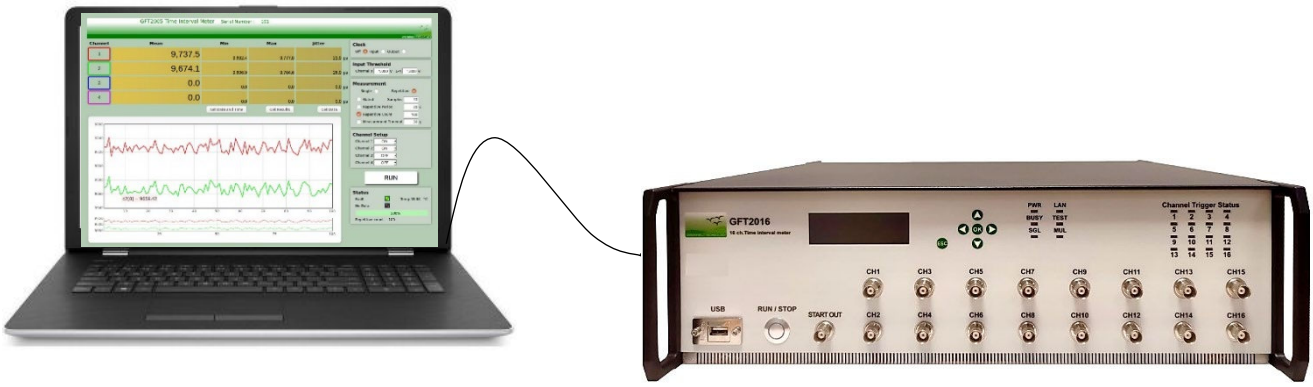
16-Channel Time Interval Meter

Features

- 16-channel Time Interval Meter: 1x Start and 15x Stops
  - < 10 Picosecond resolution
  - < 20 picosecond RMS jitter
  - Up to 10 seconds of the range
  - Up to 1 MHz sample rate per channel
- Common GATE input
- Input for external 10 MHz reference
- 4 GPIO signals for communication to external equipment
- Controlled via Ethernet TCP/IP commands, web page, and front panel
- 1 Gbit/s Ethernet interface
- Compact 19”, 3U

Applications

- Time of flight mass spectrometry
- Lab / R&D Characterizations
- Fluorescent decay
- Real time, time stamping
- ATE (Automatic Test Equipment)
- Optical and magnetic disk timing
- Component Test
- Variation in Pulse Timing



GFT2016 and laptop with embedded web page

Description

GFT2016 is a very precise Time Interval Meter. It has 16 channels: All channels can be configured as the "Start" time reference for the 15 other channels set as “Stops” events of the Time Interval measurement. The time interval between the rising edge of the “Start” channel and the “Stop” channels can be measured with up to 10 picoseconds resolution with up to 10 second range. Time Interval samples can be automatically processed to provide Mean, Max, Min and RMS/Jitter.

The instrument uses an internal 10 MHz oscillator or can be operated on an external more stable 10 MHz source.

The Instrument offers 4 GPIO (4 digital bi-directional signals) under software control for communication to external equipment. GFT2016 is a 19", 3U rack instrument with Ethernet interface.

The instrument as a built in Web server that provide an easy remote control via a standard Web Browser. “Control panel Web page” from embedded web server provide an easy method to:

- Configure settings for each channel and Control operation and status of the instrument
- View the measurements (value and graphic form)

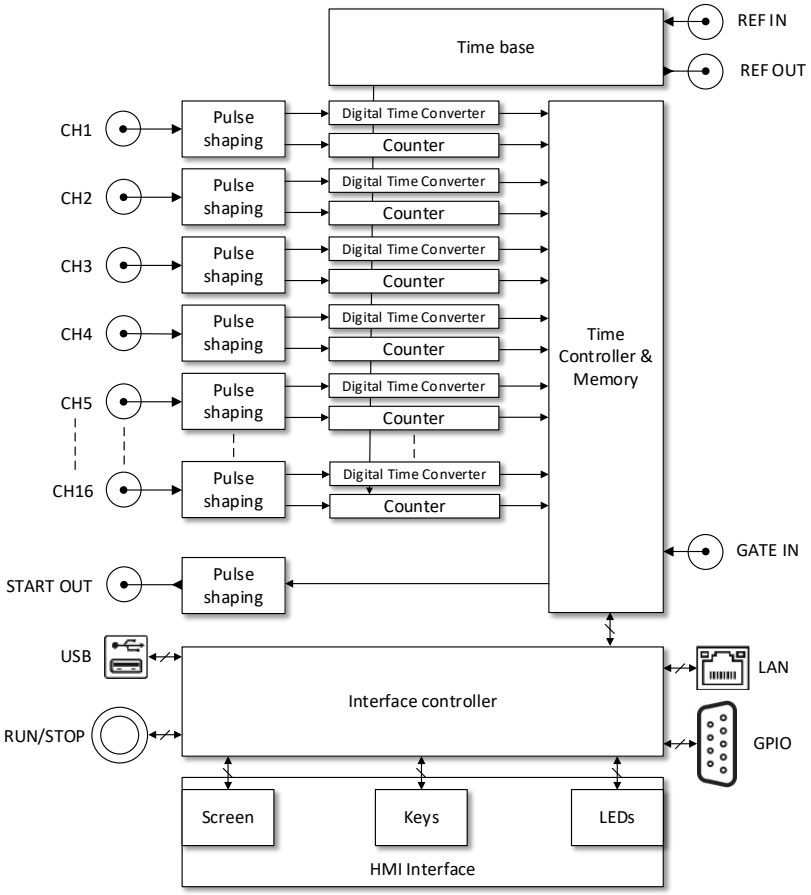
Save the measurements in the command control computer

Specifications

Time Interval Meter	
Time interval resolution	< 10 ps
Time interval range	10 s
Time interval jitter	< 20 ps RMS (for time intervals < 1 µs)
Measurement mode	Multiple, Single or Test
Time interval average	1 to 50,000 samples
Time interval max. rate	Up to 1 MHz
Statistics for sample number > 1	Mean, Min, Max, pk-to-pk and RMS jitter
Channel 1 to 16 inputs (CH1 to CH16)	
Channel function	1 Start, 15 Stops, user configurable
Trigger edge	Rising or falling
Input threshold	- 10 V to + 10 V, user programmable, 1 mV steps
Input impedance	50 Ω, DC coupled
Start output (START OUT)	
Level	+ 10 V +/- 0.5 V (50 Ω load)
Rise/Fall time	< 2 ns (50 Ω load)
Width	Copy of the “Start” channel trigger width
General Purpose Input/Output (GPIO)	
Number of GPIO	4
Type	LVTTL, Bidirectional, user configurable direction
Reference input (REF IN)	
Minimum level	> 0.3 V pk-to-pk
Required frequency	10 MHz +/-0.1 kHz
Input impedance	50 Ω, AC coupled
Internal to external clock reference	User configurable
Reference output (REF OUT)	
Frequency	10 MHz
Shape	Square
Level	+3 V +/- 0.5 V (50 Ω load)
Rise/Fall time	< 5 ns (50 Ω load)
Internal reference	
Frequency	10 MHz
Stability	+/- 5 ppb
General	
Control interface	Remote:1 Gb/s Ethernet, TCP/IP commands or Web page interface Local: Front panel screen & keys
Measurement storage Storage connector	Automatic, 10 s after Start trigger if USB key present Manual, if USB key inserted after Start trigger USB type A
Power supply	88~264 VAC, 47~63 Hz, 80 W max
Dimensions Weight	19’’ rack width, 3 U height, 376 mm overall depth < 10 kg
Options	
-PC	Power Cord: EU, US, UK
-32	32-channel time interval meter
-20	Threshold: - 20 V to + 20 V, user programmable, 1 mV step

Functional Overview

Block diagram: GFT2016 is organized around main functions described here:



Time base provides low jitter time base locked on an internal 10MHz reference or an external 10MHz if selected and provided on REF IN input (rear panel). This time base is clock used for all precisely timed functions. The time base function also generates a synchronous 10MHz reference provided on the rear panel (REF OUT) to synchronize other equipment or to use when daisy-chain multiple GFT2016.

Pulse shaping function at the channel inputs (CHx) compare the signal to a configured threshold and reshape the signal for the other functions. Pulse shaping function at the START OUT reshape the received start pulse to a calibrated fast rise time, +10 V pulse.

Digital Time Converter function use tapped delay line principle to provide the “fine” part of the time interval being measured.

Counter function use a fast clock to counts and determine the “coarse” part of the time interval being measured.

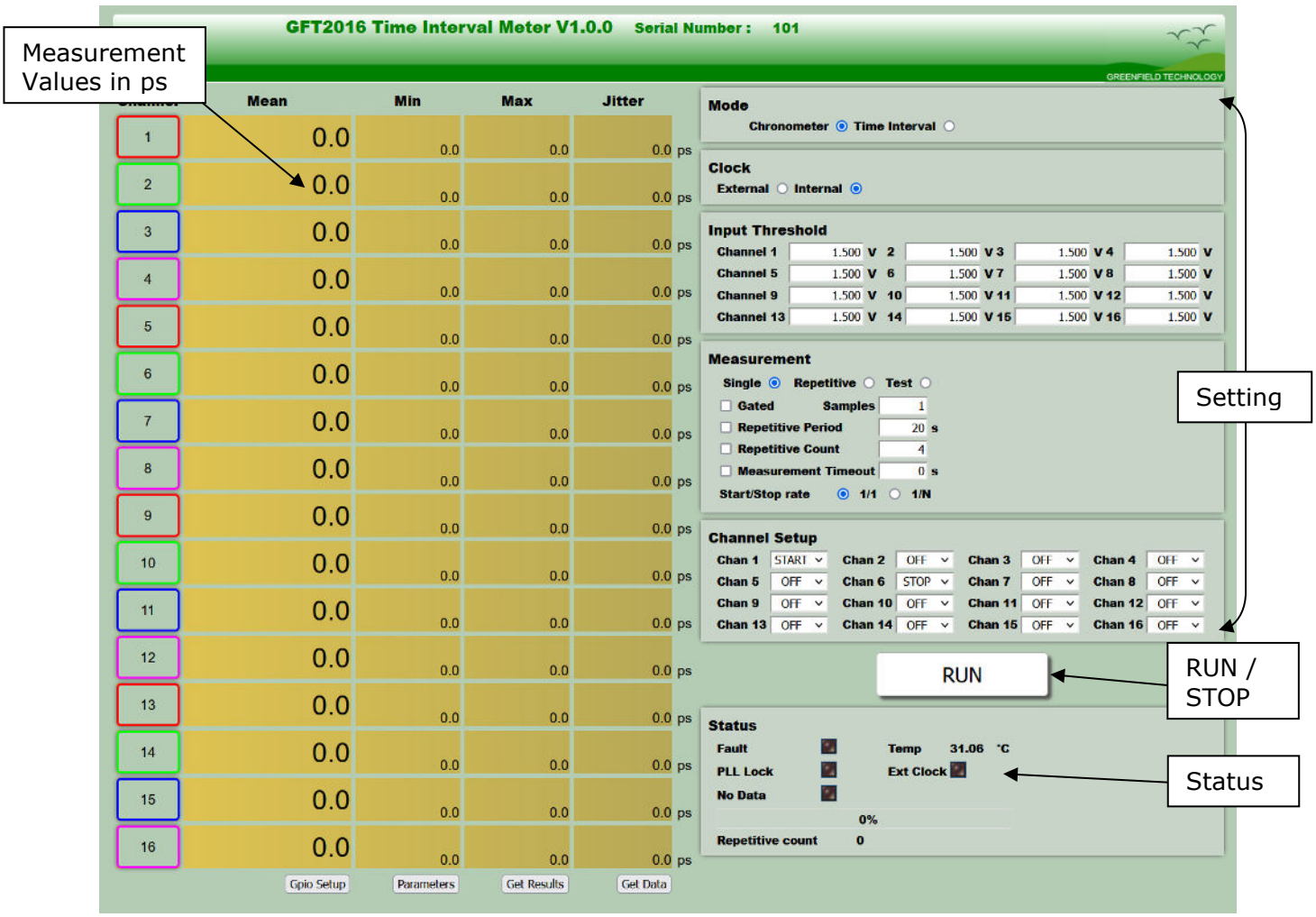
Time controller & memory function collects the “fine” & “coarse” parts, adjust, and determine the time interval and store it as a sample. This function completes the number of samples selected, then stops when the sample size is reached, and samples are read by the Interface Controller. If the multiple measurement mode is selected, the function collects a new series of samples (at the repeat period and up to the repeat count).

Interface controller manages all the “non-timed” functions and the user interfaces: Ethernet for remote control (TCP/IP command or Web page); screen, keys, and LEDs for local control; USB port for data storage; Run/Stop switch to start/stop experience; GPIO (general purpose input output), 4 generic configurable bi-directional signals controlled by software commands.

Software tools

They are three ways to control the Time Interval Meter:

- "**Quick way**" via Internet and control panel web page (see below). Web page from embedded server, provides an easy method to configure settings, to control operation, to display status of the instrument, to display measurement values and to save data (samples and measurements) in "RAW" data file format for off-line analysis.
  Measurement on each channel (identified by different color) can be viewed (Mean, Min, Max, Jitter) in real time and presented in graphic form (Time interval mean as function of repetitive count) in repetitive mode. A RUN/STOP button is used to START a new measure in single mode and to START/STOP a new measure in repetitive mode.
  Internet connection: The web page can be quickly opened via standard browser like Edge, Firefox or Chrome (without any DLL or specific software). After connecting a cable from GFT2016's Ethernet port to your computer network, enter GFT2016's IP address into your PC's browser (the IP address can be identified or assigned via the web page). The browser will automatically open the control panel web page on your PC.

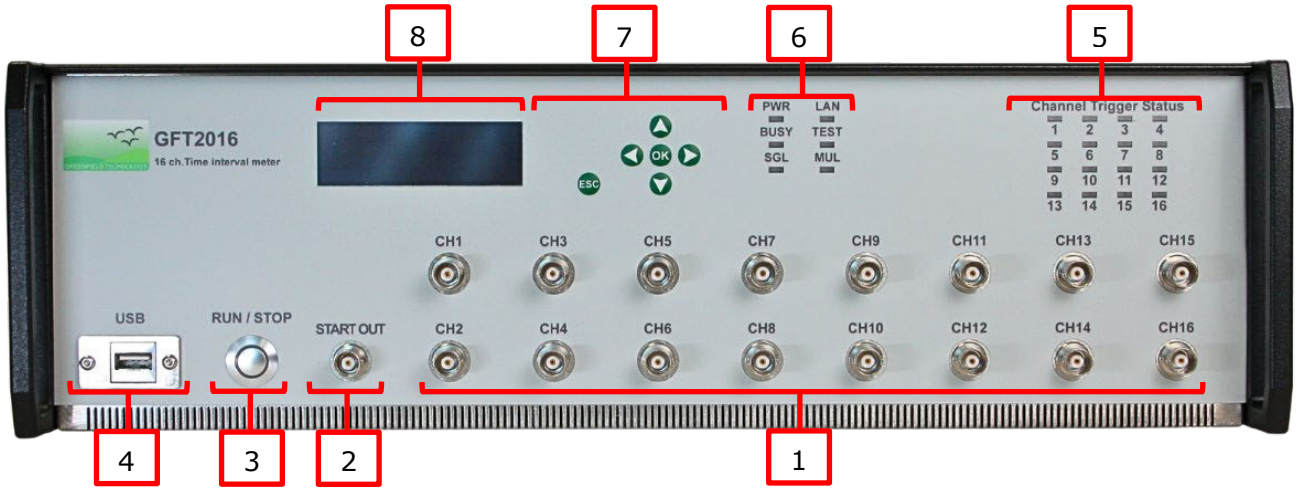


Control panel web page (example)

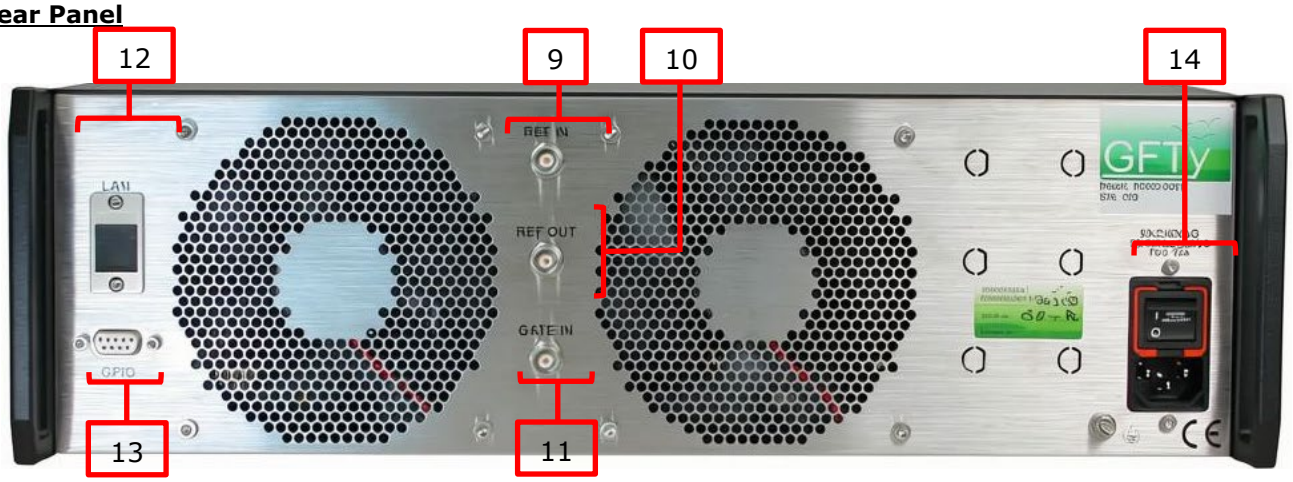
- **"General remote way**" via Ethernet or PC software application.
  GFT2016 offers a set of command to configure settings for each channel and trigger, Read the measurements, Control operation and status of the instrument
  Example of use is provided in a user's manual.
- **"Local way"** via the front Panel Display and Keyboard. The local way is used to program equipment and to read the results.

Product Interface

Front Panel



Rear Panel



Interface

Front Panel			Rear Panel		
Indicators			**Connectors**		
5	Channel Trigger Status	Trigger feedback	9	REF IN	Reference clock input: BNC connector
6	PWR, LAN, BUSY, TEST, SGL, MUL	Equipment status	10	REF OUT	Reference clock output: BNC connector
Connectors			11	GATE IN	Gate input (Enable): BNC connector
1	CH1 to CH16	Trigger inputs (START or STOP): BNC connectors	12	LAN	Ethernet network interface: RJ45 connector
2	START OUT	START event output for daisy-chain operation: BNC connector	13	GPIO	General Purpose Input/Output: SUB-D 9 female connector
4	USB	USB port for data backup on USB key	14	-	Mains input: AC power IEC plug with filter and fuses
Switch					
3	RUN / STOP	Run / Stop of the measurement			
7	-	Screen menu navigation keys			
8	-	Local control menu display			

Ordering Information

Model	Description
GFT2016	Base version: 16 channel Time Interval Meter
-PC	Power cord (EU, US, UK) -
-32	32-channel time interval meter
-20	Threshold: +/- 20 V

Ordering example: GFT2016-EU (model GFT2016 with EU power cord)