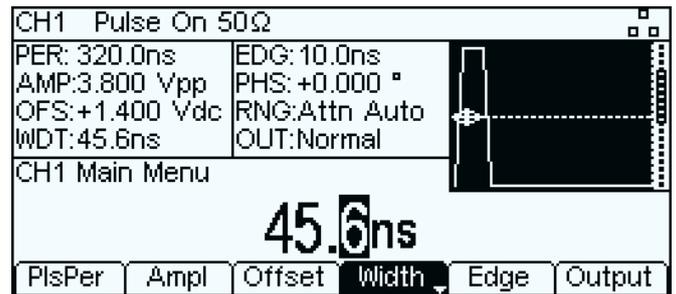


# TGF3000 Series - Functions and Waveforms

## HIGH RESOLUTION PULSE GENERATOR

The pulse generator function offers an exceptionally high pulse width resolution of 100ps over a period range from 50ns to 1000s.

The pulse edge speed is fully variable from 10ns to 1ms. Pulse jitter is dramatically lower than any comparable generator at only 30ps.



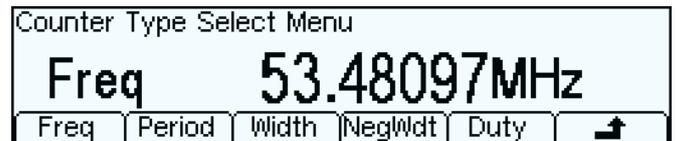
*Pulse width and edge speeds can be set to a resolution of 0.1ns (100ps)*

## FREQUENCY COUNTER/TIMER

The frequency counter function allows external signals to be measured in terms of frequency, period, pulse width or duty cycle.

The frequency range is 0.1Hz to 125MHz with a measurement resolution of up to seven digits.

Both generator channels remain operational when the counter is in use.



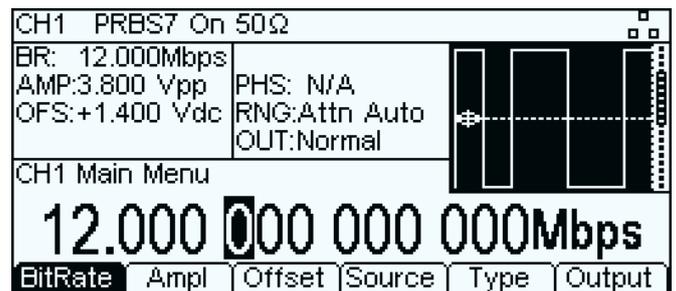
*The external frequency counter function can measure period, pulse width or duty cycle*

## PRBS GENERATOR \*

PRBS (Pseudo-Random Bit Sequence) is a binary waveform type that is widely used within secure communications systems.

PRBS is offered with a choice of 8 sequence lengths at rates between 1Mbps and 50Mbps.

PRBS can be used as both a carrier waveform and a modulation.

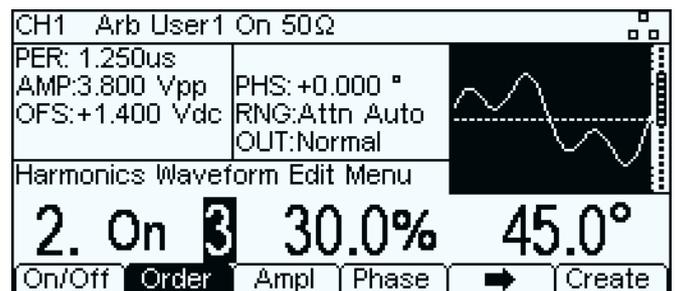


*PRBS patterns of 8 sequence lengths up to 50Mbps*

## HARMONICS GENERATOR \*

The harmonics generator function built into the TGF3162 enables waveform to be created by the addition of sine wave harmonics.

Up to 16 harmonics can be used, chosen from up to the 50th order. The amplitude and phase can be individually set for each harmonic.



*The harmonics generator enables waveforms to be constructed using up to 16 sine harmonics*

NOTE: Features marked \* are standard on the TGF3162 and optional on the TGF3082.

# TGF3000 Series - Modulations and Control

## TWO CHANNEL OPERATION

The two channels are identical with no performance limitations giving maximum flexibility and value for money.

### Independent Channel Operation

The two channels can be operated completely independently as if they were two separate generators. (Note that external trigger and external modulation inputs are shared).

### Relative Phase

The relative phase can be set from -360 degrees to +360 degrees with 0.001° resolution. Pressing the 'align' key phase synchronises the two channels with the specified phase offset.

### Coupled Operation \*

The frequencies of the two channels can be coupled such that changes on one are applied to the other.

Amplitudes (and DC offsets) of the two channels can be coupled such that changes are applied to both simultaneously.

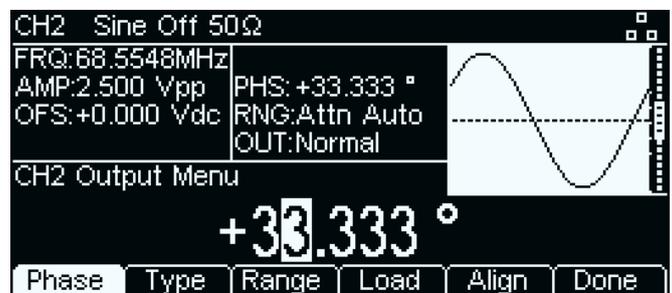
Outputs can be coupled such that the output on/off switches both channels simultaneously.

### Tracking Operation \*

When in tracking mode both channels behave as one channel. If inverse tracking is selected, both channel still behave as one channel except that the output of channel 2 is inverted.



Channels can be linked in tracking or coupled modes \*



Channels phase can be controlled to a resolution of 0.001° \*  
(CH2 display is reversed for ease of identification)

## EXTENSIVE DIGITAL & ANALOG MODULATIONS

A large set of modulation types are built-in including AM, FM, PM, FSK, ASK, BPSK, PWM and SUM.

All standard and arbitrary waveforms can be modulated as the carrier, although Noise, Pulse and PRBS are limited to AM and SUM modulations plus PWM for Pulse.

### Internal Digital Modulations

AM, FM, PM, PWM and SUM modulations can use an internal modulation source based upon any standard or arbitrary waveform type or Noise. A very wide modulation frequency range of 1μHz to 10MHz can be used.

FSK, ASK, and BPSK use a square wave modulation signal adjustable between 2mHz and 10MHz.

### External Analog Modulation and Triggering

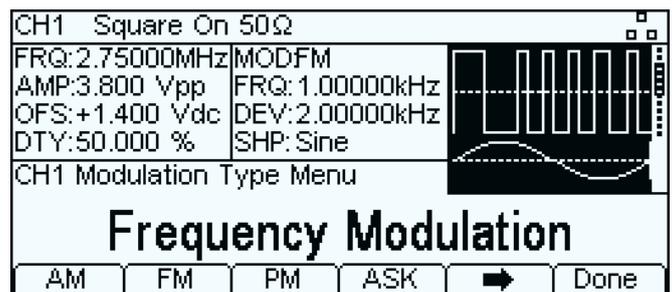
All modulation types can use an external modulation signal, either analog (AM, FM, PM, PWM and SUM) or digital triggering (FSK, ASK, and BPSK).

The analog modulation input bandwidth is DC to 5MHz.

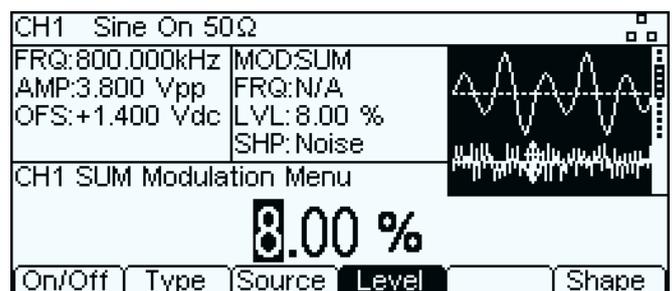
### SUM Modulation \*

SUM modulation, not offered by most other products, enables the modulation waveform to be added to the carrier at any percentage.

All waveform types including Pulse and PRBS can be SUM modulated. This is particularly useful using Noise as the modulator to test circuit resilience with noisy signals.



Extensive digital and analog modulations with unusually wide modulation bandwidths



SUM modulation generates waveforms not available through conventional modulation schemes \*

NOTE: Features marked \* are standard on the TGF3162 and optional on the TGF3082.

# TGF3000 Series - Modulations and Control

## GATE, BURST & SWEEP

Comprehensive facilities for gating, burst triggering and frequency sweeping of signals is provided.

### Trigger Signal

The trigger signal can be manual from the front panel key, internal from the internal trigger generator, external from the trigger-in socket, or remote via a bus command. It can be used for gating, triggered burst or triggered sweep.

The internal trigger generator is adjustable between 2mHz and 50MHz.

### Gating

In gated mode Waveform will run while the gate signal is true and stop while false. The start/stop phase is settable between  $-360.0^\circ$  to  $+360.0^\circ$  to  $0.001^\circ$  resolution.

### Triggered Burst

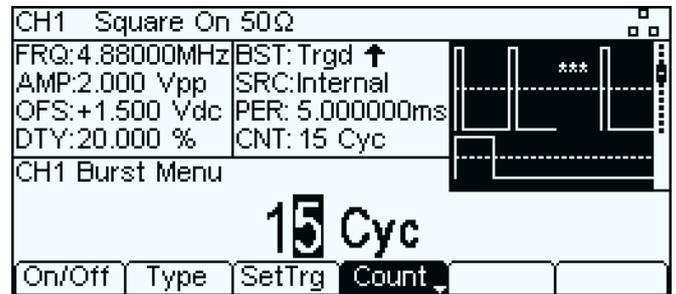
In Burst mode, each active edge of the trigger will produce one burst of the waveform.

The number of cycles in a burst can be set between 1 and 2,147,483,647 (or infinite). The burst start/end phase angle is settable between  $-360.0^\circ$  to  $+360.0^\circ$  to  $0.001^\circ$  resolution.

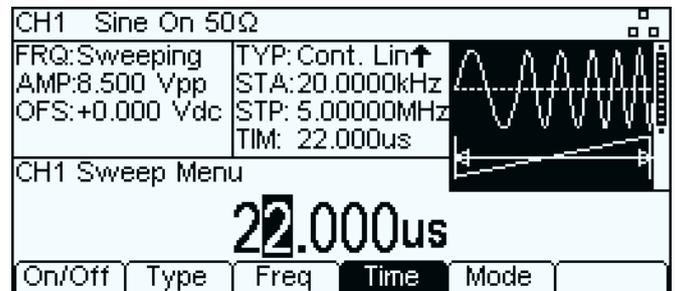
### Sweep

Phase continuous sweep is available for all standard and arbitrary waveforms except for Pulse, PRBS and Noise. The sweep range is from  $1\mu\text{Hz}$  through to the maximum for the chosen carrier waveform. Start and stop frequencies can be set independently.

The sweep can be linear or logarithmic, triggered or continuous with a period between  $1\mu\text{Hz}$  and 500s.



Waveform bursts can be internally or externally triggered



Wide range phase continuous linear or logarithmic sweep

## WAVEFORM/SETUP STORAGE

### USB Flash Drive Interface

A front mounted USB host socket enables the use of flash memory disk drives which can store up to 1,000 waveforms and 1,000 setups.

### Unlimited Waveform Storage

These drives can be used both to store waveforms permanently and to transfer waveforms from or to a PC.

Arbitrary waveform storage within the instrument is limited to four waveforms, however each flash drive can store up to 1000 waveforms which can be accessed using the instruments file handling utilities.

### Storage of Instrument Set-ups

Up to nine complete set-ups of the instrument can be stored within its own non-volatile memory. Up to 1000 further set-ups can be stored on each flash drive.

CH1 Pulse Off 50Ω			
Local: Waveforms		Disk: Waveforms	
➔ ARB-AG5	1024	➔ ARB-AG5	1024
2 NTNTEST4	100	ARB-AK1	220
3 ARB-BF2	446	ARB-BF2	446
4 BRB4	16	PTN-AA9	100
		PTN-AB4	100
Source	Copy	Delete	Done

Waveforms and set-ups can be stored on a USB Flash drive as well as within the instrument

# TGF3000 Series - Inputs/Outputs and Remote Interfaces

## FREQUENCY REFERENCE

The generators use a high quality TCXO crystal as the internal frequency reference providing 1ppm accuracy and stability.

If a higher accuracy or stability is required, an external 10MHz reference signal (from an off-air standard for example) can be applied to the Ref. Clock input.

The internal 10MHz clock is available as a rear panel output for synchronisation with external equipment.

## OTHER INPUTS

In addition to the Reference Clock input and output sockets, rear panel inputs for Modulation and Trigger are provided.

These are used both for the modulation and triggering/gating functions and for the external frequency counter function.

## SYNC OUTPUT

Channel 2 can be configured to be a Sync output for channel 1.

Sync can be chosen to perform a variety of tasks depending upon the waveform type and the application.

## MAIN OUTPUTS

The main outputs can provide up to 10V pk-pk into 50Ω (20V pk-pk EMF) for frequencies up to 50MHz.

Maximum amplitude is reduced for higher frequencies (sine and arbitrary waveforms only).

High levels of DC offset can be set in conjunction with low signal levels, and the attenuator can be fixed to prevent glitches when changing levels.

Amplitudes can be entered as peak to peak voltage plus offset or in terms of high level and low level

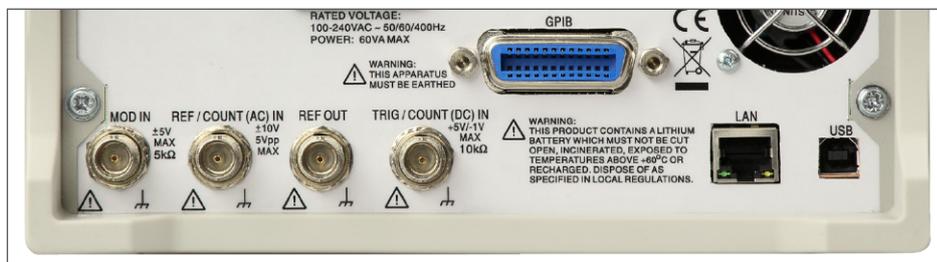
The amplitudes are shown relative to a 50Ω load impedance or as the open circuit EMF values.

Alternatively the user can enter any load value between 1Ω to 10kΩ and the amplitude will be calculated accordingly.

## FULL REMOTE CONTROL

All functions of the generators can be controlled from the digital interfaces. Arbitrary waveform data can also be loaded using these interfaces.

An IVI driver for Windows is supplied. This provides support for common applications such as LabView\*, LabWindows\* and HP-VEE\*.



## LAN (Ethernet)



The LAN interface uses a standard 10/100 base-T Ethernet hardware connection with ICMP and TCP/IP Protocol for connection to a Local Area Network or direct connection to a single PC.

This interface supports LXI and is the most appropriate for larger system use because of its scalable nature.

## LXI Compliance



The LAN interface is compliant with LXI (LAN eXtensions for Instrumentation). LXI is the next-generation, LAN-based modular architecture standard for automated test systems managed by the LXI Consortium, and is expected to become the successor to GPIB in many systems.

## USB



USB provides a simple and convenient means of connection to a PC and is particularly appropriate for small system use. USB has effectively replaced RS232 in many applications.

The interface uses a standard USB 2.0 hardware connection and is implemented as virtual-COM port. A Windows\* USB driver is provided.

As well as the rear mounted USB device interface connector, a front mounted USB Host interface connector allows USB Flash memory to be connected.

## GPIB



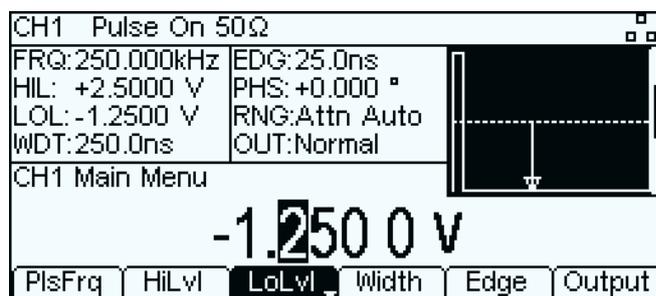
An optional GPIB (IEEE-488) interface is available. When fitted, the instruments retain the USB and LAN interfaces giving them even greater flexibility.

\* LabView and LabWindows are trademarks of National Instruments.

HP-VEE (Agilent/Keysight VEE) is a trademark of Keysight Technologies Inc.

\* USB interface is supported for all versions of Windows from 2000 onwards

Windows is a trademark of Microsoft Inc.



Output levels can be entered as high level and low level as an alternative to amplitude and offset