TGF3000 Series
Dual Channel Arbitrary Function Generators

- Frequency up to 160MHz, 15 digits or 1µHz resolution
- Arbitrary waveforms up to 16 bits at 800MS/s
- Wideband noise generator | high resolution pulse generator
- Comprehensive internal/external digital and analog modulations
- Two identical channels with phase control, coupling and tracking
- USB and LXI compliant LAN interfaces, plus optional GPIB interface

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Aim-TTi

TGF3000 Series - Key Features

Sine frequency up to 160MHz high sine purity, THD <0.05%

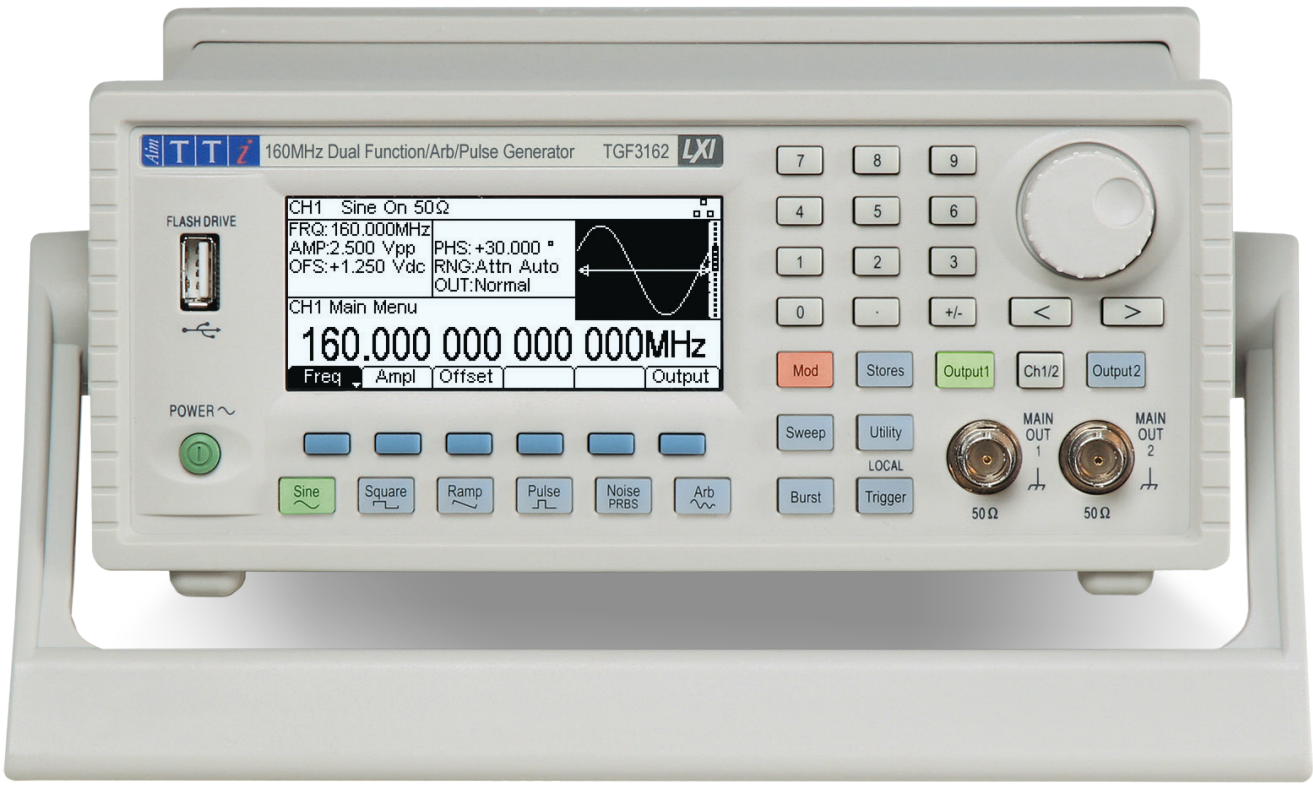
Arbitrary waveforms of 16 bits at up to 800MSa/s

Class-leading modulation set including SUM modulation

Two identical channels with phase control, coupling and tracking

High resolution pulse generator and wide bandwidth noise source

PRBS serial patterns with eight selectable sequence lengths



USB and LXI compliant LAN interfaces, plus optional GPIB.

The TGF3000 series is the latest function/arbitrary generator series from Aim-TTi offering class-leading performance and unrivalled value for money.

A frequency capability of up to 160MHz is combined with two identical full performance channels that can operate as independent generators or in coupled or tracking modes. Precise channel to channel phase control with a resolution of 0.001° is provided.

A wide range of built-in waveforms is included and custom arbitrary waveforms can be used at sample speeds up to 800MS/s and replay rates up to 80MHz. PC based arbitrary waveform generation and editing software is provided.

High resolution, low jitter pulses can be generated as can wide bandwidth white noise.

A extensive array of modulations is provided using internal and external sources. Gated, burst and sweep modes can use internal or external trigger sources.

Remote control via USB and LXI compliant LAN (standard) can be supplemented by optional GPIB if required.

LAN ETHERNET

USB UNIVERSAL SERIAL BUS

LXI LAN eXtensions for Instrumentation

GPIB IEEE-488 OPTIONAL

TGF3082 | TGF3162 - Features summary

Model Comparison	TGF3162	TGF3082
No. of channels	2	2
Max frequency (sine)	160MHz	80MHz
Vertical bits / Sample rate	16 bits / 800MS/s	14 bits / 400MS/s
Max noise bandwidth	100MHz	62.5MHz
Model specific features*		
PRBS Generator	Standard	Optional*
Harmonics Generator	Standard	Optional*
Sum Modulation	Standard	Optional*
Inter-channel coupling & tracking	Standard	Optional*

* The four features listed as model specific can be added to the TGF3082 by software unlocking. (option GU3082). Most other features and specifications are common to both models (see technical specifications section for full details).

FEATURES SUMMARY

- 0.001mHz to 80MHz (TGF3082) or 160MHz (TGF3162) sine frequency range
- High sine wave purity with low phase noise and jitter, audio band THD down to 0.05%
- Square waves up to 50MHz with variable duty cycle, edge speeds down to 5ns
- Resolution of up to 15 digits or 1µHz, high stability TCXO timebase
- Two identical channels - independent or linked with coupled and tracking modes *
- Inter-channel phase offset of -360° to +360° with 0.001° resolution
- Pulse generation with 100ps width resolution, <30ps jitter, and variable rise/fall times
- Wideband noise generator with up to 100MHz noise bandwidth
- PRBS pseudo-random bit sequence generation with 8 sequence lengths *
- Harmonics generation using up to 16 harmonics *
- Wide range of standard and arbitrary waveforms built-in
- Arbitrary waveforms of 14-bits / 400MS/s (TGF3082) or 16-bits / 800MS/s (TGF3162)
- Waveform Manager Plus for Windows editing software included
- Front USB host socket for waveform storage and file transfers using Flash drives
- Comprehensive internal/external digital and analog modulation set including Sum * modulation
- Modulation frequencies up to 10MHz internal and 5MHz external
- Gate and Burst modes with internal and external triggering
- Bi-directional linear and logarithmic sweep using internal or external triggering
- 125MHz frequency counter/timer with five measurement modes
- Compact half-rack 2U casing with protective buffers and handle
- Programmable via USB and LAN (LXI) interfaces; GPIB optional

Features marked * are standard on the TGF3162 and optional on the TGF3082 by adding GU3082

TGF3000 Series - Functions and Waveforms

HIGHER FREQUENCIES

The TGF3000 Series out-performs other generators in its price range by offering sine waves up to 160MHz and square waves up to 50MHz.

Exceptional frequency precision

The frequency of these waveforms can be set with up to 15 digits or one micro hertz of resolution.

The DDS based frequency generation system uses a high stability TCXO timebase oscillator.

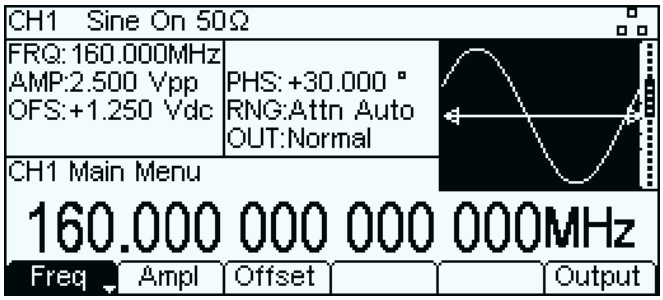
Waveform quality

The TGF3000 Series generates high purity sine waves with low harmonic distortion and low phase noise. Audio band THD is significantly better than similar generators at just 0.05%.

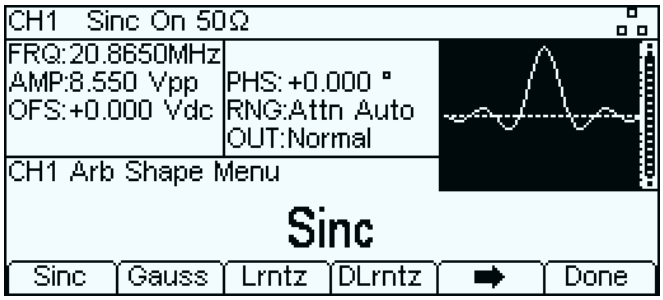
Built-in Waveforms

A large number of standard and pre-built arbitrary waveforms are built into the generator. These include triangles, ramps, sinc, logarithmics, exponentials, gaussians and cardiac (among others).

High sampling rate allows higher repetition rates than other generators.



High quality sine waves at up to 160MHx (TGF3162) or 80MHz (TFG3082)



Built-in complex waveforms supplemented by more than 100 loadable additional waveforms

CUSTOM ARBITRARY WAVEFORMS

Custom arbitrary waveforms of 16 bit vertical resolution and up to 8192 points can be defined and replayed at sampling rates up to 800MS/s and repetition rates up to 80MHz.

Waveform Editing

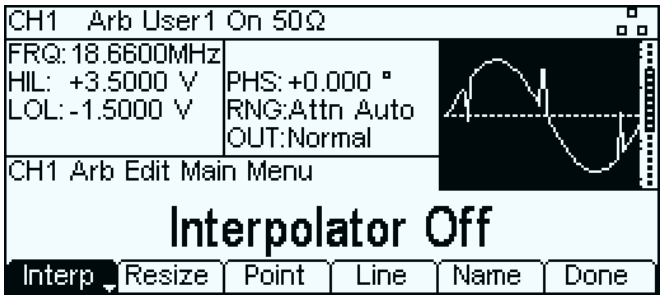
Basic waveform creation and editing is built into the generator. However for complex waveforms Waveform Manager Plus software is included.

This Windows based package enables almost any waveform shape to be created using mathematical expressions, freehand drawing, waveform libraries, and import of waveforms using the Clip Board.

Waveform Transfer and Storage

Waveforms can be be stored on Flash drives using the front panel mounted USB host interface.

Waveforms can be transferred from or to a PC either using a Flash drive, or via the digital interfaces (USB, LAN or GPIB).



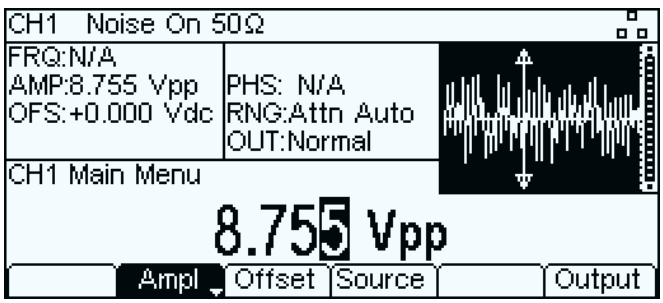
Arbitrary waveforms can be generated and edited within the instrument, but complex wave shapes are generated using the supplied PC software Waveform Manager Plus- see page 9

WIDEBAND NOISE GENERATOR

The Noise function provides wideband gaussian noise at bandwidths up to 100MHz and crest factor of more than five.

Noise can be used both as a carrier waveform and as a modulating waveform for AM, FM, PM, PWM and SUM modulation types.

As a carrier it can be AM, ASK or SUM modulated.

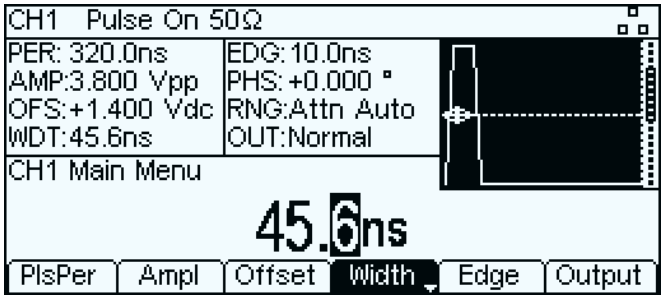


TGF3000 Series - Functions and Waveforms

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.



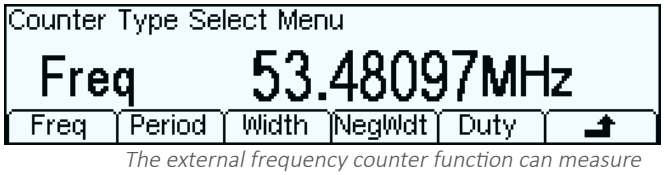
Pulse width and edge speeds cab be set to a resolution of 0.1ns (100ps)

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 is use.



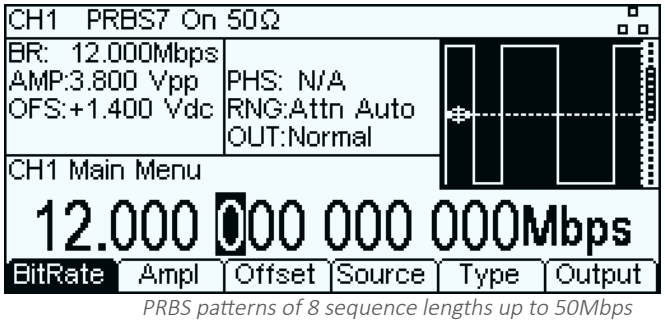
The external frequency counter function can measure period, pulse width or duty cycle

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.

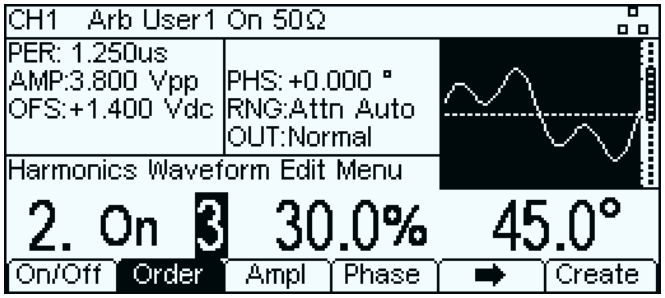


PRBS patterns of 8 sequence lengths up to 50Mbps

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 *

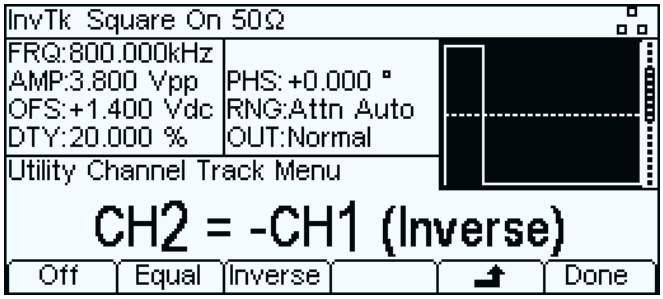
The frequencies of the two channels can be coupled such that changes on one are applied to the other.

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

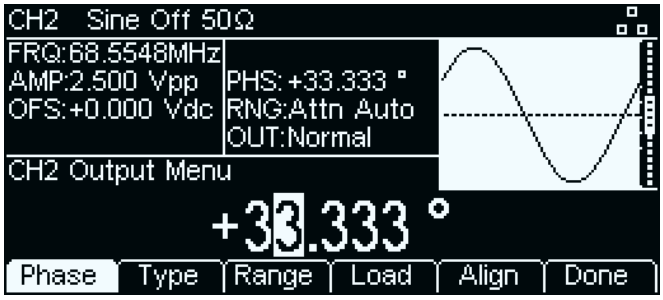
Outputs can be coupled such that the output on/off switches both channels simultaneously.

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 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

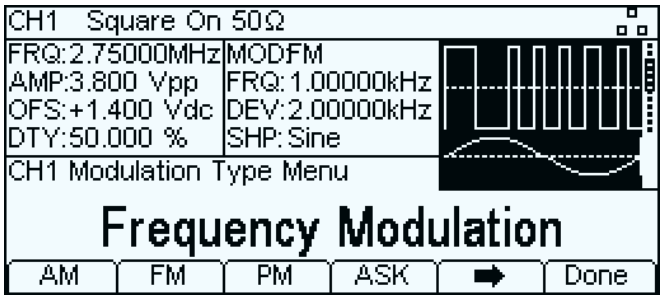
All modulation types can use an external modulation signal, either analog (AM, FM, PM, PWM and SUM) or digital triggering (FSK, ASK, and BPSK).

The analog modulation input bandwidth is DC to 5MHz.

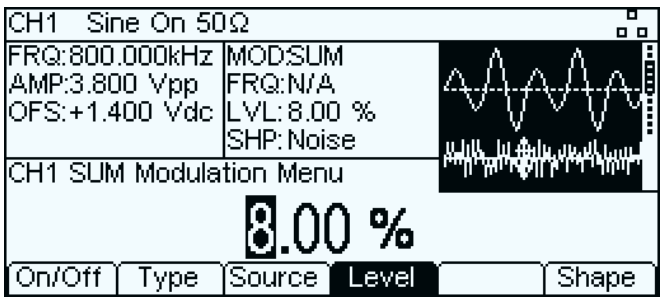
SUM Modulation *

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.*

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° to +360.0° to 0.001° resolution.

Triggered Burst

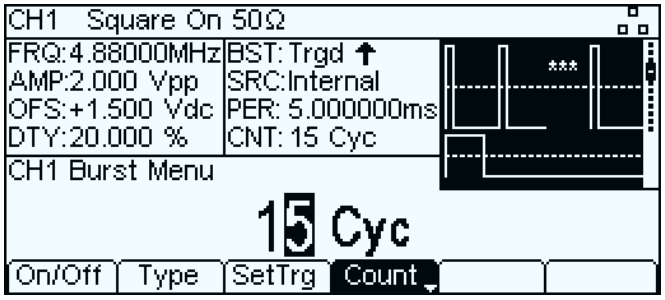
In Burst mode, each active edge of the trigger will produce one burst of the waveform.

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° to +360.0° to 0.001° resolution.

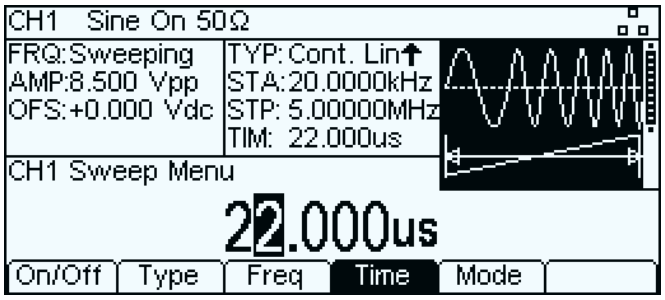
Sweep

Phase continuous sweep is available for all standard and arbitrary waveforms except for Pulse, PRBS and Noise. The sweep range is from 1µHz 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 1µHz 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.

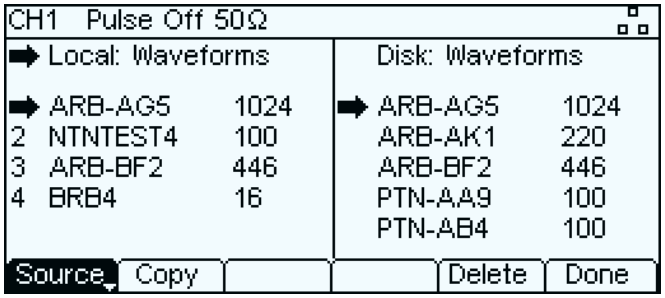
Unlimited Waveform Storage

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.



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 to perform a variety 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

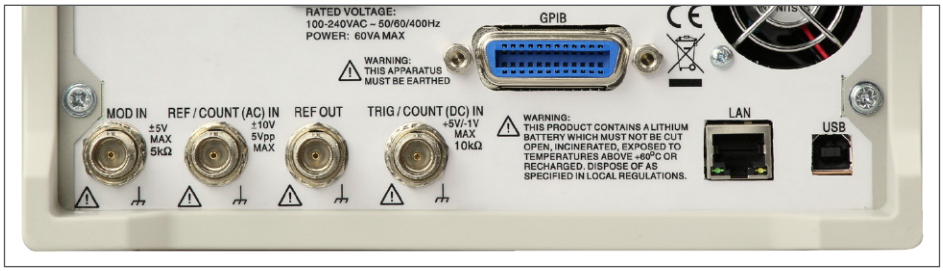
The amplitudes are shown relative to a 50Ω load impedance or as the open circuit EMF values.

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.

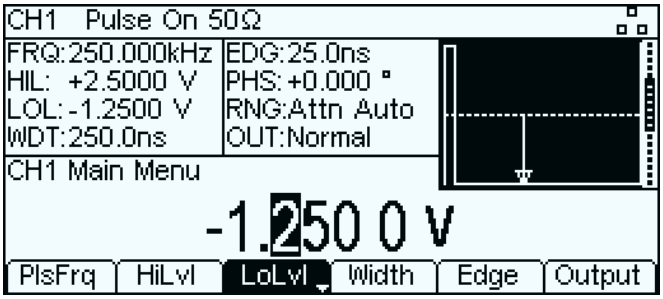
The interface uses a standard USB 2.0 hardware connection and is implemented as virtual-COM port. A Windows* USB driver is provided.

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.



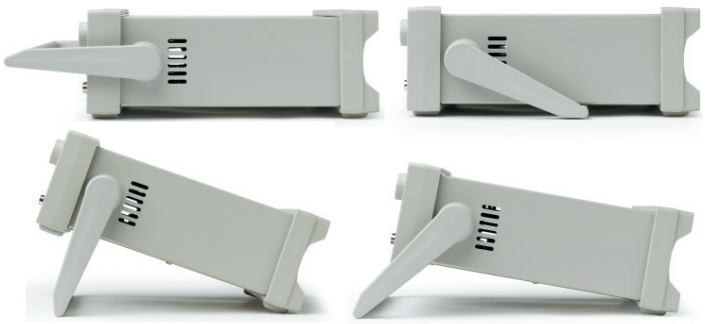
Output levels can be entered as high level and low level as an alternative to amplitude and offset

TGF3000 Series - Mechanical | Supplied Software

BENCH-TOP OPERATION

The generators are highly compact and use a minimum of bench space.

Protective mouldings guard against knock damage and a multi-position stand angles the instrument conveniently as well as providing a carry handle.

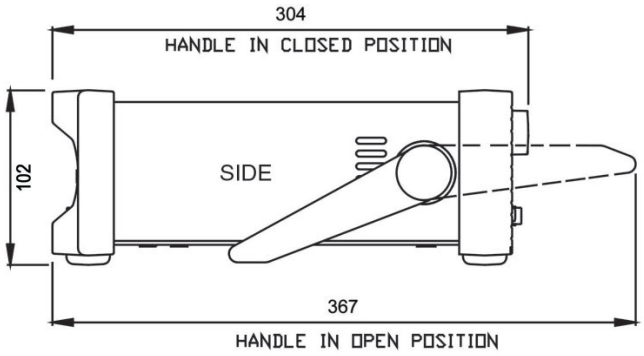


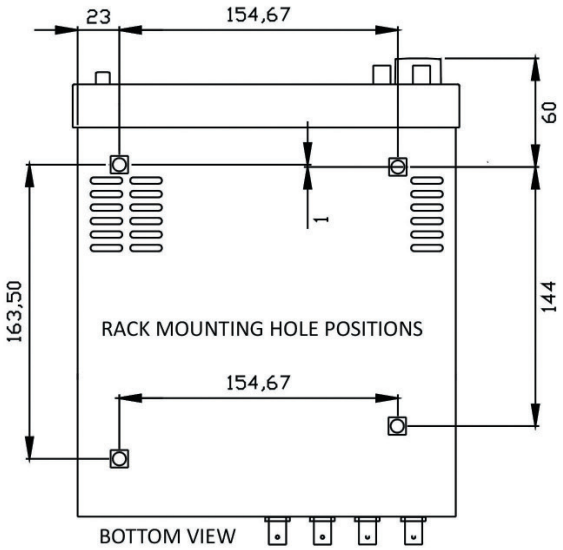
RACK MOUNTING

For system applications the generators can be rack mounted.

With the protective mouldings and handle removed the size is half rack width by 2U high.

A 2U rack mounting kit is available suitable for one or two instruments.





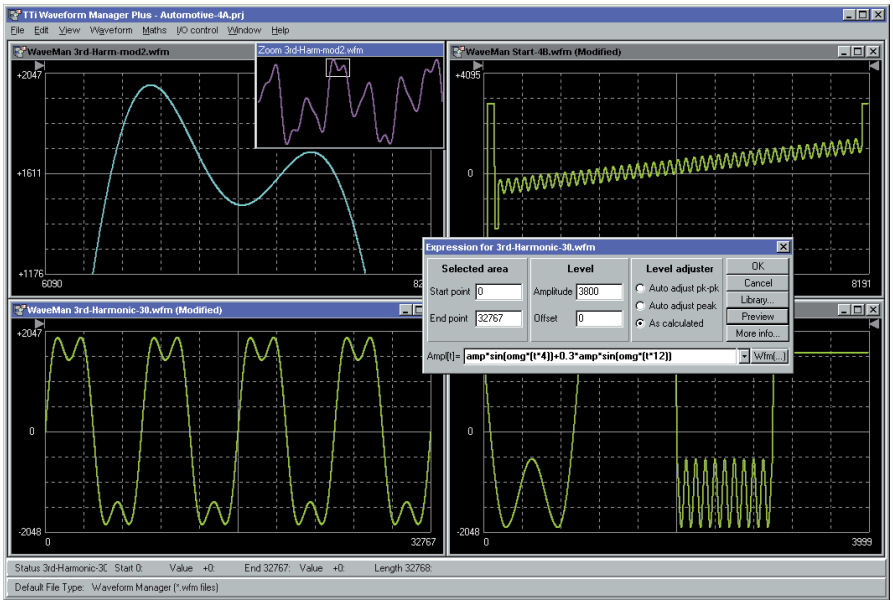
WAVEFORM SOFTWARE

Both generators are supplied with Waveform Manager Plus software for Windows.

This PC software enables complex arbitrary waveforms to be created and edited.

Waveforms can be built in any number of sections using any combination of standard waveforms, mathematical expressions, drawn waveforms, uploaded waveforms, imported waveforms and existing stored waveforms.

Waveforms can be transfered to the generator using either the Flash drive interface or the bus interfaces.



Technical Specifications - TGF3162 | TGF3082

General specifications apply for the temperature range 5°C to 40°C. Accuracy specifications apply for the temperature range 18°C to 28°C after 30 minutes warm-up, at maximum output into 50Ω. Typical specifications are determined by design and are not guaranteed. Information is subject to change without notice.

WAVEFORMS

Standard Waveforms	Sine, Square, Ramp (Variable Symmetry), Triangle (50% Ramp symmetry), Positive Ramp (100% Ramp symmetry), Negative Ramp (0% Ramp symmetry), Pulse, Noise (Gaussian), PRBS*, DC, Sin(x)/x, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Cardiac, Gaussian, Lorentz, D-Lorentz, 4 User Defined Arbitrary Waveforms.

SINE	TGF3162	TGF3082 (where different)
Frequency Range:	1µHz to 160MHz	1µHz to 80MHz
Frequency Resolution:	1µHz, 15 digits	1µHz, 14 digits
Output Level:	≤ 50MHz 10mVp-p to 10Vp-p into 50Ω ≤ 100MHz 10mVp-p to 5Vp-p into 50Ω ≤ 160MHz 10mVp-p to 2.5Vp-p into 50Ω	 ≤ 80MHz 10mVp-p to 5Vp-p into 50Ω N/A
Amplitude Flatness (1V p-p relative to 1kHz):	≤10MHz: ±0.1dB ≤100MHz: ±0.2dB ≤160MHz: ±0.6dB	 ≤80MHz: ±0.2dB N/A
Harmonic Distortion (1V p-p)	≤ 10MHz -60dBc ≤ 50MHz -50dBc ≤ 160MHz -36dBc	 ≤ 80MHz -40dBc
Total Harmonic Distortion DC to 20kHz:	<0.05% (Typical)	<0.07% (Typical)
Non-Harmonic Spurii:	-65dBc	
Phase Noise:	-113dBc/Hz (10MHz, 1V p-p, 10kHz offset)	

SQUARE	TGF3162	TGF3082 (where different)
Frequency Range:	1µHz to 50MHz	
Frequency Resolution:	1µHz, 14 digits	
Output Level:	10mVp-p to 10Vp-p into 50Ω	
Rise and Fall Times:	5ns Fixed	10ns Fixed
Aberrations (Typical):	±5% of amplitude	
Jitter (RMS):	<30ps (cycle to cycle)	

RAMP	TGF3162	TGF3082 (where different)
Frequency Range:	1µHz to 5MHz	
Frequency Resolution:	1µHz, 13 digits	
Output Level:	10mVp-p to 10Vp-p into 50Ω	
Linearity Error:	<0.1% to 200kHz	<0.1% to 100kHz
Variable Symmetry:	0.00 % to 100.00 %, 0.01% resolution	

Pulse	TGF3162	TGF3082 (where different)
Frequency Range:	1mHz to 20MHz	
Frequency Resolution:	1mHz, 11 digits	
Output Level:	10mVp-p to 10Vp-p into 50Ω	
Aberrations (Typical):	±3% of amplitude	±5% of amplitude
Jitter RMS:	<30ps (cycle to cycle)	
Rise and Fall Times: (Rise time = Fall time)	Range: 10ns to 1ms (10% to 90%) Resolution: 100ps ; Accuracy: ±500ps ±0.01% of period	
Width:	Range: 25ns to 999.999999975s Resolution: 100ps; Accuracy: ±200ps ±0.01% of period Duty: 0.01% to 99.99%, 0.01% resolution	

Arbitrary	TGF3162	TGF3082 (where different)
In built arbitrary waveforms (Sin(x)/x, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Cardiac, Gaussian, Lorentz and D-Lorentz). Up to 4 user-defined waveforms may be stored in non-volatile memory. Waveforms can be defined by downloading of waveform data via remote interfaces or from the instrument's front panel.		
Waveform Memory Size:	8192 points	
Vertical Resolution:	16 bits	14 bits
Frequency Range:	1µHz to 80MHz	1µHz to 40MHz
Frequency Resolution:	1µHz, 14 digits	
Output Level:	10mVp-p to 10Vpp into 50Ω (5Vpp max. above 50MHz)	
Sampling rate:	800MSa/s	400MSa/s
Point to Point Jitter:	1.25ns Typical	2.5ns Typical
Rise and Fall Times:	<5ns	<8ns
Effective Analogue Bandwidth (-3dB):	100MHz	62.5MHz

Technical Specifications (continued)

NOISE	TGF3162	TGF3082 (where different)
Gaussian White Noise: Noise can also be used as modulating waveform.		
Bandwidth (-3dB):	100MHz	62.5MHz
Noise crest factor (Vp/Vrms):	5.16	6.4
Output Level:	10mVp-p to 10Vpp into 50Ω	

PRBS	Standard on TGF3162	Optional on TGF3082 with GU3082
Bit Rate:	1mbps to 50Mbps, 1µbps resolution	
Sequence Length:	$2^m - 1$, where m = 7, 9, 11, 15, 20, 23, 29 or 31	
Rise and Fall Times	5ns Fixed	
Output Level:	10mVp-p to 10Vpp into 50Ω	

Harmonic Waveforms	Standard on TGF3162	Optional on TGF3082 with GU3082
Harmonic waveforms can be defined and stored in user-defined arbitrary waveform locations		
Frequency Range:	1µHz to 80MHz	1µHz to 40MHz
Frequency Resolution:	1µHz, 14 digits	
Harmonic Order:	1 to 50, Up to 16 different harmonics order can be defined	
Harmonic Amplitude:	0.0% to 100.0% of output amplitude, 0.1% resolution	
Harmonic Phase:	-360.0 to +360.0 degrees, 0.1 degree resolution	
Output Level:	10mVp-p to 10Vpp into 50Ω, (5V p-p max above 50MHz)	

Internal Frequency Reference	
Initial Setting Error:	<± 1ppm
Oscillator Ageing Rate:	<± 1ppm first year
Temperature Stability:	<1ppm over the specified temperature range

MODULATION	TGF3162	TGF3082 (where different)
AM (Amplitude Modulation) Normal & Suppressed Carrier		
Carrier Waveforms:	Sine, Square, Ramp, Pulse, Noise, Arb, PRBS* (max. carrier frequency 50MHz)	
Max. Carrier Frequency	50MHz	25MHz
Modulation Source:	Internal/External	
Internal Modulating Waveforms:	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac, User Defined Arbs, PRBS*	
Internal Modulating Frequency:	1µHz to 10MHz, 1µHz resolution	
Amplitude Depth:	0.00% to 100.00%, 0.01% resolution	
FM (Frequency Modulation)		
Carrier Waveforms:	Sine, Square, Ramp, Arb	
Modulation Source:	Internal/External	
Internal Modulating Waveforms:	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac, User Defined Arbs, PRBS*	
Internal Modulating Frequency:	1µHz to 10MHz, 1µHz resolution	
Frequency Deviation:	DC to Fmax/2, 1µHz resolution	
PM (Phase Modulation)		
Carrier Waveforms:	Sine, Square, Ramp, Arb	
Modulation Source:	Internal/External	
Internal Modulating Waveforms:	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac and User Defined Arbs, PRBS*	
Internal Modulating Frequency:	1µHz to 10MHz, 1µHz resolution	
Phase Deviation:	-360.000 to +360.000 degrees, 0.001 degree resolution	
ASK (Amplitude Shift Keying)		
Carrier Waveforms:	Sine, Square, Ramp, Pulse, Noise, Arb, PRBS* (max. carrier frequency 50MHz)	
Source:	Internal/External (via TRIG IN)	
Internal Modulation:	2mHz to 10MHz (50% duty cycle square)	
FSK (Frequency Shift Keying)		
Carrier Waveforms:	Sine, Square, Ramp, Arb	
Max. Carrier Frequency	50MHz	25MHz
Source:	Internal/External (via TRIG IN)	
Internal Modulation:	2mHz to 10MHz (50% duty cycle square)	

Technical Specifications (continued)

BPSK (Binary Phase Shift Keying)			
Carrier Waveforms:	Sine, Square, Ramp, Arb		
Modulation Source:	Internal/External (via TRIG IN)		
Internal Modulation:	2mHz to 10MHz (50% duty cycle square)		
PWM (Pulse Width Modulation)			
Carrier Waveforms:	Pulse		
Modulation Source:	Internal/External		
Internal Modulating Waveforms:	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac and User Defined Arbs, PRBS*		
Internal Modulating Frequency:	1µHz to 10MHz, 1µHz resolution		
Pulse Width Deviation:	0% to 100% of pulse width, 0.01% resolution		
SUM (Additive Modulation)			
Carrier Waveforms:	Sine, Square, Ramp, Pulse, Noise, Arb, PRBS*		
Max. Carrier Frequency	50MHz	|	25MHz
Modulation Source:	Internal/External		
Internal Modulating Waveforms:	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac, and User Defined Arbs PRBS*		
Internal Modulating Frequency:	1µHz to 10MHz, 1µHz resolution		
Ratio:	0% to 100%, 0.01% resolution		

***NOTE:** References to PRBS within the Modulations section refer only to the TGF3162 or TGF3082 with option GU3082

TRIGGERED BURST	**TGF3162**	|	**TGF3082 (where different)**
Each active edge of the trigger signal will produce one burst of the waveform.			
Carrier Waveforms:	Sine, Square, Ramp, Pulse, Noise, Arb, PRBS*		
Maximum Carrier Frequency: (subject to carrier waveform	50MHz (finite cycles), Fmax(infinite),	|	25MHz (finite cycles), Fmax(infinite)
Sine, Square, Ramp, Pulse, Arb:	A fixed number of cycles, specified as number of cycles are generated at every trigger event.		
PRBS:	A fixed number of bits, specified as number of cycles are generated at every trigger event.		
Noise:	Noise is reset to its start condition at every trigger event. Allows generating same random noise sequence.		
Number of Cycles:	1 to 2147483647 and infinite.		
Trigger Repetition Rate:	2mHz to 50MHz internal, dc to 1MHz ext.	|	2mHz to 25MHz internal, dc to 1MHz external.
Trigger Signal Source:	Internal from keyboard or trigger generator, External from TRIG IN or remote interface.		
Trigger Start/Stop Phase:	-360.000 to +360.000 degrees, 0.001 degree resolution. Phase offset cannot be set for Noise and PRBS waveforms.		

GATED	**TGF3162**		**TGF3082 (where different)**
Waveform will run while the Gate signal is true and stop while false.			
Carrier Waveforms:	Sine, Square, Ramp, Pulse, Noise, Arb, PRBS*		
Maximum Carrier Frequency: (subject to carrier waveform	50MHz (finite cycles), Fmax(infinite),	|	25MHz (finite cycles), Fmax(infinite)
Trigger Repetition Rate:	2mHz to 50MHz internal, dc to 1MHz ext.	|	2mHz to 25MHz internal, dc to 1MHz external.
Gate Signal Source:	Internal from keyboard or trigger generator, External from TRIG IN or remote interface.		
Gate Start/Stop Phase:	-360.000 to +360.000 degrees, 0.001 degree resolution. Phase offset cannot be set for Noise and PRBS waveforms.		

SWEEP		
Frequency sweep capability is provided for both standard and arbitrary waveforms.		
Carrier Waveforms:	Sine, Square, Ramp, Arb	
Sweep Mode:	Linear or logarithmic, triggered or continuous.	
Sweep Direction:	Up or Down	
Sweep Range:	From 1µHz to Fmax. Phase continuous. Independent setting of the start and stop frequency.	
Sweep Time:	1µs to 500s (9 digit resolution).	
Sweep Trigger Source:	The sweep may be free run or triggered from the following sources: Internal from keyboard or trigger generator. Externally from TRIG IN input or remote interface.	

TRIGGER GENERATOR	**TGF3162**	|	**TGF3082 (where different)**
Internal source square wave source adjustable in 10ns steps, 11 digit resolution. Each channel has its own trigger generator. Channel 1 trigger is available for external use from the MAIN OUT 2 socket when Channel 2 is configured to output Channel 1 sync waveform and sync source is set to trigger.			
Frequency/Period Range	2mHz to 50MHz / 20ns to 500s	|	2mHz to 25MHz / 40ns to 500s

Technical Specifications (continued)

FREQUENCY COUNTER/TIMER	
External signals can be measured using the TRIG IN or REF IN Sockets.	
Functions:	Frequency, Period, Positive Width, Negative Width, Duty Cycle
Frequency Range:	AC coupled 3Hz to >125MHz DC coupled 100mHz to >125MHz
Input Source:	AC coupled REF IN / COUNT (AC) IN socket DC coupled TRIG IN / COUNT (DC) IN socket
Frequency Resolutuion:	Up to 7 digits displayed
Measurement Time:	Automatic
Input Range and Sensitivity:	AC coupled 100mVpp – 5Vpp, maximum input ±10V DC coupled Threshold typically 1.2V; sensitivity 100mVpp; maximum input +5V/-1V.
Accuracy:	±1 digit ± timebase accuracy.
INTER-CHANNEL OPERATIONS	
Inter Channel Characteristics	
Relative phase:	-360.000 to 360.000 degrees, 0.001 degree resolution (Phase offset cannot be set for Noise)
Channel to channel Skew (typical):	<1ns (when performing identical operations)
Crosstalk (typical):	<-80db
Channel Tracking	Standard on TGF3162 | Optional on TGF3082 with GU3082
Independent (Off):	The channels are independent of each other.
Equal:	The two channels are identical and behave identically.
Channel Coupling	Standard on TGF3162 | Optional on TGF3082 with GU3082
Frequency coupling:	The frequencies of the two channels can be coupled. Changing the frequency of one channel changes the frequencies of both channels.
Amplitude (and DC Offset) coupling:	Amplitude (and DC offset) of the two channels can be coupled. Changing the amplitude and offset on one channel changes the amplitude and offset of both channels.
Output coupling:	Output On/Off can be coupled. Switching the output On/Off on one channel switches the output On/Off of both channels.
OUTPUTS	
MAIN OUTPUTS	
Output Impedance:	50Ω
Amplitude:	≤ 50MHz 20mV to 20Vp-p open circuit (10mV to 10Vp-p into 50Ω) ≤ 125MHz 20mV to 10Vp-p open circuit (10mV to 5Vp-p into 50Ω) ≤ 160MHz 20mV to 5Vp-p open circuit (10mV to 2.5Vp-p into 50Ω) Amplitude can be specified open circuit (hi Z) or into an assumed load of 1Ω to 10kΩ in Vp-p.
Amplitude Accuracy:	1.5% ±5mV at 1kHz into 50Ω
DC Offset Range:	≤ 50MHz ±10V. DC offset plus signal peak limited to ±10V from 50Ω. ≤ 125MHz ±5V. DC offset plus signal peak limited to ±5V from 50Ω. ≤ 160MHz ±2.5V. DC offset plus signal peak limited to ±2.5V from 50Ω.
DC Offset Accuracy:	Typically 1% ±50mV.
Resolution:	3 digits or 1mV for both Amplitude and DC Offset.
SYNC OUTPUT	
Channel 2 can be configured to output Channel 1 sync from its MAIN OUT 2 socket. Sync is a multi function output which is automatically selected to be any of the following. Alternatively, user can choose Sync to always be carrier referenced, to output the currently used trigger signal or turn it off.	
Carrier Waveform Sync:	Sine ≤ 50MHz: A square wave with 50% duty cycle at the waveform frequency. Sine >50MHz ≤ 160MHz: A sine wave at the waveform frequency. Square / Ramp / Pulse / Arbs: A square wave with 50% duty cycle at the waveform frequency. Pattern: A positive pulse which is 1 bit rate wide at the beginning of the sequence Noise: No sync associated with noise.
Modulation Sync:	AM/FM/PM/SUM/PWM: A square wave with 50% duty cycle referenced to the internal modulation waveform when modulation source is internal, or a square wave referenced to the carrier waveform when modulation source is external. No sync is associated with Noise and DC waveforms as the modulation source . FSK: A square wave referenced to the trigger rate. The sync is a TTL high when hop frequency is the output frequency and TTL low when carrier frequency is the output frequency for positive slope and vice versa for negative slope. BPSK: A square wave referenced to the trigger rate. The sync is a TTL high when the hop phase is the output phase and TTL low when carrier phase is the output phase for positive slope and vice versa for negative slope.
Sweep Sync:	A square wave that is a TTL high from the beginning of the sweep and a TTL low from the midpoint of the sweep
Burst Sync:	Internal Trigger: A square wave with 50% duty cycle at the trigger frequency. External Trigger: A square wave with same duty cycle and frequency as the external source. Manual Trigger: A positive pulse which is approximately 18us wide at the beginning of the event.
Trigger:	Selects the current trigger signal.
Output Signal Level:	Logic level nominally 3V
Output Impedance:	50Ω

Technical Specifications (continued)

REF CLOCK OUTPUT	
Buffered version of the 10MHz clock currently in use (internal or external)	
Output Level:	Nominally 3V logic level from 50Ω
INPUTS	
TRIG IN / COUNT (DC) IN	
For ASK, FSK, BPSK, triggered sweep, gated burst, triggered burst and DC coupled external frequency measurement	
Frequency Range:	DC- 1MHz for Trigger, 100mHz to >125MHz for Counter
Signal Range:	Threshold typically 1.2V; 100mVpp sensitivity; maximum input +5V /-1V.
Minimum Trigger Pulse Width:	50ns
Trigger Polarity:	Selectable as high/rising edge or low/falling edge.
Input Impedance:	10kΩ
EXTERNAL MODULATION INPUT	
For AM, FM, PM, SUM and PWM	
Voltage Range:	± 2.5V full scale
Input Impedance:	5kΩ typical
Bandwidth:	DC to 5MHz
REF IN / COUNT (AC) IN	
Input for an external 10MHz reference clock and AC coupled external frequency measurement	
Voltage Range:	100mVpp – 5Vpp
Maximum Voltage:	+5V
Minimum Voltage:	-1V
INTERFACES	
Full digital remote control facilities are available through LAN, USB and optional GPIB interfaces.	
LAN Interface	Ethernet 100/10base – T hardware connection. 1.4 LXI Core 2011
USB Interface	Standard USB 2.0 hardware connection. Implemented as virtual-COM port.
USB Flash Drive	For waveform and set-up storage/recall.
GPIB (optional)	Conforming with IEEE488.1 and IEEE488.2
GENERAL	
Display:	256 x 112 pixel monochrome graphics display. White LED backlight with adjustable brightness and contrast. Black-on-white or inverse modes.
Data Entry:	Keyboard selection of mode, waveform etc.; value entry direct by numeric keys or by rotary control.
Stored Settings:	Up to 9 complete instrument set-ups may be stored and recalled from non-volatile memory.
Size:	Bench Top: 97mm height; 250mm width; 295mm long Rack mount: 86.5mm (2U) height; 213.5mm (½-rack) width; 269mm long
Weight:	3.2kg
Power:	110-240VAC ±10% 50/60Hz; 100-120VAC ±10% 400Hz; 60VA max. Installation Category II.
Operating Range:	+5°C to 40°C, 20-80% RH.
Storage Range:	-20°C to + 60°C.
Environmental:	Indoor use at altitudes up to 2000m, Pollution Degree 2.
Options:	19 inch rack mounting kit.
Safety & EMC:	Complies with EN61010-1 & EN61326-1.
For details, request the EU Declaration of Conformity for this instrument via http://www.aimtti.com/support (serial no. needed).	
OPTIONS	
GPIB Interface TG-GPIB:	User installable GPIB (IEEE-488) interface module.
Features Upgrade GU3082	User installable software enhancement that adds Inter-channel functions, PRBS generator, Harmonics generator and Sum modulation to the TGF3082.
Rack Mount Kit RM200A:	2U high rack mount for one or two generators.

TGF3000 Series - Ordering Information

Product Reference	
TGF3162	160MHz two channel generator 110V to 240V AC input, supplied with: AC power cable appropriate to country of sale Printed quick-start manual in English, French, German, Italian and Spanish Printed full operating manual in English Waveform Manager Plus software on CD Large number of pre-built arbitrary waveform on CD IVI driver, combined LabView/LabWindows CVI driver, and USB driver on CD
TGF3082	80MHz two channel generator 110V to 240V AC input, supplied with: AC power cable appropriate to country of sale Printed quick-start manual in English, French, German, Italian and Spanish Printed full operating manual in English Waveform Manager Plus software on CD Large number of pre-built arbitrary waveform on CD IVI driver, combined LabView/LabWindows CVI driver, and USB driver on CD
TG-GPIB	User installable GPIB interface module
GU3082	User installable features upgrade for TFG3082 only
RM200A	2U high rack mount kit for one or two instruments

OTHER WAVEFORM GENERATORS FROM AIM-TTI

The TGF3000 Series is just part of an extensive range of generators from Aim-TTi ranging from simple analog function generators through to four channel true variable clock arbitrary generators. RF signal generators are also available.

Function Generators

TG300 Series	3MHz analog function generators with digital display of frequency and level
TG1006	10MHz DDS function generator with sweep, modulation and counter
TG2000 Series	10MHz/20MHz DDS function generators with full digital control

Arbitrary Function Generators

TGxx11/12A	25MHz/50MHz generators with one and two channel and extensive features

Pulse Generators

TGP110	10MHz analog pulse generator
TGP3100 Series	25MHz/50MHz digital pulse and universal generators with one or two channel and jitter free aysynchronous operation

True Arbitrary Generators

TGA1240 Series	40MHz variable clock Arbs with 1, 2 or 4 channels
TGA12100 Series	100MHz variable clock Arbs with 1, 2 or 4 channels
TGA12200 Series	(coming 2018) 2 or 4 channel true Arbs with up to 500MS/s clock rate and very extensive features

Available from:

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