Technical Specifications

Specifications apply at 18°C - 28°C after 1 hour warm-up, at maximum output into 50Ω.

FREQUENCY
All waveforms are derived from a crystal clock using Direct Digital Synthesis.
Frequency Range: 1mHz to 10MHz
Resolution: 6 digits or 1mHz
Accuracy: ±10ppm for 1 year, 18°C to 28°C
Tempco.: Typically <1ppm/oC outside of 18°C to 28°C

SINEWAVE
Range: 1mHz to 10MHz/20MHz
Resolution: 6 digits or 1mHz
Distortion: <0.9% THD to 20MHz (typically 0.1%), <45dBc to 300kHz, <65dBc to 20MHz (typically <60dBc)
Spur: Non harmonically related spur <55dBc to 1MHz, <50dBc +6dB/octave 1MHz to 20MHz

SQUAREWAVE
Range: 1mHz to 10MHz/20MHz
Resolution: 6 digits or 1mHz
Symmetry: variable 20% to 80% in 1% steps
Amplitude: ±3% ±50mV
 Rise & Fall Times: <22ns
Output Level: 5V±20V pk-pk from 50Ω or 600Ω

TRIANGLE
Range: 1mHz to 10MHz/20MHz
Resolution: 6 digits or 1mHz
Linearity error: <0.5% or 100kHz
Output Level: 5V±20V pk-pk from 50Ω or 600Ω

POSITIVE & NEGATIVE PULSE
Range: 1mHz to 10MHz/20MHz
Resolution: 6 digits or 1mHz
Symmetry: variable 20% to 80% in 1% steps
Amplitude: ±3% ±50mV
 Rise & Fall Times: <22ns
Output Level: 2.5V±10V pk-pk from 50Ω or 600Ω

MODULATION MODES
Continuous
Continuous cycles of the selected waveform are output at the selected frequency.

Gated
Non phase-coherent signal keying = output is On while gate signal is high and OFF while low.
Carrier frequency: From 0 Hz to 10MHz/20MHz
Carrier waveform: All
Trigger rep-rate: do to 100kHz external, do to 50kHz internal
Gate source: Front panel MAN TRIG key, Internal Gate Generator, TRIG/GATE input, or Remote Interface

Sweeps
Sweep waveform: All
Sweep Mode: Linear or logarithmic, single or continuous
Sweep Width: 20Hz to 10MHz/20MHz in one range. Phase continuous
Sweep Time: Independent setting of the start and stop frequency
Marker: Available from AUX output. Variable during sweep
Sweep Trigger: The sweep may be fine run or triggered from: front panel source: MAN TRIG key, TRIG/GATE input, or Remote Interface

Amplitude Modulation
Carrier frequency: 1mHz to 10MHz/20MHz
Carrier waveform: All
Modulation source: VCA IN socket

Frequency Shift Keying (FSK)
Phase coherent switching between two selected frequencies at a rate defined by the switching signal source.
Carrier frequency: 20Hz to 10MHz/20MHz
Carrier waveform: All
Switch rate: do to 1MHz (internal), do to 10MHz (external)
Switching signal source: Front panel MAN TRIG key, Internal Trigger Generator, TRIG/GATE input, or Remote Interface

Tone
The tone is output while the trigger signal is high, and stopped when the trigger signal is low. The next tone is output when the trigger signal goes high again.
Carrier waveform: All
Frequency list: Up to 16 frequencies between 1Hz and 10MHz/20MHz
Min. switching time: 3ms per tone
Switching source: Front panel MAN TRIG key, Internal Trigger Generator, TRIG/GATE input, or Remote Interface

Internal Trigger/Gate Generator
Period: 0.2ms to 999s (resolution 0.2 ms)
Waveform: Square wave (1:1 duty cycle)

MAIN OUTPUT
Output Impedance: 50Ω or 600Ω switchable
Amplitude: 5V±20V pk-pk open circuit (2.5V±10V into 50Ω or 600Ω)
Output can be specified as V-HiZ (open circuit value) or V (potential difference) in ±3% +100mV
DC Offset: ±10V from 50Ω or 600Ω. DC offset plus signal peak limited to ±10V. Accuracy ±3% ±10mV
Resolution: 3 digits for both amplitude and offset

AXIAL OUTPUT
Multi-function output user definable to be any of the following:
Waveform Sync: Output a 50% duty cycle squarewave at the main waveform frequency
Trigger Out: Outputs an edge of the current trigger signal
Sweep Sync: Outputs a trigger signal at the start of sweep (for synchronising an oscilloscope or chart recorder). Can additionally output a sweep marker.
Signal Levels: Output Impedance 50Ω nominal. Logic levels of ±0.8V and ±3V. Sweep Sync is a 3 level waveform, low at start of sweep, high at end of sweep, with a narrow 1V pulse at the marker point

EXT TRIG/GATE
Frequency Range: DC to 1MHz for FSK, DC to 100Hz for Gate, DC to 2.5kHz for Tone and Sweep
Signal Range: Nominal TTL, level threshold: maximum input ±10V
Min. Pulse Width: 100ns for Gate/FSK, 0.2ms for Sweep and Tone

VCA IN
Frequency Range: DC - 100kHz
Signal Range: 2.5V for 100% level change at maximum output
Input Impedance: Typically 10kΩ

INTERFACES (TG2000 only)
Full remote control facilities are available through the RS232 or USB interfaces.
RS232: Variable Baud rate (1200 max), 9-pin connector. As well as operating in a conventional RS232 mode the interface can be operated in addressable mode whereby up to 32 instruments can be addressed from one RS-232 port.
Standard USB hardware connection. Conforming USB 1.1

10MHz & 20MHz DDS function generators
Sweep, AM, FSK & Tone switching modes
RS-232 and USB interfaces (TG2000 only)

AIM & THURLBY THANDAR INSTRUMENTS
TG1000 & TG2000

AIM & THURLBY THANDAR INSTRUMENTS
Glebe Road, Huntingdon, Cambs. PE29 7DR United Kingdom (UK)
Designed and built in Europe by:
Thurlby Thandar Instruments Ltd.
Glebe Road, Huntingdon, Cambs. PE29 7DR United Kingdom (UK)
Tel: +44 (0)1480 451241 Fax: +44 (0)1480 450409
Email: Info@aimtti.com Web: www.aimtti.com

Thurlby Thandar Instruments Ltd. operates a policy of continuous development and reserves the right to alter specifications without prior notice.
A new price point

The TG1000/2000 breaks new ground by offering a high quality DDS function generator at a significantly lower price. DDS (direct digital synthesis) is a technique for generating waveforms digitally using a phase accumulator, a look-up table and a DAC. The accuracy and stability of the resulting waveforms is related to that of the crystal master clock. When correctly engineered, the DDS generator offers not only exceptional accuracy and stability but also high spectral purity, low phase noise and excellent frequency agility.

Total digital control

Unlike some other generators which only provide digital control of frequency, every function is digitally controlled enabling complete instrument set-ups to be stored, or full remote control to be implemented (TG2000 only).

Wide frequency and amplitude range

The TG2000 can generate waveforms between 0.001Hz and 20MHz with a resolution of six digits and a one-year accuracy better than 10ppm. The TG1000 has a 10MHz limit. Amplitude is variable between 5mV and 20V pk-pk from a source impedance of 50Ω or 600Ω.

Unlike many generators, the waveform quality remains excellent over the full amplitude range.

RS-232 and USB interfaces

The TG2000 also includes both an RS-232 interface and USB interface. These interfaces can be used for remote control of all of the instrument functions and for remotely storing instrument set-ups.

Ease of use

The TG1000 and TG2000 are particularly easy to use. All of the main information is clearly displayed on a backlit LCD with 4 rows of 20 characters. Sub menus are used for the mode settings and other complex functions.

All parameters can be entered directly from the numeric keypad. Alternatively, the parameters can be incremented or decremented using the rotary encoder for quasi-analogue control.

Frequency or period entry

The generator frequency can be set in terms of either frequency or period. Numeric entry is floating point using whatever units the operator prefers.

Flexible amplitude entry

Amplitudes can be entered in terms of peak to peak voltage, RMS voltage or dBM.

The output impedance can be set to 50Ω or 600Ω, and the amplitude can be set in terms of either the voltage into the correct termination, or the source EMF (for a high impedance load).

Quick recall of settings

Both generators provide nine memories for storing settings.

Because all parameters are controlled electronically, the memories store the full set-up of the instrument and automated test sequences are easy to set up. In addition to the nine user memories, the current state of the instrument is saved at switch off. The user can choose to have this state restored at switch on, or choose a pre-defined default set-up.

Synchronisation

The auxiliary output socket can provide any one of three different Sync. signals.

Waveform Sync is a 50% duty cycle square wave at the frequency of the main output. Sweep Sync outputs a pulse at the start of each sweep and can also output a pulse at a user defined marker frequency.

The gating source can be the front panel key, internal trigger generator, trigger input socket, or bus interface signal.

AM

External Amplitude Modulation of up to 100% is available for all waveforms via the VCA input.

FSK

Frequency Shift Keying provides phase coherent switching between two selected frequencies at a rate defined by the source.

Tone Switching

The generator can be set to switch between a number of different frequencies in response to a trigger signal. Up to 16 frequencies can be defined.

Modulation modes

Sweep

All waveforms can be swept over their full frequency range (0.2Hz minimum) at a rate variable between 50 milliseconds and more than 15 minutes. The sweep is fully phase continuous.

Sweep can be linear or logarithmic, single or continuous. Single sweeps can be triggered from the front panel, the trigger input, or the digital interfaces.

A sweep marker is provided that is adjustable whilst sweep is running. The markers can provide a visual indication of frequency points on a 'scope or chart recorder.

Gated

The Gated mode sets the output signal on or off depending on the gating signal state. The gating source can be the front panel key, internal trigger generator, trigger input socket, or bus interface signal.

AM

External Amplitude Modulation of up to 100% is available for all waveforms via the VCA input.

FSK

Frequency Shift Keying provides phase coherent switching between two selected frequencies at a rate defined by the source.

Tone Switching

The generator can be set to switch between a number of different frequencies in response to a trigger signal. Up to 16 frequencies can be defined.

See the difference!

Ultimately what matters in a function generator is the quality of the output signal. The TG1000/2000 maintains the TTI reputation for high signal quality at all frequencies and all levels.

The waveform capture opposite shows just how much difference that can make!

The 'scope display opposite was captured using a competitive DDS generator.

The lower waveform is from a TG2000.
A new price point
The TG1000/2000 breaks new ground by offering a high quality DDS function generator at a significantly lower price. DDS (direct digital synthesis) is a technique for generating waveforms digitally using a phase accumulator, a look-up table and a DAC. The accuracy and stability of the resulting waveforms is related to that of the crystal master clock. When correctly engineered, the DDS generator offers not only exceptional accuracy and stability but also high spectral purity, low phase noise and excellent frequency agility.

Total digital control
Unlike some other generators which only provide digital control of frequency, every function is digitally controlled enabling complete instrument set-ups to be stored, or full remote control to be implemented (TG2000 only).

Wide frequency and amplitude range
The TG2000 can generate waveforms between 0.001Hz and 20MHz with a resolution of six digits and a one year accuracy better than 10ppm. The TG1000 has a 10MHz limit. Amplitude is variable between 5mV and 20V pk-pk from a source impedance of 50Ω or 600Ω. Unlike many generators, the waveform quality remains excellent over the full amplitude range.

RS-232 and USB interfaces
The TG2000 also includes both an RS-232 interface and USB interface. These interfaces can be used for remote control of all of the instrument functions and for remotely storing instrument set-ups.

Ease of use
The TG1000 and TG2000 are particularly easy to use. All of the main information is clearly displayed on a backlit LCD with 4 rows of 20 characters. Sub menus are used for the modulation modes and other complex functions. All parameters can be entered directly from the numeric keypad. Alternatively most parameters can be incremented or decremented using the rotary encoder for quasi-analogue control.

Frequency or period entry
The generator frequency can be set in terms of either frequency or period. Numeric entry is floating point using whatever units the operator prefers.

Flexible amplitude entry
Amplitudes can be entered in terms of peak to peak voltage, RMS voltage or dBm. The output impedance can be set to 50Ω or 600Ω, and the amplitude can be set in terms of either the voltage into the correct termination, or the source EMF (for a high impedance load).

Quick recall of settings
Both generators provide nine memories for storing settings. Because all parameters are controlled electronically, the memories store the full set-up of the instrument and automated test sequences are easy to set up. In addition to the nine user memories, the current state of the instrument is saved at switch on, or choose a pre-defined default set-up.

Synchronisation
The auxiliary output socket can provide any one of three different Sync. signals. Waveform Sync is a 50% duty cycle square wave at the frequency of the main output. Sweep Sync outputs a pulse at the start of each sweep and can also output a pulse at a user defined marker frequency. Trigger Out provides a replica of the trigger signal which can be from the trigger input socket, the internal trigger/gate generator, the manual trigger key, or the bus interface.

See the difference!
Ultimately what matters in a function generator is the quality of the output signal. The TG1000/2000 maintains the TTI reputation for high signal quality at all frequencies and all levels. The waveform capture opposite shows just how much difference that can make! The 'scope display opposite was captured from two 5MHz square wave signals each at 60mV pk-pk level into 50Ω. The upper waveform is from a TG2000. The lower waveform is from a TG2000.

Modulation modes
Sweep
All waveforms can be swept over their full frequency range (0.2Hz minimum) at a rate variable between 50 milliseconds and more than 15 minutes. The sweep is fully phase continuous.

Gated
The Gated mode sets the output signal on or off depending on the gating signal state. The gating source can be the front panel key, internal trigger generator, trigger input socket, or bus interface signal.

FSK
Frequency Shift Keying provides phase coherent switching between two selected frequencies at a rate defined by the source. The switching source can be the front panel key, internal trigger generator, trigger input socket, or bus interface signal.

AM
External Amplitude Modulation of up to 100% is available for all waveforms via the VCA input.

Tone Switching
The generator can be set to switch between a number of different frequencies in response to a trigger signal. Up to 16 frequencies can be defined.

0.001Hz to 10MHz or 20MHz frequency range, 6 digits or 1mHz setting resolution.
1ppm stability and better than 10 ppm absolute accuracy for one year.
Sine, square, triangle, positive pulse and negative pulse waveforms.
Low distortion, high spectral purity sine waves.
Internal sweep, linear or logarithmic, full range phase continuous, adjustable marker.
Modulations modes of gated, AM, FSK and tone switching; built-in trigger generator.
5mV to 20V pk-pk output from 50Ω or 600Ω; plus multi function auxiliary output.
Storage for up to nine complete instrument set-ups in non-volatile memory.
Fully programmable via RS-232 or USB interfaces (TG2000 only).

A value-for-money 10MHz or 20MHz function generator
with the precision of Direct Digital Synthesis
and full digital control via RS-232 or USB (TG2000 only)
Technical Specifications

Specifications apply at 18° - 28°C after 1 hour warm-up, at maximum output into 50Ω.

FREQUENCY
All waveforms are derived from a crystal clock using Direct Digital Synthesis.
Frequency Range: 1mHz to 10MHz (TG1000) or 20MHz (TG2000)
Resolution: 6 digits or 1MHz
Accuracy: ±0.5% or 1mHz
Temperature: Typically ±0.5°C outside of 18°C to 28°C

WAVEFORMS
Sinewave
Range: 1mHz to 10MHz/20MHz
Resolution: 6 digits or 1MHz
Distortion: <0.3% THD to 1kHz, typically 0.1%, <0.08% to 20MHz
Sweep: Non-harmonically related sweep at 1kHz, <0.05dB/μs = 0dB/octave/1MHz to 20MHz
Output Level: 5mV to 20V pk-pk from 50Ω or 600Ω

Squarewave
Range: 1mHz to 10MHz/20MHz
Resolution: 6 digits or 1MHz
Symmetry: variable to 80% in 1% steps
Amplitude: variable from 5% of 2.5V pk-pk to 10V pk-pk
Rise & Fall Times: <2μs
Output Level: 5mV to 20V pk-pk from 50Ω or 600Ω

Triangular
Range: 1mHz to 10MHz/20MHz
Resolution: 6 digits or 1MHz
Symmetry: variable to 80% in 1% steps
Amplitude: variable from 5% of 2.5V pk-pk to 10V pk-pk
Rise & Fall Times: <2μs
Output Level: 5mV to 20V pk-pk from 50Ω or 600Ω

Trapezoidal
Range: 1mHz to 10MHz/20MHz
Resolution: 6 digits or 1MHz
Symmetry: variable to 80% in 1% steps
Amplitude: variable from 5% of 2.5V pk-pk to 10V pk-pk
Rise & Fall Times: <2μs
Output Level: 5mV to 20V pk-pk from 50Ω or 600Ω

Modulation Modes
Continuous
Continuous cycles of the selected waveform are output at the selected frequency.

Gated
Non-phase-coherent signal keying: output is On while gate signal is high and OFF while low.
Carrier frequency: 0.1Hz to 10MHz/20MHz
Carrier waveform: A
Trigger rep. rate: 1Hz to 100kHz
Gate source: Front panel MAN TRIG key, Internal Trigger Generator, TRIG/GATE input, or Remote Interface

Sweep
Carrier waveform: A
Sweep Mode: Logarithmic, linear or linear
Sweep Width: 0.1Hz to 10MHz/20MHz in one range. Phase continuous
Sweep Time: Independent setting of the start and stop frequency, 50ms to 999s (3 digit resolution)
Marker: Available from AUX output. User definable for each channel
Sweep Trigger: The sweep may be free run or triggered from: front panel MAN TRIG key, TRIG/GATE input, or Remote Interface

Amplitude Modulation
Carrier frequency: 0.1Hz to 10MHz/20MHz
Carrier waveform: A
Modulation source: VCA IN socket
Frequency Shift Keying (FSK)
Phase-coherent switching between two selected frequencies at a rate defined by the switching signal source.
Carrier frequency: 0.1Hz to 10MHz/20MHz
Carrier waveform: A
Switching: <0.5μs (internal), >0.2μs (external)
Switching signal source: Front panel MAN TRIG key, Internal Trigger Generator, TRIG/GATE input, or Remote Interface

Tone
The tone is output while the trigger signal is high, and stopped when the trigger signal is low. The next tone is output when the trigger signal goes high again.

Carrier waveform: A
Frequency list: Up to 16 frequencies between 1Hz and 10MHz/20MHz
Min. switching time: 1μs per tone
Switching source: Front panel MAN TRIG key, Internal Trigger Generator, TRIG/GATE input, or Remote Interface

Internal Trigger/Gate Generator
Period: 0.1ms to 999s (resolution 0.1μs)
Waveform: Square wave (1:1 duty cycle)

MAIN OUTPUT
Output Impedance: 50Ω or 600Ω switchable
Amplitude: 5mV to 20V pk-pk switchable (2.5Vm to 10Vpk into 50Ω/600Ω)
Output can be specified as V-HiZ (open circuit value) or V (potential difference) in positive or negative Pulse modes the amplitude range is ±2.5Vm to ±10Vpk
Accuracy: ±3% ±10mV at 1kHz into 50Ω
Flatness: ±0.2dB from 50Ω/600Ω
DC Offset: ±10V from 50Ω/600Ω
Output plus signal peak limited to ±10V. Accuracy ±3% ±10mV
Resolution: 3 digits for both amplitude and offset

Auxiliary Output
Multi-function output user definable to be any of the following:
Waveform Sync: Outputs a 50% duty cycle squarewave at the main waveform frequency
Trigger Out: Outputs a pulse of the current trigger signal
Sweep Sync: Outputs a trigger signal at the start of sweep (for synchronising an oscilloscope or chart recorder). Can additionally output a sweep marker.
Signal Levels: Output Impedance 50Ω nominal. Logic levels of 0V and 3V. Sweep Sync is a 3 level waveform, low at start of sweep, high at end of sweep, with a narrow 1V pulse at the marker point

Inputs
Ext Trig/Gate Frequency Range: DC to 1MHz for FSK; DC to 100kHz for Gate; DC to 2.5kHz for Tone and Sweep
Signal Range: Nominal TTL level threshold; maximum input ±10V
Min. Pulse Width: 200ns for Gate/FSK; 0.2ms for Sweep and Tone
Input Impedance: Typical 10kΩ

VCA In
Frequency Range: DC - 100kHz
Input Impedance: 2.5V for 100% level change at maximum output
Typical 10kΩ

Interfaces (TG2000 only)
Full-remote control facilities are available through the RS232 or USB interfaces.
RS232: Variable Baud rate (1200 max), 9-pin Connector. As well as operating in a conventional RS-232 mode the interface can be operated in addressable mode whereby up to 32 instruments can be addressed from one RS-232 connection. Standard USB hardware connection. Conforming USB 1.1
USB: USB

Display: 20 character x 4 row alphanumeric LCD
Data Entry: Keyboard selection of mode, waveform etc.; value entry driven by numeric keys or rotary control.
Stored Settings: Up to 9 complete instrument set-ups may be stored in battery-backed memory.
Size & Weight: 240 x 180 x 44mm + 2350g; 2kg (4.5lb)
Power: 100V, 110-120V or 220-240V ±10% 50/60Hz, adjustable internally. 40VA max. (see Installation Category II)
Operating Temperature: +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
Safety & EMC: Complies with EN61010-1 and EN61326

AIM & THURLBY THANDAR INSTRUMENTS
Glebe Road, Huntingdon, Cambs. PE29 7DR United Kingdom (UK)
Tel: +44 (0)1480 450409 Fax: +44 (0)1480 450405
Email: info@aimtti.com Web: www.aimtti.com

Designated and built in Europe by:
Thurlby Thandar Instruments Ltd.
Glebe Road, Huntingdon. Cambs. PE29 7DR United Kingdom (UK)
Tel: +44 (0)1480 450409 Fax: +44 (0)1480 450405
Email: info@aimtti.com Web: www.aimtti.com

10MHz & 20MHz DDS function generators
Sweep, AM, FSK & Tone switching modes
RS-232 and USB interfaces (TG2000 only)
Company name and product brands
Thurlby Thandar Instruments Ltd. (TTi) is one of Europe’s leading manufacturers of test and measurement instruments.

Products have been sold under two brand names: TTi and Aim.

In the future, however, the full product range will be branded Aim-TTi.

This changeover will be gradual and many products will continue to carry the TTi or Aim brands for some time to come.

Web Addresses (URLs)
The preferred URL for obtaining information concerning Aim-TTi products is:
www.aimtti.com (international customers)

Customers in the UK should use the URL:
www.aimtti.co.uk

Customers in the USA should use the URL:
www.aimtti.us

Note that previous URLs such as www.tti-test.com will continue to operate for the time being.

Designed and built in Europe by:

Thurlby Thandar Instruments Ltd.
Glebe Road, Huntingdon, Cambridgeshire PE29 7DR England (United Kingdom)
Tel: +44 (0)1480 412451 Fax: +44 (0)1480 450409
Email: info@aimtti.com Web: www.aimtti.com