

# Multiformat Video Test Signal Generator

## TG8000 Datasheet

The TG8000 is a precision multiformat analog and digital signal generation platform, designed for sync pulse and timecode generation in broadcasting applications and reference test signal generation in video equipment testing applications.

### Key features

- Multiformat analog and digital test signal generation
- Ideal channel configuration and performance to support reference generator needs
- Modular configurable platform
- Stay GenLock™ – Unique, robust Genlock mode provides stable synchronization signals for digital and traditional broadcast facilities

### Applications

- Sync pulse generator and test signal generator for post production and broadcast facilities
- Test signal generator for research and development
- Equipment design and maintenance

### TG8000 mainframe

The TG8000 mainframe is a modular system, accommodating up to four user-changeable generator modules and one power supply module in a full-width 1RU form factor. A total of 6<sup>1</sup> different modules are available for the TG8000, covering a wide range of interfaces and functions such as GPS/GLONASS synchronization and genlock, SD/HD/3G-SDI test signal generation, composite and analog test signal generation, and audio test signal generation.

The TG8000 mainframe has a high-precision oscillator for master operation, or for stable holdover operation when the genlock or GPS/GLONASS reference is interrupted. A 10/100/1000BASE-T Ethernet interface provides connectivity to the local network for remote operation, test pattern download, and an NTP server (when the GPS7 module is present). A General Purpose Input/Output (GPIO) interface is available to recall one of seven user-configured presets and to report system alarms. The front-panel USB port can be used to easily download user-created test patterns and system preset information, and can be used for system upgrades.

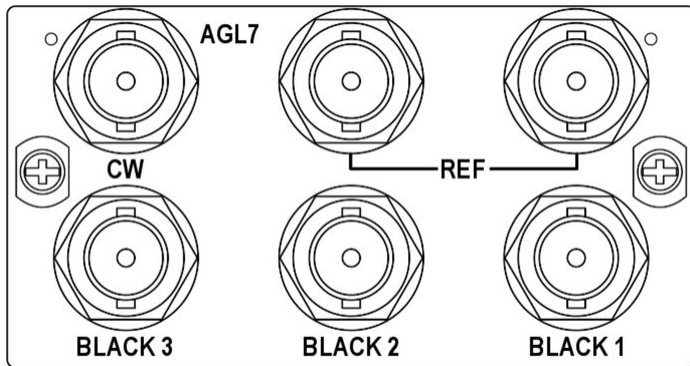


<sup>1</sup> There are 12 different modules that will operate in the TG8000 mainframe. The ATG7, AVG7, AWWG7, DVG7, HDLG7, and HDVG7 modules are no longer available but are still fully functional with the latest version of TG8000 firmware.

## AGL7 Analog Genlock Module

The AGL7 Analog Genlock Module adds the capacity to lock to a variety of signals, which makes the TG8000 an ideal solution as the master house reference or slave reference for broadcast and production/post-production applications. Three black outputs are available and are selectable for HDTV tri-level or NTSC or PAL. Additionally, the AGL7 can lock to a variety of formats to include NTSC/PAL black and HDTV tri-level as well as 1, 3.58, 4.43, 5, and 10 MHz CW.

When the AGL7 is configured for Stay GenLock™ mode, a momentary loss of synchronization at the genlock reference input will not cause a disturbance in the TG8000 test signal and black outputs. When the genlock signal is reapplied, the AGL7 will gradually reacquire lock, causing little disruption to devices synchronized to the TG8000 reference.



AGL7 Analog Genlock Module

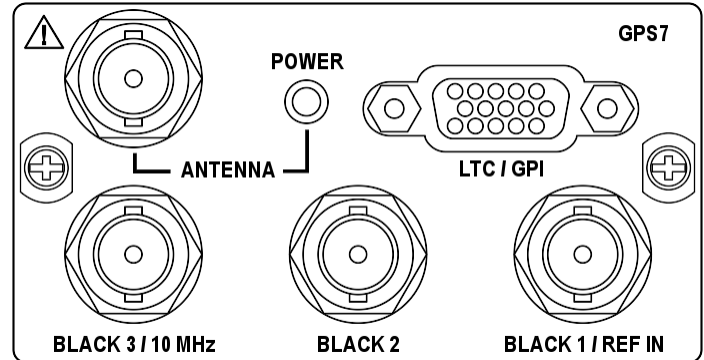
## GPS7 GPS Synchronization and Time Code Module

The GPS7 GPS Synchronization and Time Code Module includes an integrated GPS/GLONASS receiver which can serve as the system timing reference. Synchronization to the GPS and/or GLONASS timing signals ensures long-term stability, and video frame alignment between independent systems.

The GPS/GLONASS RF coaxial signal input is available with 3.3 V or 5 V DC power output for the GPS/GLONASS antenna enabling the user to select from a variety of antennas available on the market. The GPS7 also includes a genlock input with VITC reader, enabling user-selectable configuration of the TG8000 as the master reference or as a slave to another master, depending on the dynamic requirements of each production.

The GPS7 module will maintain system timing by Stay GenLock™ technology even during periods of GPS/GLONASS signal loss or genlock signal loss. Three black outputs are available and are selectable for HDTV tri-level, NTSC, or PAL. Time code source can be selectable to the time-of-day (with user-selectable offsets) from GPS/GLONASS receiver, internal source, VITC on the reference input, LTC input, or to a "program time" counter for elapsed-time time code.

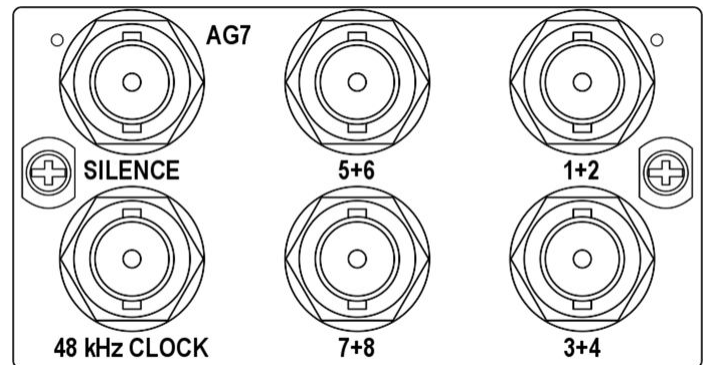
The Daylight Savings Time (DST) adjustment could be scheduled as a recurring event based on calendar rules. Time code is available as VITC on black outputs (GPS7, BG7 – hardware V1.2 or above), as Ancillary Time Code (ATC) (HD3G7, SDI7), from four independent LTC outputs (GPS7), and as a response to time requests on a Network Time Protocol (NTP version 3.0) Server.



GPS7 GPS Synchronization and Time Code Module

## AG7 Audio Generator Module

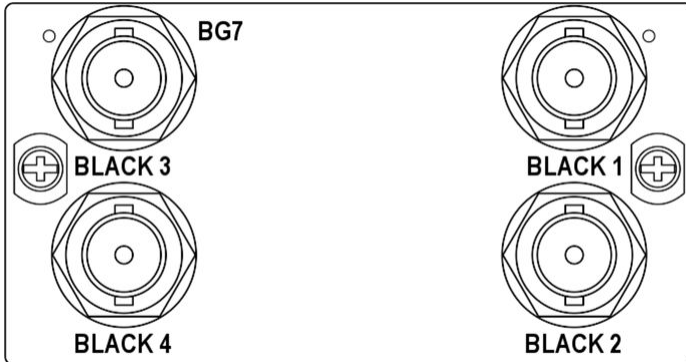
The AG7 Audio Generator Module provides eight channels (4 AES/EBU pairs) of audio signal generation. The module also provides two channels (1 AES/EBU pair) of silence as well as a 48 kHz word clock output.



AG7 Audio Generator Module

## BG7 Analog Black Generator Module

The BG7 Analog Black Generator Module provides four independently selectable outputs. The module supports NTSC and PAL black burst as well as HDTV tri-level sync. With Option CB, two of the outputs can also generate various analog NTSC and PAL color bar test signals.



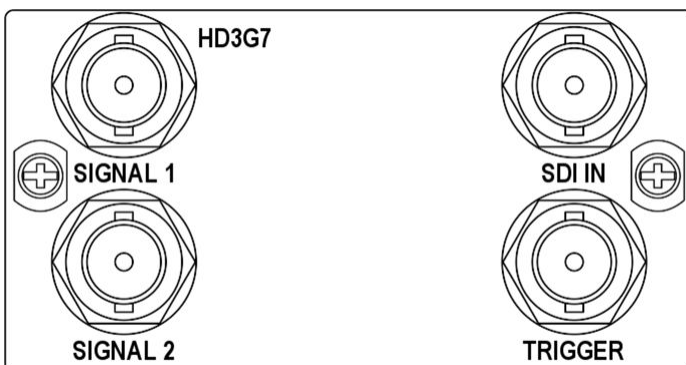
BG7 Analog Black Generator Module

## HD3G7 HD/3G-SDI Test Signal Generator Module

The HD3G7 HD/3G-SDI Test Signal Generator Module is a test signal generator that provides two outputs of a HD/3G-SDI video test signal. 720-line formats and 1080-line formats described in SMPTE standards are supported for both Level A and Level B mapping structures, including 4:4:4 and/or 12-bit sampling, Y'C'bC'r, R'G'B', or XYZ color space, and 2K digital cinema formats. The 2xSMPTE 292M HD-SDI format used by some 3D TV applications is also supported.

The HD3G7 can generate up to 32 channels of 24-bit 48 kHz embedded audio, with independently set frequency and amplitude for each channel. The HD3G7 also has the ability to generate other types of ancillary data, such as video payload identifier, ancillary time code, and user-defined packets.

The HD3G7 includes a wide variety of standard test signals, including SMPTE color bars, pathological test patterns, and a programmable moving zone plate pattern, and it also has the ability to up-convert an input 1.485 Gb/s HD-SDI signal to a 3G output. The module has a clock/frame trigger output that can be used to synchronize the output with an oscilloscope.



HD3G7 HD/3G-SDI Test Signal Generator Module

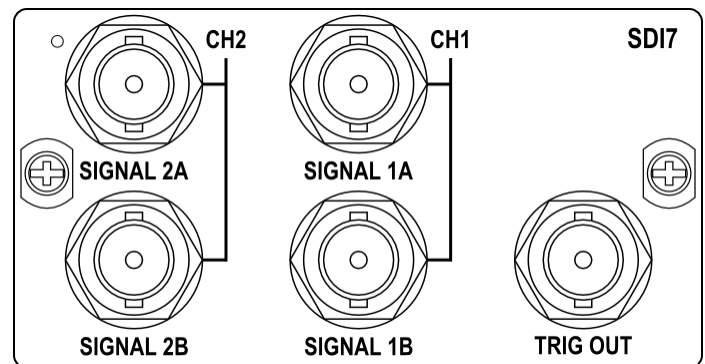
## SDI7 SD/HD/3G-SDI Test Signal Generator Module

The SDI7 SD/HD/3G-SDI Test Signal Generator Module provides two independent channels of SD/HD/3G-SDI video test signal generation in a variety of formats with separate test and test/black signal generation per channel (3G-SDI signal generation is optionally available).

The SDI7 can generate up to 32 channels of 24-bit 48 kHz embedded audio, with independently set frequency and amplitude for each channel. Option DBT extends the audio functionality by generating these test tones in Dolby E format. Various Dolby E audio frame start locations can be set to test the error handling ability of the signal processing equipment in the signal path. Embedded Dolby E metadata are also included in the Dolby E test stream. Supported Dolby E program configurations include mono, stereo, 5.1 and 7.1 surround sound audio. The SDI7 also has the ability to generate other types of ancillary data, such as video payload identifier, ancillary time code, and user-defined packets.

The SDI7 includes a wide variety of standard test signals, including SMPTE color bars, pathological test patterns, and a programmable moving zone plate pattern, and it also has the ability to generate full frame test signals created by the user. AV timing signal generation, when used in conjunction with a waveform monitor, can be used to ensure that audio and video are synchronized through a video path.

Circle, multi-language text, and color logo overlays may be applied to the generated test signals to check aspect ratio, identify streams, or apply station logos. The SDI7 has a clock/frame trigger output that can be used to trigger an oscilloscope to be synchronous with the video output.



SDI7 SD/HD/3G-SDI Test Signal Generator Module

## AGL7 Analog Genlock Module specifications

### Reference input

Input connector	BNC ×2, passive loopthrough
Input impedance	75 Ω
Input signal	NTSC/PAL black burst or HDTV tri-level sync (720p, 1080i)
Amplitude range	Standard ±6 dB
S/N ratio	>40 dB
SCH phase	0 ±40°
Return loss	≥30 dB at 5 MHz to 30 MHz
Burst lock / sync lock stability	±3 dB amplitude change: <1 ns
Jitter with burst lock	<0.5°
Jitter with sync lock	<1 ns

### CW input

Input connector	BNC ×1, internally terminated
Input impedance	75 Ω
Input signal	CW (continuous wave)
Amplitude	2 V (1 to 2.25) $V_{p-p}$
Frequency	NTSC/PAL FSC, 1/5/10 MHz
Return loss	>30 dB to 30 MHz
CW lock stability	
Over the amplitude range	<1 ns
Jitter	<1 ns (typical 1°) with CW input S/N >50 dB

## Genlock

### Genlock time adjustment

Range	Anywhere in the color frame
Resolution	<0.5° of NTSC/PAL subcarrier 1 ns with tri-level sync input

Color framing	Keeps accuracy even with $\pm 45^\circ$ SCH error of input reference input
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## Reference outputs

### Output signal

Black 1	NTSC/PAL black burst output
Black 2, 3	NTSC/PAL black burst output or tri-level HDTV sync

### Output format

	Combination of the following:
1.	NTSC/PAL black burst $\times 3$ (one black burst is independent, two black burst are distributed outputs)
2.	NTSC/PAL black burst $\times 2$ , HDTV tri-level sync $\times 1$ (all three outputs are independent)
3.	NTSC/PAL black burst $\times 1$ , HDTV tri-level sync $\times 2$ (HDTV tri-level are distributed from the same source)

Output impedance	75 $\Omega$
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Return loss	>30 dB to 30 MHz
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## NTSC/PAL black burst output

Output standards	EBU N14, SMPTE RP154 PAL-M and PAL-N are not supported
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Amplitude accuracy	Standard black burst $\pm 2\%$
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Burst frequency	NTSC/PAL FSC $\pm 1$ Hz
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SCH phase	< $\pm 5^\circ$
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### Timing adjustment

Range	Anywhere in the color frame
Resolution	<0.5° of NTSC/PAL subcarrier

## HDTV tri-level sync output

Standards	SMPTE 240M, 274M, 296M, RP211
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Formats	1080i/50 Hz, 59.94 Hz, 60 Hz 1080p/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz 1080psF/23.98 Hz, 24 Hz 720p/59.94 Hz, 60 Hz
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Amplitude accuracy	Standard HDTV tri-level $\pm 2\%$
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## HDTV tri-level sync output

### Timing adjustment

Range	Anywhere in the frame
Resolution	<1 ns

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## AG7 Audio Generator Module specifications

### Audio test signal output

Standards	ANSI S4.40 (AES3), AES3-ID
Output channels	8 channels (4 AES/EBU pairs)
Output impedance	75 $\Omega$ , unbalanced
Output connector	BNC $\times$ 4
Output amplitude	1 V $\pm$ 0.2 V
Frequency (Hz)	50, 100, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000, 1200, 1500, 1600, 2000, 2400, 3000, 3200, 4000, 4800, 5000, 6000, 8000, 9600, 10000, 12000, 15000, 16000, 20000
Level	-60 to 0 dBFS, 1 dB step
Sampling frequency	48 kHz (lock on video signal)
Quantization	Linear PCM, 20 or 24 bits (2's complement)
Transfer coding	Bi-phase mark

### Silence output

Standards	ANSI S4.40 (AES3), AES3-ID
Channel	2 channels (1 AES/EBU pair)
Output impedance	75 $\Omega$ , unbalanced
Output connector	BNC $\times$ 1
Output amplitude	1 $\pm$ 0.2 V
Frequency, level	No signal
Sampling frequency	48 kHz (lock on video signal)
Quantization	Linear PCM, 20 or 24 s (2's complement)
Transfer coding	Bi-phase mark

### Word clock output

Output connector	BNC $\times$ 1
Output level	CMOS compatible
Frequency	48 kHz

## BG7 Analog Black Generator Module specifications

### Analog signal outputs

Output connector	BNC ×4
Output impedance	75 Ω
Output formats	NTSC/PAL black burst or HDTV tri-level sync, each output independently selectable PAL-M and PAL-N are not supported With Option CB, NTSC/PAL test signals are available on outputs 3 and 4
Return loss	≥30 dB to 30 MHz
Jitter	≤1 ns

### NTSC/PAL black burst output

Output standards	EBU N14, SMPTE RP 154, RP318M-B
Time code	Optional VITC insertion (if GPS7 module is present)
Required hardware	V1.2 or above
Line	One or two lines, user selectable
Source	Time-of-day with adjustable offset, or program (elapsed) time counter
Amplitude accuracy	Standard black burst ±2%
SCH phase	< ±5°
Timing adjustment	
Range	Anywhere in the color frame
Resolution	Clock resolution 18.5 ns (1/54 μs)

### HDTV tri-level sync output

Standards	SMPTE 240M, 274M, 296M, RP211
Formats	1080i/50 Hz, 59.94 Hz, 60 Hz 1080p/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz 1080psF/23.98 Hz, 24 Hz 720p/50 Hz, 59.94 Hz, 60 Hz
Amplitude accuracy	Standard HDTV tri-level ±2%
Timing adjustment	
Range	Anywhere in the frame
Resolution	Clock resolution 13.5 ns (1/74.25 μs)



**Analog test signal (Option CB)**

<b>NTSC and NTSC no setup format</b>	100% Color Bars, 75% Color Bars, SMPTE Color Bars, 40% Flat Field, SNG Color Bars, Monitor Setup Matrix, 10 Field ID
<b>PAL format</b>	100% Color Bars, 75% Color Bars, 100% Color Bars over Red, 75% Color Bars over Red, 40% Flat Field, SNG Color Bars, 4-level Pluge, Monitor Setup Matrix
<b>Luminance amplitude accuracy</b>	$\pm 1\%$ (video at 100%)
<b>Chroma amplitude accuracy</b>	$\pm 2\%$

## GPS7 GPS Synchronization and Time Code Module specifications

### GPS/GLONASS receiver

Type	L1 frequency (GPS - 1575.42 MHz, GLONASS - 1602.00 MHz), C/A Code, 32 channels
Time accuracy	Within 150 ns to GPS/GLONASS/UTC
Acquisition time	2 minutes on boot up with warm oven, good satellite signal, and known position
Time of day	User-selectable time zone and DST offset adjustment

### GPS/GLONASS antenna input

Connector	BNC
Input impedance	50 $\Omega$ , internally terminated
DC antenna power output voltage	3.3 V or 5 V at nominal load
Fault protection	Short-circuit/open detection and protection
Return loss	8 dB at 1575 MHz

### Reference input

Input connector	BNC, terminated, shared with BLACK 1 output
Input impedance	75 $\Omega$
Input signal	NTSC/PAL black burst or HDTV tri-level sync
Amplitude range	Standard -6 dB to +8 dB
S/N ratio	>40 dB
SCH phase	0 $\pm$ 40°
Return loss	$\geq$ 30 dB at 300 kHz to 10 MHz
Burst lock / sync lock stability	$\pm$ 3 dB amplitude change: <1 ns
Jitter with burst lock	<0.5°
Jitter with sync lock	<1 ns

## Genlock

### Genlock time adjustment

<b>Range</b>	Anywhere in the color frame
<b>Resolution</b>	<0.5° of NTSC/PAL subcarrier 1 ns with tri-level sync input

**Color framing** Keeps accuracy even with  $\pm 45^\circ$  SCH error of input reference input

**Time reference** VITC reader for NTSC/PAL black burst input signal

## Analog signal outputs

**Output connector** BNC  $\times 3$

**Output impedance** 75  $\Omega$

**Output formats** NTSC/PAL black burst or HDTV tri-level sync, each output independently selectable  
PAL-M and PAL-N are not supported  
Black output 3 can be configured as a 10 MHz continuous wave output

**Return loss**  $\geq 30$  dB to 30 MHz

## Black burst output

**Output standards** EBU N14, SMPTE RP 154, RP318M-B

**Time code** Optional VITC insertion  
**Line** One or two lines, user selectable  
**Source** Time-of-day with adjustable offset, or program (elapsed) time counter

**Amplitude accuracy** Standard black burst  $\pm 2\%$

**SCH phase**  $< \pm 5^\circ$

**Timing adjustment** Each output is independent  
**Range** Anywhere in the color frame  
**Resolution** Clock resolution 18.5 ns (1/54  $\mu$ s)

## HDTV tri-level sync output

**Standards** SMPTE 240M, 274M, 296M, RP211

**Formats** 1080i/50 Hz, 59.94 Hz, 60 Hz  
1080p/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz  
1080psF/23.98 Hz, 24 Hz  
720p/59.94 Hz, 60 Hz

**Amplitude accuracy** Standard HDTV tri-level  $\pm 2\%$

### HDTV tri-level sync output

Timing adjustment	Each output is independent
Range	Anywhere in the color frame
Resolution	Clock resolution 13.5 ns (1/74.25 $\mu$ s)

### LTC input

LTC input	LTC1 can be configured as an input, a time-of-day source, or an output
Formats	23.98, 24, 25, 30 fps drop-frame as per SMPTE 12M
Timing to video	Compliant with SMPTE 12M and continues to operate over at least 90% of possible timing range
Signal voltage range	0.5 to 10 V <sub>p-p</sub> differential, 1 to 5 V <sub>p-p</sub> single ended
Noise tolerance	-30 dB SNR RMS white noise with 10 kHz BW to the p-p signal level, or -10 dB SNR for 5 MHz whitenoise
Hum tolerance	0 dB hum-to-signal ratio
Error immunity	100 consecutive frames with consistent time code must be detected for time to be considered valid
Input impedance	Nominal 600 $\Omega$ differential, 300 $\Omega$ single ended

### LTC output

Outputs	4 independent
Connector	Available through D-sub 15-pin connector; optional break-out cable to XLR connectors available
Formats	24 fps (24 Hz or 23.98 Hz), 25 fps, 30 fps, 30 fps drop-frame as per SMPTE 12M
Source	Time-of-day with adjustable offset, or program (elapsed) time counter
Output amplitude	5 V $\pm$ 10%; adjustable from 0.5 V to 5 V in 0.5 V steps

### Network time protocol

Mode	Server only, using Ethernet interface on the TG8000 mainframe
Standard	NTPv3 for IPv4, per RFC 2030

### General Purpose Interface (GPI)

Connector	Available through D-sub 15-pin connector; optional break-out cable to BNC connectors available
Outputs	Two, user-selectable to assert when GPS/GLONASS synchronization is lost, GPS/GLONASS signal falls below threshold, or elapsed time value reaches set value  In Genlock mode, user-selectable to assert on loss-of-lock or near loss-of-lock
Output level	0.5-5 V
Input	One, user-selectable to signal GPS/GLONASS reacquisition or restart timer
Input level	0.8-2.4 V

# HD3G7 HD/3G-SDI Test Signal Generator Module specifications

## Serial digital signal output

<b>Test signals</b>	100%/75%/SMPTE (EG1, EG432-1, RP219) Color Bars, 0%/50%/100% Flat field, Red/Green/Blue/Cyan/Magenta/Yellow 100% Field, Ramp, Limit Ramp, Valid Ramp, Shallow Ramp Matrix, 5/10 Step Staircase, Checkerboard, Clean Aperture, Convergence, Black-White Step Scale, Black-Dark Gray Step Scale, Pluge and Luma Reference, Production Aperture, Window, SMPTE 303M Color Reference, ChromaDuMonde, 2T Pulse and Bar, Color Pulses, Equalizer Test, PLL Test, SDI Matrix, Co-siting Pulse, Parametric Moving Zone Plate  (More test signals are available on the TG8000 SW Library and Documentation DVD.)
<b>HD-SDI converter</b>	Input 1080 line HD-SDI signal up-converted to output 3G-SDI signal
<b>Standards</b>	SMPTE 12M-2, 272M, 274M, 291M, 292M, 296M, 299M, 352M, 424M, 425M-AB
<b>Bit rate</b>	2.97 Gb/s, 2.97/1.001 Gb/s, 1.485 Gb/s, 1.485/1.001 Gb/s
<b>Output formats</b>	720p/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz, 50 Hz, 59.94 Hz, 60 Hz 1080i/50 Hz, 59.94 Hz, 60 Hz 1080p/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz, 50 Hz, 59.94 Hz, 60 Hz 1080psF/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz 2048×1080p/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz 2048×1080psF/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz
<b>Sampling formats</b>	4:2:2 Y'C'bC'r, 4:2:2 Y'Cb'Cr'+A, 4:4:4 Y'Cb'Cr', 4:4:4 Y'Cb'Cr'+A, 4:4:4 G'B'R', 4:4:4 G'B'R'+A, 4:4:4 X'Y'Z'
<b>Word size</b>	10 or 12 bits
<b>3G-SDI mapping formats</b>	Level A, Level B, 2x HD in Level B
<b>Alpha channel</b>	Same as Y/G channel or Flat Field (0% to 100% in 10% steps)
<b>Payload identifier</b>	Per SMPTE 352M
<b>Time code</b>	Optional ATC-LTC and/or ATC-VITC insertion
<b>Source</b>	Time-of-day with adjustable offset (if GPS7 module is present), or program (elapsed) time counter
<b>Ancillary data</b>	User programmable
<b>Content</b>	DID, SDID, DC, UDW (255), CS. Automatically calculate checksum and/or parity, or manual override
<b>Location</b>	Line number, sample offset, luma/chroma channel, virtual link
<b>Mode</b>	Continuous insertion or single packet
<b>Output impedance</b>	75 Ω
<b>Output amplitude</b>	800 mV <sub>p-p</sub> ±3%
<b>Overshoot</b>	≤5% (typical)
<b>Rise/fall time</b>	≤135 ps (20-80%)

**Serial digital signal output**

DC offset (AC coupling)	0 V $\pm$ 0.5 V (typical)
Jitter	$\leq$ 67 ps (typical) (3 Gb, alignment) $\leq$ 80 ps (typical) (3 Gb, timing)
Timing adjustment	
Range	Anywhere in the frame
Resolution	One clock cycle at the Y, G, or X pixel rate
Return loss	$\geq$ 15 dB from 5 MHz to 2.5 GHz $\geq$ 10 dB from 2.5 GHz to 3 GHz

**Embedded audio signal**

Active channels	1-32 channels
Sample frequency	48 kHz
Digital coding	24 bits
Signal alignment	Asynchronous and Synchronous (no frame #), Synchronous (frame #)
Audio tone	10.0 Hz to 20000.0 Hz, 0.5 Hz resolution
Level	-60 to 0 dBFS, 1 dB steps

**Trigger output**

Output format	148.5 MHz clock, frame pulse, or line pulse
Output impedance	50 $\Omega$
Output amplitude	720 mV <sub>p-p</sub> $\pm$ 10%
Return loss	$\geq$ 15 dB from 10 MHz to 300 MHz

# SDI7 SD/HD/3G-SDI Test Signal Generator Module specifications

## Serial digital signal output

<b>Test signals</b>	100%/75%/SMPTE (EG1, EG432-1, RP219) Color Bars, 0%/50%/100% Flat field, Red/Green/Blue/Cyan/Magenta/Yellow 100% Field, Ramp, Limit Ramp, Valid Ramp, Shallow Ramp Matrix, 5/10 Step Staircase, Multiburst, Checkerboard, Clean Aperture, Convergence, Black-White Step Scale, Black-Dark Gray Step Scale, Pluge and Luma Reference, Production Aperture, Window, SMPTE 303M Color Reference, ChromaDuMonde, 2T Pulse and Bar, Color Pulses, Equalizer Test, PLL Test, SDI Matrix, Co-siting Pulse, Parametric Moving Zone Plate  (More test signals are available on the TG8000 SW Library and Documentation DVD.)
<b>Standards</b>	SMPTE 12M-2, 259M, 272M, 274M, 291M, 292M, 296M, 299M, 352M, 424M, 425M-AB
<b>Bit rate</b>	2.97 Gb/s, 2.97/1.001 Gb/s, 1.485 Gb/s, 1.485/1.001 Gb/s, 270 Mb/s
<b>Output formats</b>	525i/59.94 Hz 625i/50 Hz 720p/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz, 50 Hz, 59.94 Hz, 60 Hz 1080i/50 Hz, 59.94 Hz, 60 Hz 1080p/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz, 50 Hz, 59.94 Hz, 60 Hz 1080psF/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz 2048×1080p/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz 2048×1080psF/23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, 30 Hz
<b>Sampling formats</b>	4:2:2 Y'C'bC'r, 4:2:2 Y'Cb'Cr'+A, 4:4:4 Y'Cb'Cr', 4:4:4 Y'Cb'Cr'+A, 4:4:4 G'B'R', 4:4:4 G'B'R'+A, 4:4:4 X'Y'Z'
<b>Word size</b>	10 or 12 bits
<b>3G-SDI mapping formats</b>	Level A, Level B, 2x HD in Level B
<b>Alpha channel</b>	Same as Y/G channel or Flat Field (0% to 100% in 10% steps)
<b>Payload identifier</b>	Per SMPTE 352M
<b>Time code</b>	Optional ATC-LTC and/or ATC-VITC insertion
<b>Source</b>	Time-of-day with adjustable offset (if GPS7 module is present), or program (elapsed) time counter
<b>Ancillary data</b>	User programmable
<b>Content</b>	DID, SDID, DC, UDW (255), CS. Automatically calculate checksum and/or parity, or manual override
<b>Location</b>	Line number, sample offset, luma/chroma channel, virtual link
<b>Mode</b>	Continuous insertion or single packet
<b>Full frame picture</b>	Up to 1920×1080 (.bmp file)
<b>Logo</b>	Up to 1920×1080 (.bmp file)
<b>Text</b>	A preinstalled TrueType font is provided for Latin, Greek, and Cyrillic characters; users may provide their own TrueType font to support other characters
<b>Output impedance</b>	75 Ω

**Serial digital signal output**

<b>Output amplitude</b>	800 mV <sub>p-p</sub> ±3%
<b>Overshoot</b>	≤1% (typical)
<b>Rise/fall time</b>	
<b>HD, 3G</b>	≤70 ps (typical) (20-80%)
<b>SD</b>	≤700 ps (typical) (20-80%)
<b>DC offset (AC coupling)</b>	0 V ±0.5 V (typical)
<b>Jitter</b>	
<b>HD, 3G</b>	≤50 ps (typical) (alignment) ≤80 ps (typical) (timing)
<b>SD</b>	≤200 ps (typical) (alignment) ≤200 ps (typical) (timing)
<b>Timing adjustment</b>	
<b>Range</b>	Anywhere in the frame
<b>Resolution</b>	One clock cycle at the Y, G, or X pixel rate
<b>Return loss</b>	≥15 dB from 5 MHz to 2.5 GHz (typical) ≥10 dB from 2.5 GHz to 3 GHz (typical)

**Embedded audio signal**

<b>Active channels</b>	32 channels (3G-B) 16 channels (SD, HD, 3G-A)
<b>Sample frequency</b>	48 kHz
<b>Digital coding</b>	24 bits (HD, 3G) 20 bits (SD)
<b>Signal alignment</b>	Asynchronous and Synchronous (no frame #) Synchronous (frame #)
<b>Audio tone</b>	10.0 Hz to 20000.0 Hz, 0.5 Hz resolution
<b>Level</b>	-60 to 0 dBFS, 1 dB steps

**Trigger output**

<b>Output formats</b>	System Clock, Pixel Clock, Line Rate Pulse, Field/Frame Rate Pulse
<b>Output impedance</b>	50 Ω
<b>Output amplitude</b>	520 mV <sub>p-p</sub> ±10%
<b>Return loss</b>	≥15 dB from 10 MHz to 300 MHz (typical)



## TG8000 mainframe specifications

### Mainframe

<b>Frequency accuracy</b>	
<b>Internal mode</b>	$\pm 110 \times 10^{-9}$ over 1-year calibration interval Typically $\pm 10 \times 10^{-9}$ just after adjustment
<b>Over temperature</b>	$\pm 2 \times 10^{-9}$ for $\pm 5$ °C variation $\pm 10 \times 10^{-9}$ for 0 to 50 °C
<b>Frequency drift</b>	$< \pm 100 \times 10^{-9}$ per year for internal and stay current frequency / stay genlock modes at constant temperature
<b>Genlock range</b>	$\pm 50 \times 10^{-6}$
<b>Number of slots for modules</b>	4
<b>Power supply slot</b>	1
<b>Communication</b>	USB 2.0 on front panel 1000/100/10BASE-T on power supply module GPIO interface for preset recall input, alarm output on power supply module

### Physical characteristics

<b>Dimensions</b>	
<b>Height</b>	44 mm (1.7 in.)
<b>Width</b>	483 mm (19 in.)
<b>Length</b>	559 mm (21.5 in.)
<b>Weight (net)</b>	6 kg (13 lb.)

### Environmental

<b>Power consumption</b>	135 W (max)
<b>Temperature</b>	0 to +50 °C
<b>Altitude</b>	4500 m (15,000 ft.)
<b>Source voltage</b>	100 to 240 V, 50/60 Hz

## Ordering information

### Models

#### TG8000

#### Multiformat Video Generator

(mainframe; up to four modules can be installed in the mainframe at a time)

#### Standard accessories:

- TG8000 User Manual (part number 071-3036-XX)
- TG8000 SW Library and Documentation CD (part number 063-4440-XX)
- Rackmount Rails Kit (part number 351-1137-XX)
- Rackmount Slides and Rails Kit Instructions (part number 071-2746-XX)

#### Module installation limitations:

- Only one AGL7 or GPS7 module may be installed in one TG8000 mainframe.
- No more than two HDVG7, HD3G7, or AWWG7 modules, in any combination, may be installed in one TG8000 mainframe. <sup>2</sup>

#### AGL7

Analog Genlock Module

#### AG7

Audio Generator Module

#### BG7

Analog Black Generator Module

**Option CB:** Add NTSC/PAL color bar. Option must be added at time of order; option cannot be added later.

#### GPS7

GPS Synchronization and Time Code Module. Includes a GPS/GLONASS capable receiver.

#### HD3G7

HD/3G-SDI Test Signal Generator Module

#### SDI7

SD/HD/3G-SDI Test Signal Generator Module

**Option 3G:** Add 3G-SDI support.

**Option DBT:** Add embedded Dolby E audio test signal generation capability.

#### SPG8000ANT

GPS/GLONASS rooftop antenna (5.0 VDC, 1588 MHz range signals, F connector) for receiving GPS and/or GLONASS satellite signals. The antenna works with the integrated internal GPS/GLONASS receiver of a GPS7 GPS Synchronization and Time Code Module.

<sup>2</sup> The AWWG7 and HDVG7 modules are no longer available but are still fully functional with the latest version of TG8000 firmware.

## Instrument options

### Power plug options

All power cords include a lock mechanism except as otherwise noted.

<b>Opt. A0</b>	North America power plug (115 V, 60 Hz)
<b>Opt. A1</b>	Universal Euro power plug (220 V, 50 Hz)
<b>Opt. A2</b>	United Kingdom power plug (240 V, 50 Hz)
<b>Opt. A3</b>	Australia power plug (240 V, 50 Hz)
<b>Opt. A5</b>	Switzerland power plug (220 V, 50 Hz)
<b>Opt. A6</b>	Japan power plug (100 V, 50/60 Hz)
<b>Opt. A10</b>	China power plug (50 Hz)
<b>Opt. 11</b>	India power plug (50 Hz) – No lock mechanism
<b>Opt. 12</b>	Brazil power plug (60 Hz) – No lock mechanism
<b>Opt. A99</b>	No power cord

### Service options

There are many service and repair options, and several lengths of service, available for this product. Contact Telestream for details.

### TG8UP field upgrades

Field upgrades for the TG8000 generator.

<b>Opt. PW</b>	Replacement power supply module for the TG8000 mainframe
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<sup>3</sup> Applies to mainframe and all modules.

## SDI7UP field upgrades

Field upgrades for the SDI7 module.

**Opt. 3G** Add 3G-SDI support.

**Opt. DBT** Add embedded Dolby E audio test signal generation capability.

## Optional accessories

**Blank panel for empty module slot** Order part number 614-1051-XX

**DSUB-to-XLR adapter cable for the GPS7 module** Order part number 012-1717-XX

## Warranty

1 year parts and labor.



**For Further Information.** Telestream maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit [www.telestream.net/video](http://www.telestream.net/video) for sales and support contacts.

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