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Multiformat Generator

▶ TG2000

The TG2000 is a multiformat, analog and digital, precision signal generation platform. Designed for the most demanding test applications, the TG2000 provides reference quality test signals, stressing functions in both the analog and digital domains and the flexibility to address user-defined testing requirements. Comprehensive test signal libraries are supplied in all formats and are supplemented by a Windows-based test signal development program. The modular architecture, RAM-based test signal generators, and programmable system clocks ensure the TG2000 will meet future needs as well as today's requirements.

AVG1 Analog Video Generator

The AVG1 is a high accuracy, multiformat analog test signal generator. The AVG1 supports NTSC, PAL, PAL-D, PAL-M, PAL-N, SECAM, RGB, YC, and Y, B-Y, R-Y. Signal generation architecture is 12-Bit, 27 MHz component with digital modulation for composite signals. This ensures high accuracy, distortion free signals within a 6 MHz video bandwidth and signals suitable for many applications up to 8 MHz.

DVG1 Digital Video Generator

The DVG1 is a multiformat digital test signal generator. The DVG1 supports NTSC composite and 525 and 625 component digital sampled at 13.5 and 18 MHz. Parallel and serial outputs are provided.

Full field and active picture CRC generation is supported on the serial digital outputs and may be turned on and off from the front panel. Up to 16 channels of 20-Bit audio sampled at 48 kHz and locked to the video sampling clock may be embedded on the serial digital video output. Frequency and level for each channel may be set from the front panel.

AWVG1 Analog Wideband Video Generator

The AWVG1 is a 30 MHz bandwidth test signal generator intended primarily for generation of wide band frequency and transient response test signals. The AWVG1 can be used as a source of tri-level sync. Signal generation is 12 Bits with 72 MHz sampling that ensures very low distortion T pulse generation for bandwidths up to 6 MHz. A fully programmable zone plate generator is included. AWVG1 output is analog composite.

▶ Features & Benefits

- Multiformat Analog and Digital Test Signal Generation
- Reference Generator Performance Level
- Conforms to Analog and Digital, Video and Audio Industry Standards
- Modular Expandable Platform
- Designed for the Requirements of Today and the Future
- Fully Supports VM700T Video Measurement Routines
- RAM-based Test Signal Generators with Nonvolatile Storage
- Test Signal Libraries for All Formats
- Variable Analog and Digital Video Parameters

▶ Applications

- Research and Development
- Studio Reference Generator
- Manufacturing Test
- Equipment Design Maintenance
- Post-production and Broadcast Facilities
- Automated Manufacturing Test

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HDVG1 Digital HDTV Generator

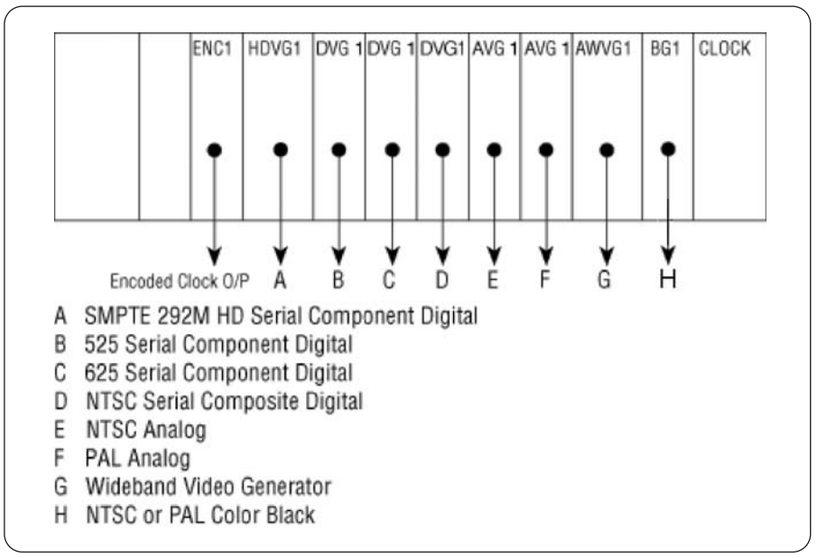
The HDVG1 is a high-accuracy, multiformat, high-definition test signal module that provides three 1.485 Gbps serial digital video test signal outputs in 1080i/60, 59.94, 1080p/25, and 24 Hz rates and 720p formats in 60 and 59.94 field rates. It is programmable with the included SDP2000 PC-based signal development software.

HDST1 Stress Test Module

The HDST1 is a HD-SDI Stress Test module that supports stress test capability for 1.485 and 1.485/1,001 Gbps HD-SDI signals. The HDST1 takes in a single HD-SDI signal and outputs a stressed HD-SDI signal. HD signals from test signal generators (including the HDVG1 module), as well as from HD cameras, VTRs, or switchers, can be used as the input signal. Signal stressing options include jitter (amplitude or frequency), amplitude, duty cycle, and random error insertion. The HDVG1 is recommended as a signal source, since it is capable of providing a signal with low residual jitter, as well as the ability to incorporate its frequency offset stress feature.

SDP2000 Signal Development Program

The SDP2000 is a Windows-based software program that provides facilities to edit signals in the factory-supplied test signal libraries and to create new signals for special applications. Line and frame editing functions permit fast, easy changes to full field test signals and composition of multi-segment matrix signals for automated testing applications. Modified and new signals may be named and stored in the factory test signal libraries or in new user-created libraries.



▶ *TG2000 configured to supply signals in several formats simultaneously.*

Internal and External Reference Operation

The TG2000 has a high stability internal reference making it suitable as the master house reference for most broadcast and production/post-production applications. A black burst output, selectable for NTSC or PAL, is provided with the TG2000 mainframe.

Remote Control

The TG2000 provides a versatile and comprehensive remote control system. All front panel functions and controls are available via the RS-232 and optional GPIB ports. A subset of those functions is available via ground closure control.

▶ Characteristics

TG2000 Mainframe

Black Burst Output –
Standards Conformance: EBU N14, SMPTE RP154.
Frequency:
NTSC or PAL F_{SC}.
Long-term Stability: ≤1 ppm per year drift.

AVG1 Analog Video Generator

Standards Conformance – EBU N10, ITU-R BT.624, SMPTE 170M.

Frequency Response – Within 0.5% to 6 MHz. Typically within 5% to 8 MHz.

Differential Gain Error – ≤0.1%.

Differential Phase Error – ≤0.1°*1.

S/N Ratio – ≥67 dB unweighted to 6 MHz, measured on a quiet line.

SCH Phase Error – ≤2°*1.

DVG1 Digital Video Generator

Standards Conformance – EBU Tech. 3267: ITU-R BT.601, BT.656, BT.801; SMPTE 125M, 244M, 259M, 267M, 272M, RP 165, RP 178.

Maximum Clock Frequency – 36 MHz.

Resolution – 8- or 10-Bit.

Serial Output –
Amplitude: 800 mV ±10% into 75 Ω.
Overshoot: ≤10%.
Rise and Fall times: 0.4 to 1.5 ns.
Jitter: ≤0.2 UI_{p-p} total for all jitter frequencies above 10 Hz.

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Embedded Audio –
Number of Channels: 16 channels in 4 groups; 8 AES/EBU audio pairs.
Audio Tones:
Frequency: silence to 16 kHz; 28 discrete settings.
Level: 0 to –60 dBFS in 2 dB steps.
Pre-emphasis: none.

AWVG1 Analog Wideband Video Generator

Frequency Response – Within 1% to 20 MHz, 2% to 30 MHz.

Delay Errors – Group Delay: ≤3 ns to 20 MHz, ≤5 ns to 25 MHz*[1].

Pulse Distortions – Pulse Ringing: 2T: ≤0.5% peak; T: ≤1% peak.

Pulse to Bar Ratio – Unity within 0.5% for T and 2T.

S/N Ratio – ≥60 dB unweighted to 30 MHz, measured on a quiet line.

*[1] Denotes a typical performance characteristic.

HDVG1 Test Signal Generator Module

Standards Compliance – SMPTE 272M, 292M.

Electrical Characteristics (Typical) –
Connector (serial): (3) BNC.
Bit Rate: 1.485 Gbps, 1.485/1,001 Gbps.
Formats:
1080i/60 Hz, 59.94, 50, 25, and 24 Hz.
720p/60 Hz and 59.94 Hz.
Amplitude: 800 mV ±10%.
Overshoot: ≤10%.
Rise and Fall Times: ≤270 ps (20% to 80%)
DC Offset (AC coupled): 0.0 V ±0.5 V.
Jitter: ≤135 ps (alignment jitter).
Return Loss:
≤15 dB from 5 MHz to 742.5 MHz.
≤10 dB from 742.5 MHz to 1.485 GHz.

Audio Signal (Embedded) –
Channels Active: 1,2,3,4,5,6,7,8.
Audio Sampling Frequency: 48 kHz.
Sampling Alignment: Asynchronous, synchronous without frame numbers, synchronous with frame numbers.
Sample Bits: 24, 20.
For Each Channel:
Audio Amplitude: 0 to –60 dBFS in 1 dB increments.
Audio Frequency (Hz): 50, 100, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000, 1200, 1500, 1600, 2000, 2400, 3000, 3200, 4000, 4800, 6000, 8000, 9600, 12000, 16000.

HDST1 HD-SDI Stress Test Module

Input

Connector – 75 Ω BNC Connector.

Input Signal – HD-SDI signal.

Bit Rate – 1.485 Gbps, 1.485/1,001 Gbps.

Amplitude – 800 mV_{p-p} ±10%.

Standards Conformance – SMPTE 292M.

Return Loss – ≤15 dB to 742.5 MHz, ≤10 dB to 1.485 GHz.

Stress Output

Connector – 75 Ω BNC Connector.

Output Signal – HD-SDI signal.

Amplitude – 80 to 1040 mV_{p-p} ±5% (measured at 4.64 MHz Square Wave).

Amplitude Setting – 1% step.

Duty Cycle – 40% to 60%.

Rise/Fall Time – ≤270 ps (20% to 80%).

Return Loss – ≤15 dB to 1.485 GHz.

Jitter

HF Jitter

Jitter Waveform – Sine Wave.

Frequency – 0.1 Hz to 10 MHz.

Amplitude – 0.01 to 1 UI.

Amplitude Setting – 0.01 UI.

Amplitude Error –
≤0.1 UI (≤1 MHz, at 1 UI setting).
≤0.1 UI ±5% (≤5 MHz, at 1 UI setting).
≤0.1 UI ±10% (≤10 MHz, at 1 UI setting).

LF Jitter

Jitter Waveform – Sine Wave.

Frequency – 0.1 Hz to 10 kHz.

Amplitude – 0.01 to 20 UI.

Amplitude Setting – 0.01 UI.

Amplitude Error –
≤0.1 UI ±1% (≤1 kHz, at 8 UI setting).
≤0.1 UI ±5% (≤5 kHz, at 8 UI setting).
≤0.1 UI ±10% (≤10 kHz, at 8 UI setting).

Error Insertion

Error Rate – 0 to 120 Errors/second.

Error Rate Setting – 0.1 Error/second.

Cable Simulator

Connector – 75 Ω BNC Connector.

Cable Type – L-5CFB.

Return Loss – ≤15 dB to 1.485 GHz.

Length – 20 m, 100 m.

AGL1 Analog Genlock Module

Inputs – Two 75 Ω loopthrough; one 75 Ω terminating.

Loopthrough Inputs –
Input Range: ±6 dB from nominal black burst.
Return Loss: ≥40 dB to 5 MHz.
Burst Lock Stability:
Amplitude Changes: ≤1 ns change over a ±3 dB input level.
Jitter: ≤1 ns with ≥50 dB S/N ratio on a nominal amplitude reference input.
Typically ≤1º.

CW Input –
Input Range: 1 to 2.25 V_{p-p}.
Frequencies: NTSC and PAL F_{sc}; 1, 5, and 10 MHz.
Return Loss: ≥30 dB to 10 MHz.
Lock Stability:
Amplitude Changes: ≤1 ns over the valid input range.
Jitter: ≤1 ns with ≥50 dB S/N ratio for a 2 V reference input. Typically ≤0.5º.

Timing Adjustment (Black Burst Reference) –
Range: Anywhere within the color frame.
Resolution: ≤0.5º.

Color Framing – Correct for up to ±45º SCH error on the reference input.

Power Source

Mains Range –
Voltage: 87 to 132 or 174 to 250 VAC.
Frequency: 50 to 60 Hz.

Power Consumption – Typically 220 W for a fully loaded TG2000 mainframe.

Environmental

Temperature –
Operating: 0 ºC to +40 ºC.
Nonoperating: –40 ºC to +65 ºC.

Certifications

EMC –
Certified to the EMC Directive 89/336/EEC.

Safety –
Approved to: CSA1010.1, ANSI S82.01.
Complies with: EN61010-1, IEC1010-1.

Physical Characteristics

Dimensions	mm	in.
Height	133	5.23
Width	483	19.0
Depth	584	23.0
Weight	**kg**	**lbs.**
Net	17.3	38.0
Shipping	23.7	52.0

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Multiformat Generator

▶ TG2000

▶ Ordering Information

When Ordering, Please Observe These Simple Guidelines:

- ▶ At least one signal generation module must accompany each TG2000 mainframe
- ▶ Only one AGL1 Genlock Module per TG2000 mainframe
- ▶ Only one GP1 GPIB Interface Module per each TG2000 mainframe
- ▶ Signal generator modules (AVG1, DVG1) may be combined in any mix desired up to the TG2000 mainframe limit of 8. The mainframe may contain a maximum of 4 of any combination of HDVG1 and AWVG1 modules
- ▶ Only one HDST1 module per TG2000 mainframe. Additional limitations may apply, depending upon other modules loaded in a mainframe configured with an HDST1. Contact Tektronix Technical Support for details
- ▶ The performance of the TG2000 is degraded to the E4 environment for radiated emissions only when operating with a combination of HDVG1 and HDST1 in HD-SDI stress testing applications
- ▶ Add Opt. 88 to each item ordered. This will ensure your TG2000 package will come assembled and calibrated as a single unit
- ▶ Modules ordered to add to an existing TG2000 package do not require Opt. 88

TG2000

Generator Mainframe with BG1 Black Burst Generator.

AVG1

Analog Video Generator.

DVG1

Digital Video Generator.

Opt. S1 – SDI Test.

AWVG1

Analog Wideband Video Generator.

Tri-level Sync Generator.

AGL1

Analog Genlock Module.

GP1

GPIB interface.

HDVG1

High Definition Video Generator.

HDST1

HD-SDI Stress Test Module.

Support Options

Opt. C3 – Calibration Service 3 Years.

Opt. R3 – Repair Service 3 Years.

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