Master Sync / Master Clock Reference Generator
SPG8000 datasheet

The SPG8000 is a precision multiformat video signal generator, suitable for master synchronization and reference applications. It provides multiple video reference signals, such as black burst, HD tri-level sync, and serial digital and composite analog test patterns, and it provides time reference signals such as time code and NTP (Network Time Protocol).

Key features

- Multiple independent black burst and HD tri-level sync outputs provide all the video reference signals required in a video broadcast or production facility

- Four LTC outputs, VITC on black burst outputs, and NTP server provide time reference signals in a variety of formats

- GPS/GLONASS-based synchronization gives an accurate time-of-day reference and deterministic video phase reference, and locks remote SPG8000 systems to each other

- Stay GenLock® and GPS Holdover Recovery prevent synchronization shock when the external reference input or GPS/GLONASS signal is temporarily lost

- Wide selection of video test patterns in serial digital formats (SD, HD and 3G-SDI) and composite analog formats (NTSC and PAL)

- Dual hot-swappable power supplies ensure continuous availability of reference signals

- Easy to manage with Web-based interface for remote configuration and SNMP for status and alert information

Applications

- Sync pulse generator and time reference generator for broadcast, studio, mobile, and post-production facilities

- Master or slave (genlock) operation for distributed system architectures

- Video equipment verification, facility link testing, and display calibration

Master video synchronization and time reference generator

The base configuration includes three sync outputs that can be configured with independent output formats (NTSC/PAL black burst and/or HD tri-level sync) and independently adjustable timing offsets. With the BG option, four more analog outputs can be added. A high-accuracy, oven-controlled crystal oscillator provides a stable frequency reference for the system, or the pass-through genlock input can be used to lock to an external video reference or 10 MHz continuous wave signal.

The SPG8000's Stay GenLock® feature avoids "synchronization shock" if the external reference suffers a temporary disturbance, by maintaining the frequency and phase of each output signal. When the external reference is restored, Stay GenLock® ensures that any accumulated clock drift is removed by slowly adjusting the system clock within standard limits instead of "jamming" back to the correct phase.

Time reference outputs are available in multiple formats. Three independent linear time code (LTC) outputs are available, and a fourth LTC connection can be used as input or output. Each LTC output has independent frame rate selection, time source (time-of-day or program time) and time zone offset. Vertical interval time code (VITC) is available on each NTSC or PAL black output, also with independent time sources and offsets. The SPG8000 can also serve as a Network Time Protocol (NTP) server, providing the time-of-day reference to network-attached devices.
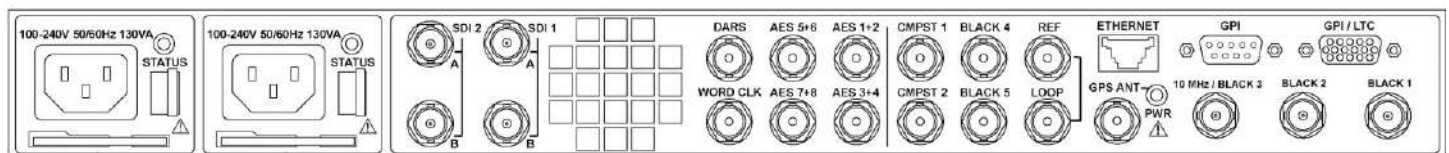
Optional GPS/GLONASS receiver

The GPS option adds an internal receiver to the SPG8000 that is capable of receiving both GPS and GLONASS signals. When connected to an external antenna that supplies the standard GPS and/or GLONASS RF signal (for example, SPG8000ANT), the SPG8000 can use the GPS/GLONASS system's stable frequency reference.

The GPS/GLONASS signal also includes a precise time-of-day reference that can be used for all time code outputs. Similar to the Stay GenLock® feature, the SPG8000 can maintain the video frequency and phase when the GPS/GLONASS signal is interrupted, and the Holdover Recovery mode will ensure a shock-free realignment of frequency and phase when the GPS/GLONASS signal is restored.

Test signal outputs

The SPG8000 can be optionally configured with a variety of test signal outputs. Option BG includes two composite analog outputs (NTSC or PAL) that can be used to generate test patterns such as color bars, or serve as additional black burst outputs.

Option SDI adds two fully independent serial digital video generator channels of two outputs each. Each channel can be configured to any standard SD or HD-SDI format and frame rate. The selected test pattern can be generated on both outputs per channel, or one output can generate digital black. Option 3G extends the functionality of the SDI test signal outputs by adding 3 Gb/s SDI formats.

A wide variety of standard test patterns are included, such as color bars, convergence grid, step scales, ramps, multiburst, SDI pathological test matrix and a real-time programmable zone plate generator. Bitmap images can be downloaded to the SPG8000's flash memory for arbitrary user-defined test patterns. ID text, burn-in time code, circle, and color logo overlays can be added to any test pattern, and several ancillary data packet types, including ancillary time code and user-defined packets, can be inserted into the SDI output signal.

Audio reference signals

Several audio reference signals are available on the SPG8000. The base configuration includes a 48 kHz word clock output, and option AG adds five AES/EBU output pairs. One pair is dedicated to a Digital Audio Reference Signal (DARS) output, and the other four pairs are used for test tone generation, with independent tone frequency and amplitude settings for each of the 8 channels.

Audio tone generation is also included with the SDI option, as embedded audio on each of the SDI outputs. 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.

Remote access

The SPG8000 includes a 10/100/1000BASE-T Ethernet interface for remote access to the instrument. A web-based user interface can be used for all configuration settings and for monitoring system status.

Alarm and key status information is also available using Simple Network Management Protocol (SNMP) messaging, enabling easy integration with network management systems. Remote control and alarm reporting is also available using a general purpose interface (GPI). The SPG8000 has a front-panel USB port that can be used to backup and restore presets and other user data, and to perform system firmware upgrades.

Optional backup power supply

For mission-critical applications, the SPG8000 can be configured with a second power supply module. Under normal operation, the designated backup supply is seldom used, ensuring that it has maximum remaining life should the primary supply fail. The backup supply is load-tested once each day to verify that it can serve as the primary supply if necessary.

The usage time of each supply is logged as "temperature-weighted hours", a metric that best estimates the calculated life of the supply. A front-panel LED will indicate when the supply is nearing its end-of-life.

If the primary supply is interrupted for any reason, the system will switch to the backup without any disruption to system operation. Power supply modules are hot-swappable for easy replacement, and feature a locking mechanism to prevent the power cable from accidental disconnection.

Input specifications

Reference input

Connector	BNC ×2, passive loop-through
Input impedance	75 Ω
Input signal	
NTSC/PAL black burst	
HD tri-level sync	1080/60/59.94/50I
	1080/30/29.97/25/24/23.98P
	1080/24/23.98PsF
	720/60/59.94/50P
10 MHz continuous wave	
Amplitude range	−8 dB to +6 dB
S/N ratio	>40 dB
SCH phase	0 ±40°
Return loss	≥30 dB at 300 kHz to 10 MHz
Lock stability	
±3 dB amplitude change	<1 ns
Jitter with burst lock	<0.5°
Jitter with sync lock	<1 ns
Jitter with CW lock	<1 ns (typ. 1°)

Genlock

Timing adjustment range	Anywhere in the color frame
Timing adjustment resolution	<0.5° of NTSC/PAL subcarrier, 1 ns with tri-level sync input
Color framing	Keeps accuracy even with ±45° SCH error of input reference signal
Genlock range	$\pm 7.5 \times 10^{-6}$

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GPS/GLONASS receiver (Option GPS)

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	From cold start, <46 sec (50%), <50 sec (90%)

GPS/GLONASS antenna input (Option GPS)

Connector	BNC
Input impedance	50 Ω, internally terminated
DC antenna power output voltage	3.3 V or 5 V at 55 mA
Fault protection	Short-circuit/open detection and protection
Return loss	8 dB at 1575 MHz

Time reference

Source	GPS or GLONASS signal, LTC input, or VITC read from NTSC/PAL genlock input
Time zone offset	−23:59 to +23:59
Daylight saving adjustment	Start/end from recurring calendar or manually scheduled, with adjustable offset
Leap second adjustment	Inserted at 00:00 UTC on the scheduled date, or deferred up to 24 hours

LTC input

Connector	Available through D-sub 15-pin connector; Optional break-out cable to XLR connector available
Formats	24 fps (24 Hz or 23.98 Hz), 25 fps, 30 fps, 30 fps drop-frame (29.97 Hz) 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_{p-p} differential, 1 to 5 V_{p-p} 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 white noise
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 Ω differential, 300 Ω single ended

Output specifications

Reference outputs

Number of outputs	3 analog sync outputs in base configuration, up to 7 with Option BG
Connector	BNC ×3-7
Formats	NTSC/PAL black burst, HD tri-level sync, or 10 MHz continuous wave
Format Combinations	
NTSC/PAL black burst	Available on all outputs (BLACK 1-5 and CMPST 1-2)
HD tri-level sync	Black outputs 1-3 can independently produce any of the formats from the integer rate group (24,25,30,50,60 Hz) or the non-integer rate group. (23.98, 29.97, 59.94 Hz).
	Blacks outputs 4-5 can also independently produce any of the formats from either the same or the other rate group.
10 MHz CW	BLACK 3 output only
Output impedance	75 Ω
Return loss	≥30 dB to 30 MHz

Black burst outputs

Standards	SMPTE 170M, ITU-R BT.1700-1, EBU N14, SMPTE RP154, RP318M-B
Formats	NTSC-M (7.5 IRE black), NTSC-J (0 IRE black), PAL-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	±2%
SCH phase	< ±5°
Timing adjustment	Independent per output
Range	Anywhere in the color frame
Resolution	Clock resolution 18.5 ns (1/54 MHz)
	Fine resolution 0.1 ns on BLACK 1-3

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HD tri-level sync outputs

Standards	SMPTE 240M, 274M, 296M, RP211
Formats	1080/60/59.94/50I
	1080/30/29.97/25/24/23.98P
	1080/24/23.98PsF
	720/60/59.94/50P
Amplitude accuracy	±2%
Timing adjustment	Independent per output
Range	Anywhere in the color frame
Resolution	Clock resolution 13.5 ns (1/74.25 MHz)
	Fine resolution 0.2 ns for BLACK 1-3

LTC outputs

Number of outputs	3 or 4 (LTC1 is selectable as input or output)
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 (29.97 Hz) per SMPTE 12M
Source	Time-of-day with adjustable offset, or program (elapsed) time counter
Output amplitude	5 V ±10%, adjustable from 0.5 V to 5 V in 0.5 V steps

Word clock output

Connector	BNC ×1
Output level	5 V DC (CMOS compatible) or 1 V AC into 75 Ω (AES level)
Frequency	48 kHz

Serial digital test signal outputs (Option SDI)

Number of outputs	2 independent test pattern generators with 2 outputs each
Video signal	Test pattern on both outputs or test pattern on one output and digital black on the second output
Connector	BNC ×4
Output impedance	75 Ω
Output amplitude	800 mV$_{p-p}$ ±3%
Overshoot	≤1% (typical)
Rise/Fall time	
HD, 3G	≤70 ps (typical) (20-80%)
SD	≤700 ps (typical) (20-80%)

Serial digital test signal outputs (Option SDI)

Jitter

HD, 3G	≤40 ps (typical) (alignment)
	≤80 ps (typical) (timing)
SD	≤200 ps (typical) (alignment)
	≤200 ps (typical) (timing)

Timing adjustment	Independent per generator channel
Range	Anywhere in the frame
Resolution	One clock cycle at the Y, G, or X pixel rate

Return loss	≥15 dB from 5 MHz to 2.5 GHz (typical)
	≥10 dB from 2.5 GHz to 3 GHz (typical)

Standard Definition (SD) formats

Standards	SMPTE 259M, 272M, 291M

Bit rate	270 Mb/s

Formats	720×486/59.94/I (525 lines)
	720×576/50/I (625 lines)

High Definition (HD) formats

Standards	SMPTE 274M, 291M, 292M, 296M

Bit rate	1.485 Gb/s and 1.485/1.001 Gb/s

Formats	1280×720/60/59.94/50/30/29.97/25/24/23.98P
	1920×1080/60/59.94/50I
	1920×1080/30/29.97/25/24/23.98P
	1920×1080/30/29.97/25/24/23.98PsF

3 Gb/s formats (Option 3G)

Standards	SMPTE 291M, 424M, 425-1

Bit rate	2.97 Gb/s and 2.97/1.001 Gb/s

Alpha channel	Same as Y/G channel or flat field (0% to 100% in 10% steps)

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3 Gb/s formats (Option 3G)

Formats		Sample structure	Frame/Field rates
Level A			
	1280×720	4:4:4 Y'C'$_B$C'$_R$(+A)/10-bit 4:4:4 R'G'B'(+A)/10-bit	60/59.94/50/30/29.97/25/24/23.98P
	1920×1080	4:2:2 Y'C'$_B$C'$_R$/10-bit	60/59.94/50P
		4:4:4 Y'C'$_B$C'$_R$(+A)/10-bit 4:4:4 R'G'B'(+A)/10-bit	60/59.94/50I 30/29.97/25/24/23.98P 30/29.97/25/24/23.98PsF
		4:4:4 Y'C'$_B$C'$_R$/12-bit 4:4:4 R'G'B'/12-bit	60/59.94/50I 30/29.97/25/24/23.98P
		4:2:2 Y'C'$_B$C'$_R$/12-bit	60/59.94/50I 30/29.97/25/24/23.98P 30/29.97/25/24/23.98PsF
	2048×1080	4:4:4 R'G'B'/12-bit 4:4:4 X'Y'Z'/12-bit	30/29.97/25/24/23.98P 30/29.97/25/24/23.98PsF
Level B Dual-Link			
	1920×1080	4:2:2 Y'C'$_B$C'$_R$/10-bit	60/59.94/50P
		4:4:4 Y'C'$_B$C'$_R$(+A)/10-bit 4:4:4 R'G'B'(+A)/10-bit	60/59.94/50I 30/29.97/25/24/23.98P 30/29.97/25/24/23.98PsF
		4:4:4 Y'C'$_B$C'$_R$/12-bit 4:4:4 R'G'B'/12-bit	60/59.94/50I 30/29.97/25/24/23.98P 30/29.97/25/24/23.98PsF
		4:2:2 Y'C'$_B$C'$_R$(+A)/12-bit	60/59.94/50I 30/29.97/25/24/23.98P 30/29.97/25/24/23.98PsF
	2048×1080	4:4:4 R'G'B'/12-bit 4:4:4 X'Y'Z'/12-bit	30/29.97/25/24/23.98P 30/29.97/25/24/23.98PsF
Level B Dual-Stream			
	2× 1920×1080	4:2:2 Y'C'$_B$C'$_R$(+A)/10-bit	60/59.94/50I 30/29.97/25/24/23.98P 30/29.97/25/24/23.98PsF
	2× 1280×720	4:2:2 Y'C'$_B$C'$_R$(+A)/10-bit	60/59.94/50/30/29.97/25/24/23.98P

Test patterns

Color bars	100%, 75%, SMPTE EG1, SMPTE RP219, SMPTE EG432-1
Flat field	Full field 0% (Black), 50%, 100% (White), Red, Green, Blue, Cyan, Magenta, Yellow
Linearity test	Ramp, Limit Ramp, Valid Ramp, Shallow Ramp Matrix, 5/10 Step Staircase
Monitor	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
SDI pathological	Equalizer Test, PLL Test, SDI Matrix per SMPTE RP178/RP198
Frequency response	Multiburst, Real-time parametric moving zone plate
Pulses	2T Pulse and Bar, Color Pulses, Co-siting Pulse
Full-frame picture	User-defined bitmap files (BMP format) can be downloaded to flash memory and displayed in any format

Video overlays

Logo	24-bit color bitmap file (BMP format) or 32-bit with transparency, up to 1920×1080 pixel size. Adjustable on-screen position.
ID text	Programmable string from front-panel entry (printable ASCII characters) or downloaded text file (UTF-8 encoding) for any Unicode characters. A preinstalled TrueType font is provided for Latin, Greek, and Cyrillic characters; an alternate TrueType font file may be downloaded to support other character sets. Character size is adjustable (%APH, 0.1% resolution).
Burnt-in time code	On-screen display of the current time code value (HH:MM:SS:FF) for the output, updated every field. Character size is 10% APH.
Circle	Adjustable diameter (%APH).
Border	Text and circle overlays are rendered as near-white objects, with a selectable enclosing near-black bounding area.
Blink	Text and circle overlays can blink on and off for dynamic on-screen activity.
Position	All overlay objects have adjustable on-screen position.

Embedded audio

Standards	SMPTE 272M (SD), 299 (HD/3G)
Active channels	16 channels (SD, HD, 3G-A), 32 channels (3G-B)
Sample frequency	48 kHz
Digital coding	24 bits (HD, 3G), 20 bits (SD)
Signal alignment	Async. and Sync. (no frame #), Synchronous (frame #)
Tone frequency	10.0 Hz to 20000.0 Hz, 0.5 Hz resolution
Level	–60 to 0 dBFS, 1 dB steps
Channel identification	Audible click, AES channel origin bytes

Ancillary data

Error detection and handling	EDH packet inserted in SD-SDI signals per SMPTE RP165
Video payload identifier	Optional VPID insertion per SMPTE 352M
Ancillary time code	Optional ATC insertion per SMPTE 12M-2
Format	ATC-LTC and/or ATC-VITC
Source	Time-of-day with adjustable offset, or program (elapsed) time counter
User-programmable ANC packet	
Content	DID, SDID, DC, UDW (255), CS; Automatically calculate checksum and/or parity, or manual override
Location	Line number, sample offset, luma/chroma channel, virtual link (3G)
Mode	Continuous insertion or single packet

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Composite analog test signal outputs (Option BG)

Number of outputs	2 independent test pattern generators
Connector	BNC ×2
Standards	SMPTE 170M, ITU-R BT.1700-1, EBU N14, SMPTE RP154, RP318
Formats	NTSC-M (7.5 IRE black), NTSC-J (0 IRE black), and PAL-B
Test patterns	
NTSC	100% Color Bars, 75% Color Bars, SMPTE EG1 Color Bars, 40% Flat Field, Convergence, Pluge and Luma Reference, Black with 10 Field ID
PAL	100% Color Bars, 75% Color Bars, 100% Color Bars over Red, 75% Color Bars over Red, 40% Flat Field, Convergence, Pluge and Luma Reference
Time code	Optional VITC insertion
Line	One or two lines, user selectable
Source	Time-of-day with adjustable offset, or program (elapsed) time counter
Luminance amplitude accuracy	±1% (video at 100%)
Chroma amplitude accuracy	±2%
Timing adjustment	Independent per output
Range	Anywhere in the color frame
Resolution	Clock resolution 18.5 ns (1/54 MHz)
Output impedance	75 Ω
Return loss	≥30 dB to 30 MHz

Audio test signal outputs (Option AG)

Standards	ANSI S4.40 (AES3), AES3-ID
Outputs	8 channels (4 AES/EBU pairs)
Output impedance	75 Ω, unbalanced
Connector	BNC ×4
Output amplitude	1 V ±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

Audio test signal outputs (Option AG)

Audio/Video synchronization	Free run or synchronized with video framing
Timing adjustment	±160 ms in 1 ms steps

DARS output

Outputs	2 channels (1 AES/EBU pair)
Output impedance	75 Ω, unbalanced
Connector	BNC ×1
Output amplitude	1 ±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

General specifications

Internal oscillator

Frequency accuracy in Internal mode	±135 × 10^{-9} over 1-year calibration interval. Typically ±10 × 10^{-9} just after adjustment.
Frequency accuracy over temperature	±2 × 10^{-9} for ±5 °C variation ±10 × 10^{-9} for 0 to 50 °C
Frequency variation from vibration and shock	±25 × 10^{-9} from 6 ms half-sine shocks over 20g
Frequency drift	< ±100 × 10^{-9} per year for internal and Stay GenLock® modes at constant temperature

Remote access

Network interface	10/100/1000 BASE-T
Configuration	Web-based user interface, HTML with JavaScript
Management	SNMPv2

General Purpose Interface (GPI)

Connector	9-pin D-sub connector for all input/output lines. Two outputs and one input also available on the same 15-pin D-sub connector as the LTC signals. Optional breakout cable makes these available on BNC connectors.
Outputs	Three, user-selectable to assert on specific events
1, 2	Assert on one of: GPS/GLONASS signal warning, loss of lock, near loss of lock, loss of input signal, or timer expiration
3	Assert on logical OR of any of: fan fault, loss of lock, near loss of lock, loss of genlock input
Output level	0.5-5 V
Inputs	Two (using 4 pins on connector)
1	User-selectable to signal GPS/GLONASS reacquisition, jam sync, or restart timer
2	Three pins on connector to recall preset 1-7
Input level	0.8-2.4 V

Physical

Dimensions

Height	44 mm (1.7 in.)
Width	483 mm (19 in.)
Depth	559 mm (21.5 in.)

Weight (net)	4.85 kg (10.7 lb.)

Environmental

Power consumption	60 W (max) on active power supply input
	60 W on backup supply input during 5 s daily load test
Temperature	0 to +50 °C
Altitude	3,000 m (9,842 ft.)
Source voltage	100 to 240 V, 50/60 Hz

Ordering information

Models

SPG8000	Master Sync / Master Clock Reference Generator base unit
	Includes: Genlock input with loop-through output, three analog composite black or HD tri-level sync outputs, LTC input/outputs (4 out or 1 in/3 out), 48 kHz word clock output; general purpose interface, 10/100/1000 Ethernet interface with Web UI support, SNMP error reporting.
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 SPG8000 with Option GPS.

Instrument options

Product options

GPS	Add GPS/GLONASS master clock synchronization capability, including internal GPS/GLONASS receiver plus NTP server support
BG	Add 2 channels of composite NTSC/PAL black or HD tri-level outputs plus 2 channels of composite NTSC/PAL test signal outputs
SDI	Add 2 channels of SD/HD SDI test signal generation on 2 outputs each; Each channel can generate a test pattern on both outputs or a selected test pattern on one output and digital black on the other output
3G	Add 3G SDI format support (Option SDI required)
DBT	Add embedded Dolby E audio test signal generation capability (Option SDI required)
AG	Add DARS output (2 AES/EBU channels) plus 4 audio tone outputs (8 AES/EBU channels)
DPW	Add a second hot-swappable redundant (backup) power supply and second power cord
XLR	D-sub to XLR/BNC adapter cable (6 feet long); Connects from the 15-pin D-sub GPI/LTC connector on the SPG8000 to four XLR male connectors (for LTC input/outputs) and three BNC male connectors (for General Purpose Interface (GPI) input/outputs)

Power plug options

Opt. A0	North America power plug (115 V, 60 Hz)
Opt. A1	Universal Euro power plug (220 V, 50 Hz)
Opt. A2	United Kingdom power plug (240 V, 50 Hz)
Opt. A3	Australia power plug (240 V, 50 Hz)
Opt. A5	Switzerland power plug (220 V, 50 Hz)
Opt. A6	Japan power plug (100 V, 50/60 Hz)
Opt. A10	China power plug (50 Hz)
Opt. A11	India power plug (50 Hz)
Opt. A12	Brazil power plug (60 Hz)
Opt. A99	No power cord

Service options

Opt. C3   Calibration Service 3 Years

Opt. C5   Calibration Service 5 Years

Opt. D1   Calibration Data Report

Opt. D3   Calibration Data Report 3 Years (with Opt. C3)

Opt. D5   Calibration Data Report 5 Years (with Opt. C5)

Opt. G3   Complete Care 3 Years (includes loaner, scheduled calibration, and more)

Opt. G5   Complete Care 5 Years (includes loaner, scheduled calibration, and more)

Opt. R3   Repair Service 3 Years (including warranty)

Opt. R5   Repair Service 5 Years (including warranty)

SPG8UP field upgrades

DPW   Add a replacement or a second hot-swappable redundant (backup) power supply. A power plug option must be specified. See Power plug options.

3G   Add 3G SDI format support (software option key upgrade); Option SDI must be already installed in the SPG8000 unit

DBT   Add embedded Dolby E audio test signal generation capability (software option key upgrade); Option SDI must be already installed in the SPG8000 unit

XLR   D-sub to XLR/BNC adapter cable (6 feet long); Connects from the 15-pin D-sub GPI/LTC connector on the SPG8000 to four XLR male connectors (for LTC input/outputs) and three BNC male connectors (for General Purpose Interface (GPI) input/outputs)

IF   Upgrade installation service

IFC   Service installation and calibration

Option XLR adapter cable

Certifications

Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

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www.tektronix.com

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