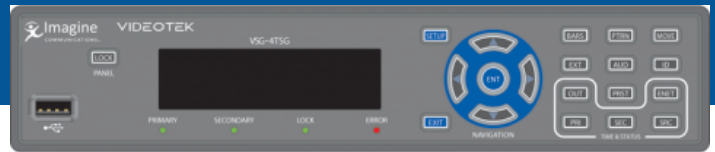# Videotek® VSG-4TSG

Analog/SD/HD/3G Advanced Test Signal Generator

The Videotek® VSG-4TSG is part of the Imagine Communications Reference Sync and Timing platform, and is a ½RU wide, 1RU tall and 12 inches deep 3G/HD/SD master timing generator. The unit is small in size, with redundant power supply inputs, and is low in power consumption and light in weight, making it a perfect fit for all broadcast television and post production environments.

Features

Inputs

- Genlocks to color black (black burst) meeting NTSC SMPTE ST 170M and PAL ITU R BT. 4705 standards
- Genlocks to tri level sync meeting SMPTE ST 240M/274M/296M standards
- Support for various time code formats and time code user bit formats, including SMPTE/EBU drop frame or non drop frame time code formats
- GPS support via 10 MHz, PPS and RS-232 interfaces
- NTP support and PTP (IEEE-1588) support via a network connection
- VITC support from color black inputs
- LTC support
- GPI inputs and outputs
- Redundant external power supplies
- Optional auxiliary input and output breakout

Outputs

- Two SDI test signal outputs with selectable video format, frame rate, test signal and AFD
- One programmable output, configurable as NTSC or PAL color black or test
- Two programmable AES or color black outputs
- VITC support on color black output
- D-VITC and ATC support on SDI output
- Two LTC outputs
- Support for DARS or word clock on a shared BNC
- Continuous motion overlaid on the video test pattern
- The capability to overlay up to 19 characters of source ID within the test pattern
- Two unbalanced analog audio outputs
- Capabilities for up to 16 channels of embedded audio, enabled by group
- Global audio selections to adjust amplitude and frequency

Processing

- Test signals in a variety of bars and patterns
- Configurable DST and leap second changes
- Auto detection for input sources
- User defined scheduled call outs to time reference sources, such as GPS receivers
- User programmable delays for input and output, offsets, time code offsets, output phasing, and input and output jam syncs
- Display of current video setup, local time, and date on a menu driven front panel interface
- Built-in intuitive web user interface

Details

An internal timing engine processes the incoming reference information, makes appropriate conversions to different time bases and maintains a consistent time base, which is used to drive the unit's outputs. Using a combination of parameters such as leap second information, DST (Daylight Savings Time) rules, and offset values, the VSG4-TSG can be configured to convert incoming International Atomic Time (TAI) to other time bases. This time is then distributed to the module's outputs as time and date information, color black video reference signals and DARS (digital audio reference signal) or word clock.

The optional GPS-3904 is recommended for use with the VSG-4TSG, as it not only provides GPS locked time and date, but also provides a highly stable master temperature-controlled oscillator source for the for the video, audio and time code reference outputs.

The VSG-4TSG has multiple timing inputs that include GPS (Global Positioning System) sourced time and date with 10 MHz, PPS (Pulse Per Second) and serial data time and date inputs, LTC (Linear Time Code), NTP (Network Time Protocol), VITC (Vertical Interval Time Code), D-VITC (Digital Vertical Interval Time Code), ATC (Ancillary Time Code) support and support for IEEE-1588 PTP (Precision Time Protocol).

The video reference input supports NTSC, PAL, SD, HD and 3G formats for video source sync signals including color black (black burst) or tri level sync.

The test generator outputs support SD, HD, 3G (Level A and B-DL (Dual Link) and B-DS (Dual Stream) and analog composite video formats and AES digital and analog audio.

The VSG-4TSG has one programmable output that can user-selected for color black or tri level sync or analog composite video, and two programmable outputs with individual offsets and formats. This provides for multiple-format test and timing from a single reference source. The VSG-4MTG also provides outputs that include NTP master, PTP master, VITC, and LTC outputs with individual offsets on all outputs, as well as DARS (Digital Audio Reference Signal) or word clock output.

The easy-to-use front panel and web user interface allow for instantaneous status on any source or output including date, time and lock information.

The VSG-4TSG provides for daylight savings time and time zone offsets, with an auto changeover function for source failures with primary and secondary source selection for maintaining the uninterruptable status that is required by the most stringent systems. The unit has dual power supply capabilities and includes two external 110/220 universal AC adapters providing the required DC power input.

Specifications

Specifications and designs are subject to change without notice

VSG-4TSG TEST SIGNAL GENERATOR	STABILITY OVER TIME	PPS (PULSE PER SECOND) ACCURACY	10 MHZ ACCURACY	APPLICATIONS
Standalone (no GPS option)	4PPM (0.34s/day)	Not Applicable	Not Applicable	Time will vary ~2 minutes per year, see below for recommendations
GPS-3903-2	Not Applicable	1 PPS (static) $\pm$50 nanoseconds	Not Applicable	Recommended for date/time-of-day and time code only reference
GPS-3904	Not Applicable	UTC 15 nanoseconds (one sigma)	1.16×10^{-12} (one day average)	Recommended for date and time-of-day and video/audio/time code reference

GENLOCK INPUT	
Input Type	1 input, passive looping
Input Connector Type	Electrical,single-ended, unbalanced, mechanical, BNC
Input Impedance	Hi-Z
Blackburst Input Amplitude	NTSC: sync and burst 286 mV, nominal PAL: sync and burst 300 mV, nominal
Blackburst Input Amplitude Tolerance	$\pm$6 dB
Return Loss	Less then or equal to -40 dB to 10 MHz
Black Burst Subcarrier Jitter	<1 ns (pk-pk) over one horizontal line
Tri-level Sync Amplitude	600 mV pk-pk nominal
Tri-level Sync Amplitude Tolerance	$\pm$3 dB

10 MHZ INPUT	
Input Type	1 input
Input Connector Type	Electrical, single-ended, unbalanced, mechanical, BNC
Input Impedance	75 ohms
Level	2 V p-p $\pm$3 dB

PPS INPUT	
Input Type	1 input
Input Connector Type	Electrical, single-ended, unbalanced, mechanical, BNC
Input Impedance	75 ohms
Level	TTL; Vih=2.0 V min, Vil=0.8V max
Edge Transition	20 ns max

LTC INPUT (DIFFERENTIAL, BALANCED)

Input Type	1 Differential balanced
Input Connector Yype	Electrical, differential, balanced, screw clamp terminals
Input Impedance	Hi-Z (>20 k ohms) or 600 ohms, selectable with switches
Nominal Input Amplitude	2.0 volts pk-pk
Minimum Input Amplitude	0.5 volts pk-pk
Maximum Input Amplitude	4.5 volts pk-pk

LTC INPUT (UNBALANCED)

Input Type	1 Unbalanced
Input Connector Type	Electrical, single-ended, unbalanced, BNC
Input Impedance	Hi-Z (>20 k ohms)
Nominal Input Amplitude	2.0 volts pk-pk
Minimum Input Amplitude	0.5 volts pk-pk
Maximum Input Amplitude	4.5 volts pk-pk

PGM 1 COMPOSITE ANALOG VIDEO OUTPUT

Connector Type	BNC female (ST-170, ST-274, ST-296)
Output Impedance	75 ohms nominal
Tri-Level Sync Amplitude	600 mV nominal, Tri-level sync terminated into 75 ohms
Composite Sync Amplitude	NTSC: 286 mV nominal (Blackburst/75% Colorbars, terminated into 75 ohms) PAL: 300 mV nominal (Blackburst/75% Colorbars, terminated into 75 ohms)
Composite Burst Amplitude	NTSC: 286 mV nominal (Blackburst/75% Colorbars, terminated into 75 ohms) PAL: 300 mV nominal (Blackburst/75% Colorbars, terminated into 75 ohms)
Composite Video Amplitude	NTSC: 1000 mV nominal (75% Colorbars, terminated into 75 ohms) PAL: 1000 mV nominal (75% Colorbars, terminated into 75 ohms)
DC Offset	0 V $\pm$ 0.5 V (blanking level) (75% Colorbars, terminated into 75 ohms)
Output Return Loss	≥ 40 dB (0.1MHz -10MHz) (75% Colorbars, terminated into 75 ohms)
SC/H Phase	0° $\pm$ 10º (75% Colorbars, terminated into 75 ohms)
Output Timing	$\pm$ 100 nS, Reference input to output timing

PGM 1 SYNC BLACKBURST/TRI-LEVEL SYNC (TLS)

Connector Type	BNC female (ST-170, ST-274, ST-296)
Output Impedance	75 ohms nominal (ST-170, ST-274, ST-296)
Tri-Level Sync Amplitude	600 mV $\pm$ 1% (Tri-level sync terminated into 75 ohms)
Composite Sync Amplitude	NTSC: 286 mV nominal (Blackburst, terminated into 75 ohms) PAL: 300 mV nominal (Blackburst, terminated into 75 ohms)
Composite Burst Amplitude	NTSC: 286 mV nominal (Blackburst, terminated into 75 ohms) PAL: 300 mV, nominal (Blackburst, terminated into 75 ohms)
DC Offset	0 V $\pm$ 0.5 V (blanking level) (Blackburst, terminated into 75 ohms)
Output Return Loss	≥40 dB (0.1 to 10 MHz) (Blackburst, terminated into 75 ohms)
SC/H Phase	0° $\pm$10º (Blackburst, terminated into 75 ohms)
Output Timing	$\pm$100 nS (Reference input to output timing)

PGM 2/3 SELECTABLE OUTPUT

Connector Type	BNC female
Output Impedance	75 ohms nominal
Output Return Loss	≥40 dB (0.1 to 10 MHz)

PGM 2/3 SYNC OUTPUT MODE

Tri-Level Sync Amplitude	600 mV ±1% (ST-170, ST-274, ST-296 Terminated into 75 ohms)
Composite Sync Amplitude	NTSC: 286 mV nominal (ST-170, ST-274, ST-296 Terminated into 75 ohms) PAL: 300 mV nominal (ST-170, ST-274, ST-296 Terminated into 75 ohms)
Composite Burst Amplitude	NTSC: 286 mV nominal (ST-170, ST-274, ST-296 Terminated into 75 ohms) PAL: 300 mV nominal (ST-170, ST-274, ST-296 Terminated into 75 ohms)
DC Offset	0 V ±0.5 V (blanking level) (ST-170, ST-274, ST-296 Terminated into 75 ohms)
SC/H Phase	0° ±10º (ST-170, ST-274, ST-296 Terminated into 75 ohms)
Output Timing	±100 nS (Reference input to output timing)

PGM 2/3 AES AUDIO OUTPUT MODE (UNBALANCED)

Amplitude	1.0 V ±10%
DC Offset	0 V ±0.05 V
Output Rise and Fall Time	30 nS to 44 nS (10% to 90%)
Serial Output Jitter	Less than or equal to 0.25 UI
Sample Rate	48 kHz

SDI 1/2 SERIAL VIDEO OUTPUT

Connector Type	BNC female
Output Impedance	75 ohms nominal
Amplitude	800 mV ±10%
DC Offset	0 V ±0.5 V
Video Output Return Loss	≥25 dB (5 to 270 MHz) ≥15 dB (270 to 1485 MHz) ≥10 dB (1485 to 2970 MHz)
Output Rise and Fall Time	≤135 ps (20% to 80%), not differing by more than 50 ps ≤270 ps (20% to 80%), not differing by more than 100 ps 400 pS to 700 pS (20% to 80%), not differing by more than 500ps
Serial Output Jitter	<0.3UI (see RP184-2004) <0.2 UI (see RP184-2004) <0.2 UI (see RP184-2004)

SDI 1/2 SUPPORTED OUTPUT FORMATS

SD	SMPTE 259M-C at 270 Mb/s (525 at 59.94 Hz, 625 at 50 Hz)
HD	SMPTE 292 at 1.485 Gb/s in SMPTE 274 or SMPTE 296 formats (1080I/60, 1080I/59.94, 1080I/50, 1080P/30, 1080P/30sF, 1080P/29.97, 1080P/29.97sF, 1080P/25, 1080P/25sF, 1080P/24, 1080P/23.98, 720p/60, 720p/59.94, 720p/50, 720p/30, 720p/29.97, 720p/25, 720p/24, 1080P/24sF, 720p/23.98, 1080P/23.98sF
Dual Link HD	SMPTE 372M 10 bit 4:2:2 YCbCr, 10 bit 4:4:4 YCbCr, 10 bit 4:4:4:4 YCbCrA, 10 bit 4:4:4 RGB, 10 bit 4:4:4:4 RGBA, 12 bit 4:2:2 YCBCR, 12 bit 4:4:4 YCBCR, 12 bit 4:4:4 RGB (1080i/60, 1080i/59.94, 1080i/50, 1080p/60, 1080p/59.94, 1080p/50, 1080p/30, 1080p/29.97, 1080p/25, 1080p/24, 1080p/23.98, 1080psF/30, 1080psF/29.97, 1080psF/25, 1080psF/24, 1080psF/23.98
3 Gb/s	SDI SMPTE 424-2006 level A and B 10 bit 4:2:2 YCbCr, 10 bit 4:4:4 YCbCr, 10 bit 4:4:4:4 YCbCrA, 10 bit 4:4:4 RGB, 10 bit 4:4:4:4 RGBA, 12 bit 4:2:2 YCbCr, 12 bit 4:4:4 YCbCr, 12 bit 4:4:4 RGB, 10 bit 4:4:4YCbCr, 10 bit 4:4:4:4 YCbCrA, 10 bit 4:4:4 RGB, 10 bit 4:4:4:4 RGBA (1080i/60, 1080i/59.94, 1080i/50, 1080p/60, 1080p/59.94, 1080p/50, 1080p/30, 1080p/29.97, 1080p/25, 1080p/24, 1080p/23.98, 1080psF/30, 1080psF/29.97, 1080psF/25, 1080psF/24, 1080psF/23.98, 720p/60, 720p/59.94, 720p/50, 720p/30, 720p/29.97, 720p/24, 720p/23.98
2k Formats	12 bit RGB 4:4:4, 12 bit XYZ, 10 bit 4:2:2 YCbCr, 12 bit 4:2:2, YCbCr, 12 bit 4:2:2 YCbCrA (2048x1080p/24Hz, 2048 x 1080p/23.98Hz, 2048 x 1080psF/24, 2048 x 1080psF/23.98

LTC OUTPUT 1

Output Connector	1 BNC, female
Interface	Unbalanced
Impedance	Low-Z (<25 ohms)
Level	2.0 Vp-p nominal into 1kohm (Low-Z output)
Transition Time	40 us $\pm$4 us measured at 10% and 90% amplitude

LTC OUTPUT 2

Interface	Differential balanced
Impedance	Low-Z (<25 ohms per side) or 600 ohms, selectable with switches on break-out board
Level	3.9 Vp-p nominal into 1k ohms (Low-Z output) 2.5 Vp-p nominal into 1k ohms (600 ohms output)
Transition Time	40 us $\pm$4 us measured at 10% and 90% amplitude
Interface	Unbalanced
Impedance	Low-Z (<25 ohms)
Level	2.0 Vp-p nominal into 1k ohm
Transition Time	40 us $\pm$4 us measured at 10% and 90% amplitude

SYNC 1 BLACKBURST/TRI-LEVEL SYNC (TLS)

Number/Connector Type	1 fixed BNC, 3 selectable BNC, female
Load Impedance	75 ohms nominal
Return Loss	≥40 dB (100 kHz to 10 MHz)
Blackburst Signal Level	NTSC: sync and burst 286 mV, nominal PAL: sync and burst 300 mV, nominal
Blackburst subcarrier jitter	<1 ns (pk-pk) over one horizontal line
Tri-Level Signal Level	600 mV pk-pk
DC Offset	0 V $\pm$.5 V
SC/H Phase	0 $\pm$10 degree
Reference to Output Timing	$\pm$100 ns

DARS

Output Connector	1 BNC, female, shared with WC
Output Impedance	75 ohms
Audio Formats	DARS, unbalanced
Sample Rate	48 kHz
AES Output Return Loss	≥25 dB -0.1 to 6 MHz
Output Signal Level	1 V pk-pk (75 ohms terminated)
AES Jitter	Less than or equal to 0.25 UI

WORD CLOCK

Output Connector	1 BNC, female, shared with DARS
Output Impedance	75 ohms nominal
Output Level	5 V TTL levels

ANALOG AUDIO OUTPUT (DIFFERENTIAL STEREO PAIR)

Connector Type	Terminal block
Output Impedance	600 ohms nominal
Amplitude	-20 dBFs = +4 dBu
Frequency Response	$\pm$ 0.1 dB (20 Hz to 20 kHz)
SNR	>100 dB (20 Hz to 20 kHz)

AES 1 AND 2 SERIAL AUDIO OUTPUT (BALANCED DIFFERENTIAL)

Connector Type	Terminal block
Output Impedance	110 ohms nominal
Amplitude	4.0 V $\pm$10%
DC Offset	0 V $\pm$0.05 V
Output Return Loss	Greater than or equal to 25 dB (0.1 to 6 MHz)
Output Rise and Fall Time	5 nS to 30 nS (10% to 90%)
Serial Output Jitter	Less than or equal to 0.25UI

OLED DISPLAY

General	256×64 OLED display for device configuration and output selections
Communication Interfaces	
Ethernet	1 Ethernet port RJ-45 10/100 Base-T connector
LTC/GPIO	1 LTC/GPIO connector 26 female pin D-sub

ETHERNET SPECIFICATIONS

Standard	10/100 Base-T conforms to IEEE802.3
Connector	RJ-45

POWER REQUIREMENTS	
Power Connector	2 barrel connectors with screw lock
Power Input	12 VDC nominal 10.8 VDC minimum, 13.2 VDC maximum
Power Consumption	Less than 25 W nominal
Non-resetting Fuse	2.5A, 16 VDC
AC Adapter	Included

MECHANICAL	
Mechanical (H x W x D)	1.74 x 8.46 x 13.12 in. (4.42 x 21.49 x 33.32 cm)
Weight	3.2 lb (1.46 kg)

| ENVIRONMENTAL	
Operating Temperature	32° to 122° F (0° to 50° C)
Storage Temperature	-22° to 149° F (-30° to 65°C)
Humidity (non condensing)	Operating: 20% to 80% Non-operating: 5% to 90%
Altitude	Operating: 6562 ft (2000 m)
Transportation	24.00 in. (60.96 cm) impact drop survivable in original factory packaging
Pollution Degree	Pollution degree 2

Ordering Information

|	
VSG-4SYS-T	VSG-4TSG System, includes 2 VSG-4TSG Test Signal Generators, 1 VSX-11-3G Multiformat Sync Changeover Unit, 1 DRT-5 and 1 RMT-U1 rack mount trays, and 2 VSG-4-BRK-1 breakout panel
VSG-4TSG	VSG-4TSG Advanced Test Signal Generator: Analog, SD, HD, 3G, AES, DARS, IEEE-1588 PTP capability, includes two PSU-12-1 power adaptors for redundancy, optional GPS-3903-2 antenna and receiver, DRT-5 dual rack mount tray and BLK-5 blank filler panel

OPTIONS	
VSG-4-BRK-1	Breakout panel and 5 ft cable with HD26 pin DSUB male to female connectors for the VSG-4xxx series and DL-870
DRT-5	Dual Rack Mount Tray for VSG-4 Series and DL-870, BLK-5 blank front filler available (DRT-ADP-1 DRT adaptor required for installing DRT-4 products in the DRT-5 rack tray (CMN-41, CMN-MV, LLM-1770, VSG-401))
BLK-5	Blank panel for left or right side of DRT-4A or DRT-5
PSU-12-1	Spare or Replacement Power Supply for Videotek VSG-4xxx and Selenio DL-870, 12 VDC output with threaded coupling ring, input 90 to 264 VAC
RMT-U1	Rack Mount Tray, holds up to 8 VSG-4 series power supplies or a combination of items

OPTIONAL GPS ANTENNA AND RECEIVER	
GPS-3904	GPS Antenna and Receiver kit, 110-240 VAC operation, serial data, 10 MHz and PPS outputs, includes AC power supply, RG-59 antenna cable (23m/75ft), for use with VSG-4MTG, VSG-4CSD, VSG-4TSG and VSG-4TCG for time/date and video/audio timecode applications
GPS-3902-RM	Rack Mount Kit, holds up to two GPS-3903-2, GPS-3904 receivers

Images/Diagrams

Back Panel
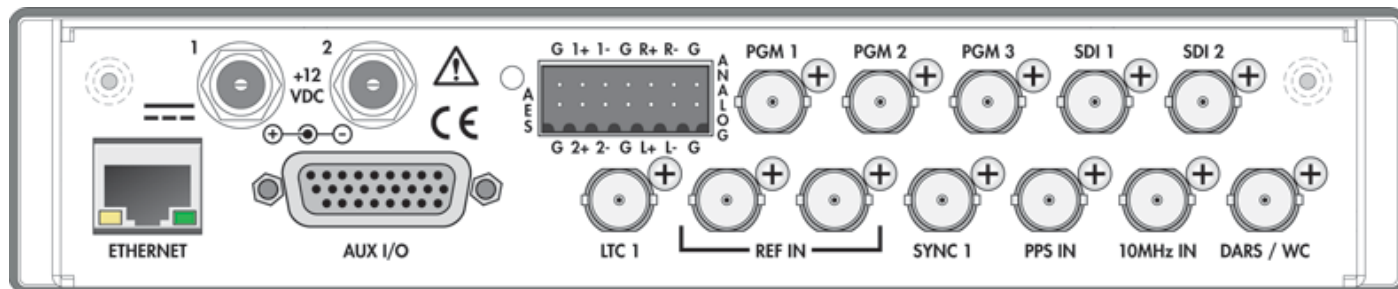
Block Diagram
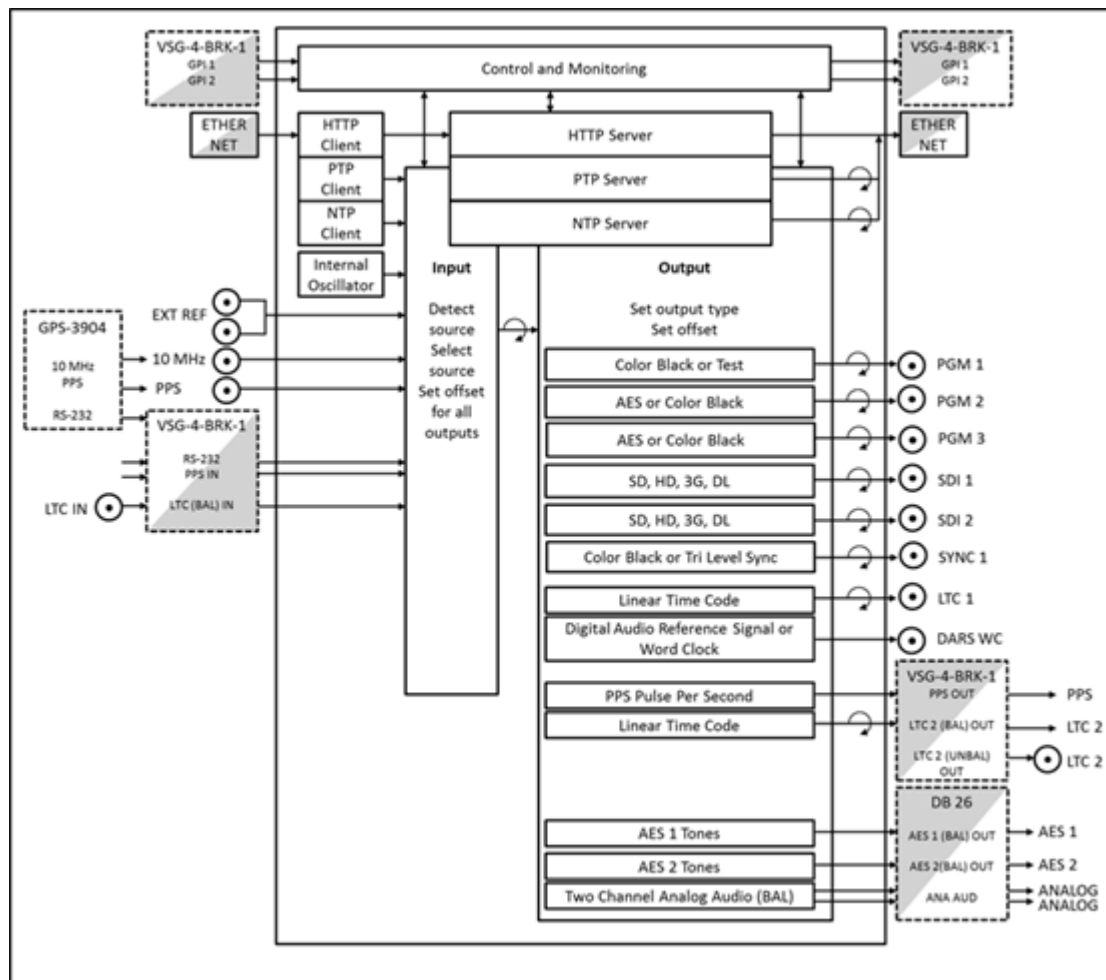
The optional VSG-4BRK-1 breakout adaptor provides GPS PPS, RS-232, LTC and GPI inputs and output connections