greenMachine®

Testor

Video and Audio Testing

Test Signal Generator Plus AV Sync Measurement Tool

~~callisto+~~

✓ titan

Description

The greenMachine Testor is a multi-format video and audio test signal generator plus audio/video delay analyzer and measurement tool. This is the ideal solution for the verification, troubleshooting and alignment of AV systems either in the field as a portable device, or rack mounted with network control in a studio installation.

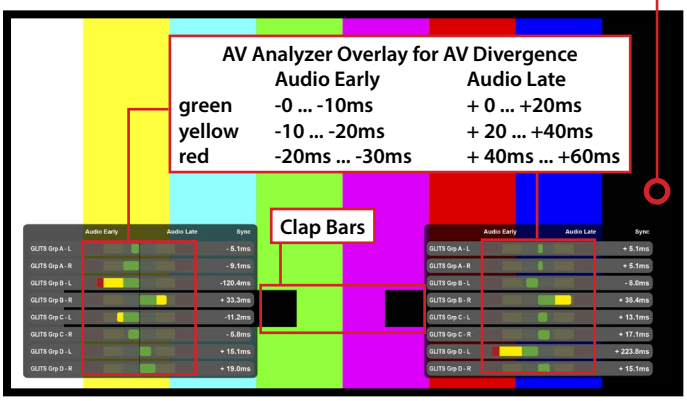
The greenMachine Testor has two primary modes of operation:

- **Single Channel 4k/UHD:** Single link or quad-link (2SI) 12G-SDI
- **Quad Channel 3G:** Four independent 3G-SDI channels

The green Machine Testor includes a library of industry standard test patterns which includes SDR static patterns, HDR static patterns, and dynamic (moving) patterns. All patterns can be customized with logos and text overlays if needed. You also have the ability to upload your own custom design test patterns.

The powerful AV delay analyzer and measurement tool allows for the precise measurement of the audio/video delay in 64 simultaneous channels of embedded audio in a 12G signal (or 16 channels in 3G). Simply feed the Testor pattern output into the signal path to be analyzed and then back into the Testor input. The results are shown graphically in LynxCentraal to visually identify early or late timing with a precise AV delay measurement of each audio channel.

Compatible with most test patterns, backgrounds, and video feeds that don't conflict with "Black Flash" or audio



AV Sync analyzer overlay on standard colorbars*

NOTE: *If the AV Sync overlay output is enabled, the reference source automatically jumps to the selected Overlay Video Source. If you want to use the Overlay feature with only one greenMachine, there must be a clock/sync uncupled device (e.g. a Frame Sync) between gM Output and gM Input.*

Functions

AV Sync:	**Generator:** Multi-channel GLITS AV Test signal **Analyzer:** Measure delays of audio channels **Overlay:** Visualize measurements and overlay them on output signal. Two greenMachines running Testor needed
Test Signals:	36 SDR + 6 HDR test signals and patterns 2 Large Scale LED panel patterns
User-defined Signal Patterns:	Upload user-defined and customizeabe signal patterns logos and text
HDR Test signals:	Test patterns for PQ, HLG and SLOG3
Integrated Overlay Editor:	Tool to place images and logos, add text, and user-defined signals, patterns, and graphics
Audio Test Generator:	16-channel audio test generator with adjustable level, phase, frequency, mix-down, and an EBU/AV sequence. Audio signals can be embedded into the SDI video output(s) and/or routed to the external audio outputs
AV Delay Test:	Test signal generator which is compatible with most standard AV delay meters. Not for use with AV Sync Analyzer.
H/V Rolling:	Horizontal and vertical rolling and speed adjustments.
Link Indicator:	For UHD signals, allows indication of 2SI link on quad link channels.
MADI Signal:	Generate a 64/56 channel MADI Signal and use audio crossbar to assign 16-channel audio test generator. (MADI transmission requires optional SFP)

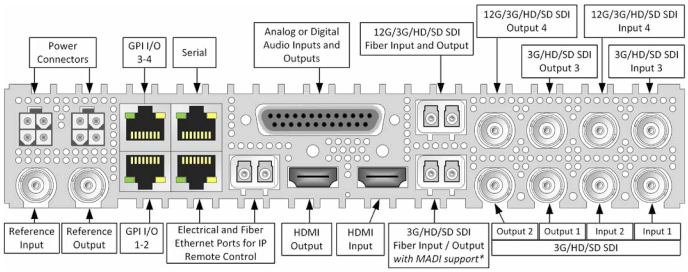
Technical Specifications

Operation Modes

- 4k UHD single channel configuration
- 3G HD quad channel configuration

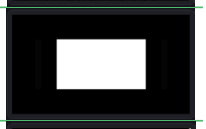
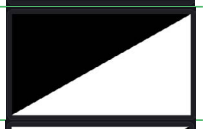
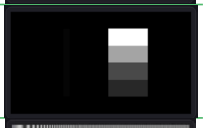
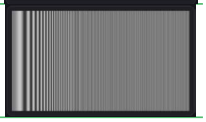
Input / Output Data Range

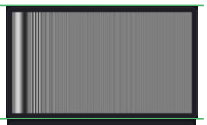
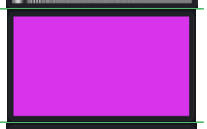
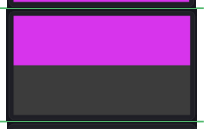
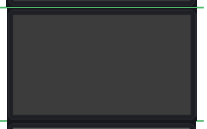
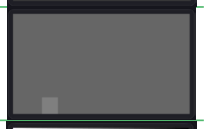
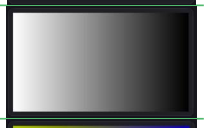
- Full range : Video signal representation (10bits) in full range of values from 0 to 1023 decimal (according to ITU BT 2100)
- Narrow range : Traditional video signal (10 bits) in range of values from 64 to 940 decimal

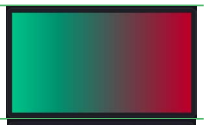
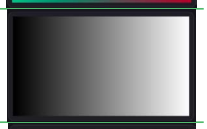
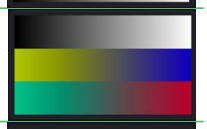
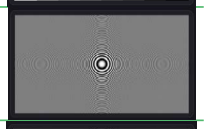
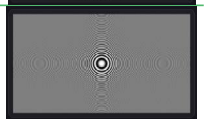


GMPT-Testor_Rev4.0 Specifications subject to change

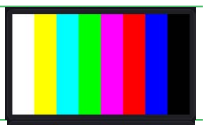
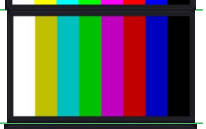
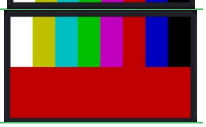
Standard Test Patterns

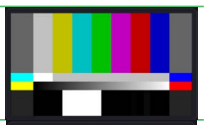
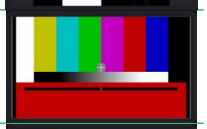
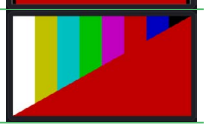
Center Sweep	
Convergence Grille	
Color Temperature	
Flash Black	
Flash White	
Four-Level PLUGE	
Frequency Sweep	

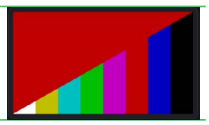
Multiburst	
Pathological EQ	
Pathological EQ/ PLL	
Pathological PLL	
Persistence Test	
Ramp Down Y	
Ramp Up CB	

Ramp Up CR	
Ramp Up Y	
Ramp Up YCbCr	
Staircase	
Zoneplate	
Zoneplate Moving	

Color Bars

Color Bar 100%	
Color Bar 75%	
Color Bar 75% over Red	

Colorbar SMPTE	
EBU AV Sync	
Field Pattern Colorbar/Red	

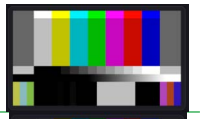
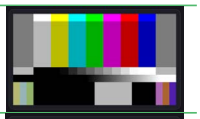
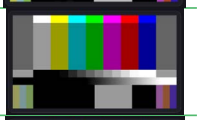
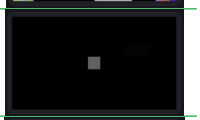
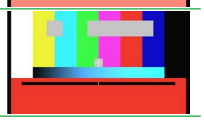
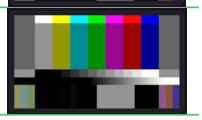
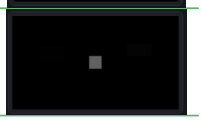
Field Pattern Red/ Colorbar	

greenMachine®

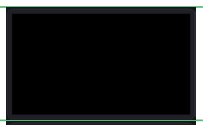
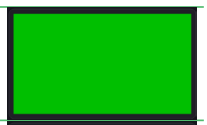
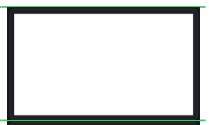
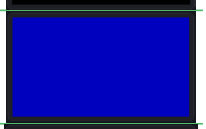
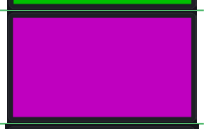
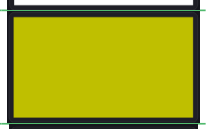
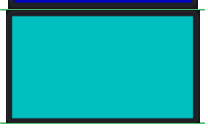
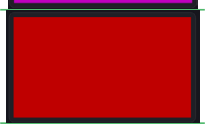
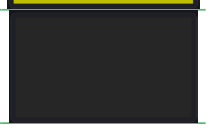
Testor
Video and Audio Testing

callisto+
titan

HDR Test Patterns

HDR Colorbar BT.2111 HLG Narrow		HDR Colorbar BT.2111 Slog3 Full		EBU AV Sync HLG Narrow	
HDR Colorbar BT.2111 PQ Full		HDR PLUGE BT.814 HLG		EBU AV Sync PQ Narrow	
HDR Colorbar BT.2111 PQ Narrow		HDR PLUGE BT.814 PQ			

Full Field Color Tests

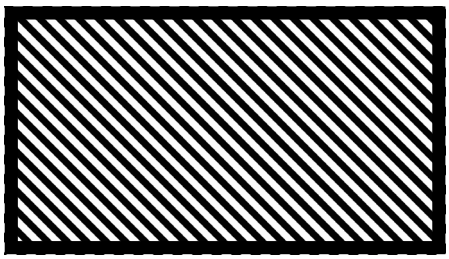
Full field Black		Full field Green		Full field White	
Full field Blue		Full field Magenta		Full field Yellow	
Full field Cyan		Full field Red		Grey 15%	

Dynamic Test Patterns for Large Scale LED Panel Display

Zebra Pattern

The Zebra Pattern is a display tearing and aspect ratio validator. The 45° angled, 20px wide, black and white bars move across an entire array of panels at the speed of 1px per frame. Individual delays of panels can easily be noticed this way.

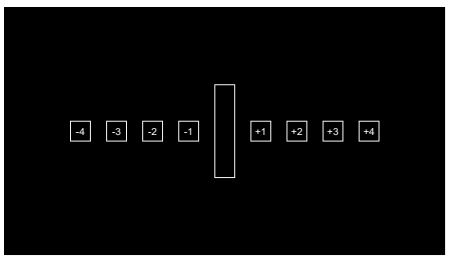
A precise delay in frames or ms can be calculated in regards of the frame rate of the display. Please note that greenMachine Testor can not change the individual delay of led panels.



Strobe Pattern

The background strobes one white frame periodically every 100 frames. If synchronization of all displays is accurate, a simultanious strobe will be visible.
To veryfy sincronicity a synchronized (genlocked) or high-speed camera has to film the screens.

The counters to the left and right of the sync bar will indicate how many frames ahead or behind any individual display is.



Feature: AV Sync Generator / Analyzer

The **AV Sync Generator and Analyzer** feature allows synchronization measurements between multi-channel audio and video within a signal path.

To use this measurement methodology, an **AV Sync Generator** is activated through the selected test pattern and passed through the signal path to be measured.

The generated test signal includes both video and audio markers, which use the "GLITS" (BBC) audio test signal standard for that purpose. The video marker consists of a horizontal black line in the center of the video image, flashing into one frame every four seconds (the "Black Flash"). In addition, two black bars moving towards each other and and colliding in the middle (commonly referred to as "Clap Bars") indicate the upcoming Black Flash to the watcher. The audio markers are small gaps in the tone that begin with a precise timing relationship to the "Black Flash". The used audio signals work with 4 different frequencies, to be able to detect audio channel swaps.

The generated video and audio markers can be activated on most existing test signals in the greenMachine's Testor constellation and in quad channel mode, up to four of these test signals can be generated at the same time. (one in 12G mode)

Using a greenMachine with Testor Constellation in quad channel mode, up to four signal chains can be measured at the same time and the measurement results are shown within LynxCentraal. In addition, the measurement results of one input channel can be overlayed on the incoming measured signal and routed out of greenMachine's SDI output 4, the optical, or HDMI output for external monitoring. (If SDI output 4 is used for the measurement overlay, it can't be used for the generator side anymore.)

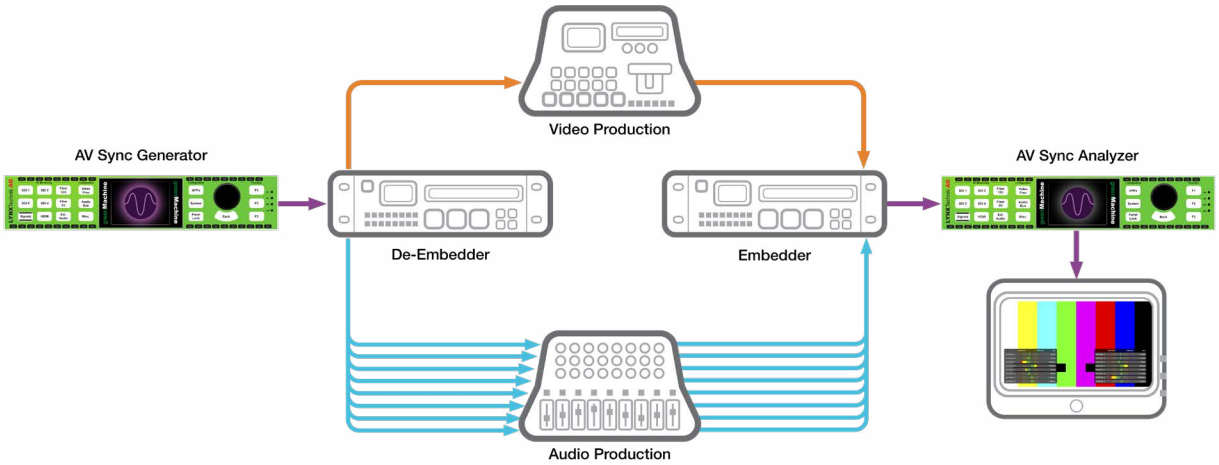
It is possible to use one greenMachine as an AV Sync generator and analyzer at the same time. But if the AV Sync overlay output is enabled, the reference source automatically jumps to the selected Overlay Video Source. If you want to use the Overlay feature with only one greenMachine, there must be a clock/sync uncupled device (e.g. a Frame Sync) between gM Output and gM Input.

Incompatible Test Patterns

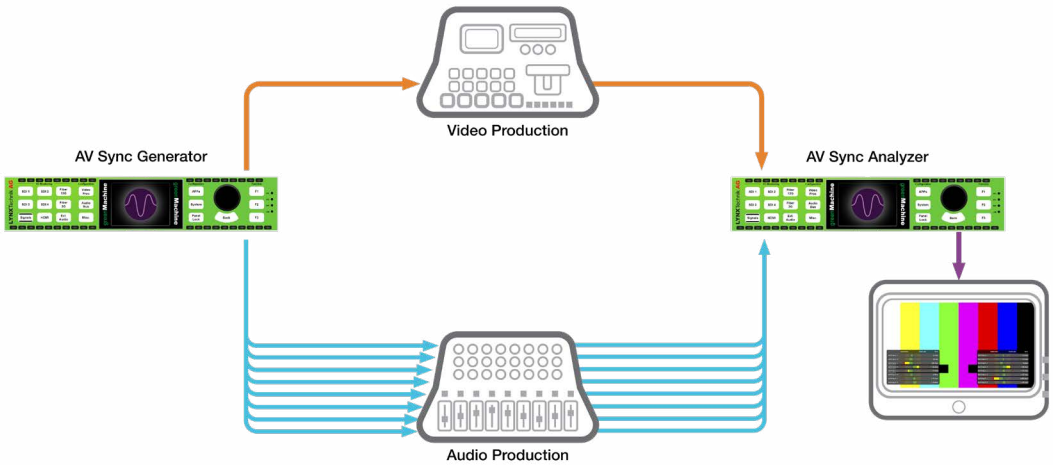
Some test patterns would cause interference with the AV Sync Generator and thus also the analyzer. The AV Sync Generator is not offered for these patterns:

EBU AV Sync (SDR and HDR)	**Colorbar SMPTE**
HDR PLUGE BT.814 (HLG and PQ)	**Strobe Pattern**
Flash Black	**Flash White**
Convergence Grill	**Persistence Test**
Four-Level PLUGE	**Full Field Black**

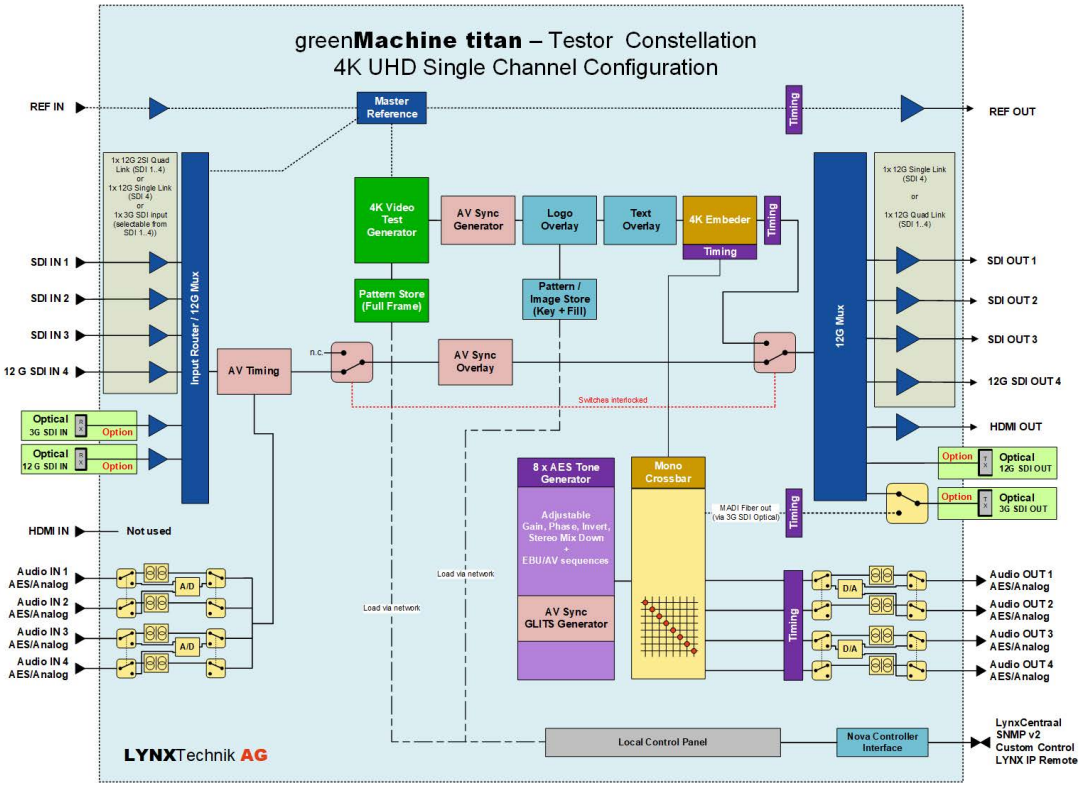
AV Sync Workflow with **embedded** audio channels**:**



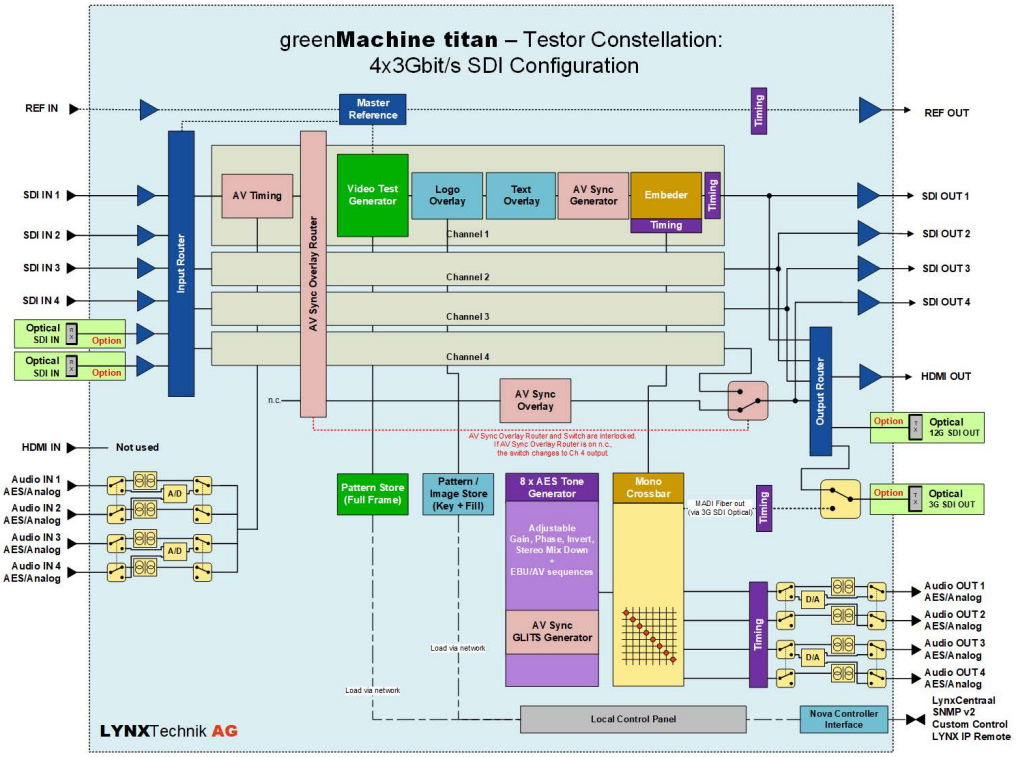
AV Sync Workflow with **discrete** audio channels**:**



Functional Diagram: 4k UHD Single Channel Mode



Functional Diagram: 3G Quad Channel Mode



Hardware Specifications

BNC Connection

SDI Inputs	3x 3G SDI video on 75 Ohm BNC connector (SMPTE, 292M, 424M, 259M) with automatic video format and standard detection	
	Return Loss:	>15dB from 5MHz to 1.5GHz, >10dB from 1.5GHz to 3GHz
	Automatic cable EQ (Belden 1694A):	340m @ 270Mbit/s, 150m @ 1.5Gbit/s, 110m @ 3Gbit/s
12G SDI Input	1x 12G SDI video on 75 Ohm BNC connector (SMPTE 292M, 424M, 259M, 2081, 2082) with automatic video format and standard detection	
	Return Loss:	>7dB to 6GHz; >4dB to 12GHz
SDI Output	3x SDI video on 75 Ohm BNC connector (SMPTE, 292M, 424M, 259M)	
	Timing jitter:	< 0.2 UI @ 270Mbit/s, < 1.0 UI @ 1.5Gbit/s, < 2.0 UI @ 3Gbit/s
	Alignment jitter:	< 0.2 UI @ 270Mbit/s, < 0.2 UI @ 1.5Gbit/s, < 0.3 UI @ 3Gbit/s
	Return Loss:	>15dB from 5MHz to 1.5GHz, >10dB from 1.5GHz to 3GHz
12G SDI Output	1x 12G SDI video on 75 Ohm BNC connector (SMPTE 292M, 424M, 259M, 2081, 2082)	
	Return Loss:	>7dB to 6GHz; >4dB to 12GHz
Reference Input	• 1x analog video reference on 75 Ohm BNC connector • Analog bi-level (SDTV) or tri-level (HDTV) auto detect	
Reference Output	• 1x analog video reference on 75 Ohm BNC connector • Analog bi-level (SDTV) or tri-level (HDTV), cross lock capability	

Audio Connection

Audio I/O	4x input and 4x output on Sub-D 25 female connector
Analog I/O	input impedance >10k Ohm Output Impedance 150 Ohm
	Analog I/O full scale level: selectable 12, 15, 18, 20, 22, 24 dBu

Technical Information

Power	12V DC @ 45W nominal (supports 7 - 24VDC input range)
	2x power connections for redundant power supply
Mechanical	W: 218mm (1/2 19"), H: 44mm (1.75"), D: 225mm (8.86") - including connectors.
	Weight: 1.4kg (3.09lb)
Ambient	Temperature: 5°C to 40°C (41°F to 104°F) maintaining specification
	Humidity: 90% maximum, non-condensing

Supported SDI Formats

SDTV	525 / 59.94Hz 625 / 50Hz		
HDTV	1080i / 50Hz 1080i / 59.94Hz 1080i / 60Hz 1080p / 23.98Hz 1080p / 24Hz 1080p / 25Hz 1080p / 29.97Hz	1080p / 30Hz 1080psf /23.98Hz 1080psf / 24Hz 1080psf / 25Hz 720p /23.98 Hz 720p / 24Hz 720p / 25Hz	720p / 29.97Hz 720p / 30Hz 720p / 50Hz 720p / 59.94Hz 720p / 60Hz
3Gbit/s Level A	1080p / 50Hz 1080p / 59.94Hz 1080p / 60Hz		
12Gbit/s Single Link	3840 x 2160p / 50Hz 3840 x 2160p / 59.94Hz 3840 x 2160p / 60Hz		
12GBit/s Quad Link 2SI Level A (4 x 3G)	3840 x 2160p / 50Hz 3840 x 2160p / 59.94Hz 3840 x 2160p / 60Hz		

Optical Connection

Optical SDI I/O (Optional)	• 1x 3G SDI SFP Transceiver (SMPTE 297M - 2006) • 1x 12G SDI SFP Transceiver (SMPTE 292M, 424M , 2081 2082) - no SD SDI (270MBit)
Optical Ethernet (Optional)	IEEE 802.3z 1000Base-X Gbit/s Ethernet over Fiber at 1Gbit/s (125 MB/s)

AV Connection

HDMI	• 1x Input 10 bit HDMI 1.4b • 1x Output 10 bit HDMI 1.4b

Digital	AES3 balanced transformer isolated; Digital output level: 4V peak to peak nom
MADI	64 channel MADI supported on selected constellations (optional MADI SFP reqired for this)

Network Connection

Ethernet (LAN)	1x 10/100/1000 BaseT RJ45 Connector
GPI I/O	• 4x general purpose inputs (RJ45 Connector) • 4x general purpose outputs (RJ45 Connector)
Serial Data	EIA/ETA RS232C / RS422 /RS 485 (selectable through Lynx-Centraal) - RJ45 connector ESD protection for up to 16kV

LYNXTechnik AG® | Broadcast Television Equipment
www.lynx-technik.com

Options: Rack Frames, Carry Case, and SFP Options

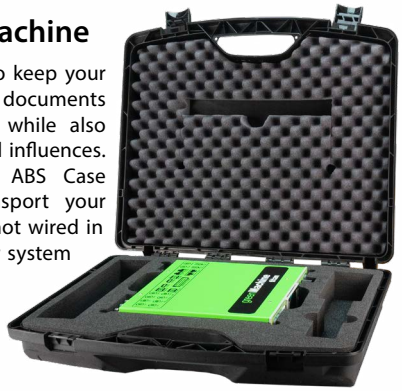
RFR 6000 - 1RU 19" Rack Mount Chassis

Rack mounting hardware which can accommodate one or two greenMachines in 1RU of rack space which also securely mounts the power supplies.
Note: Two power supplies can be mounted onto one RFR 6000. Please see more information in the RFR 6000 quick reference guide.

One greenMachine in Rack Mount

ABS Case for greenMachine

The transport case is perfect to keep your greenMachine®, cables and documents organized and in one place, while also protecting it from enviromental influences. With it's study design, our ABS Case is the ideal partner to transport your greenMachine® whenever it is not wired in a rack, standalone or any other system you can think of.



RXT 6001 19" Rack Extension for RFR 6000

The RXT 6001 is a compact and flexible rack extension for RFR 6000. It can be setup to hold up to four RPS A100 power supplies with optimized airflow surfaces.

RXT 6001 installed in RFR 6000

SFP Fiber Options

	Transmitter	Transceiver
3G SDI (Use in 3G/12G SFP port)	OH-TX-1-LC	OH-TR-1-LC
	OH-TX-1 LC/SC/ST	OH-TR-4-XXXX-LC
	OH-TX-0-850-MM	OH-TR-8-XXXX-LC
	OH-TX-4-XXXX-LC*	
12G SDI (Only use in 12G SFP port)	OH-TX-12G-LC	OH-TR-12G-LC
	OH-TX-12G-ST	OH-TR-12G-XXXX-LC*
	OH-TX-12G-XXXX-LC*	
Ethernet Control		OH-TR-51-LC
		OH-TR-54-XXXX-LC*

* **XXXX = Wavelength. All 18 CWDM wavelengths according to ITU-T G.694.2 are available.**
Select from wavelengths 1270, 1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 190, 1610nm when ordering.

Ordering Information

greenMachine Package		
Includes **GM 6840:**	greenMachine titan Processors	
Includes **RPS A100:**	Primary Power Supplies with Region Specific Power Cord	
Includes **GMC-TESTOR:**	Testor Constellation Software License	
GMPT TESTOR (N/EU/US/UK)	1 x 12G/4 x 3G SDI AV Test Signal Generator (Hardware & License) Power plug Variants (please specify when ordering) GMPT TESTOR N Power supply without Plug GMPT TESTOR EU Power Supply with EU Plug GMPT TESTOR US Power Supply with US Plug GMPT TESTOR UK Power Supply with UK Plug	**EAN:** 4250479327863
License Only (no hardware included)		
GMC-TESTOR-titan	greenMachine titan Testor constellation	4250479326101
Accessories and Power Supply		
RFR 6000	1 RU 19" Rack Mount Chassis	4250479324466
RXT 6001	19" Rack Frame Extension for RFR 6000	4250479326507
RPS A100 (N/EU/US/UK)	AC to DC Desktop Power Supply Module 12V/8A (with None / EU / US / UK plug)	4250479327955

More broadcast applications:

- *GMC-3GUPXD*: Dual 3G Up/down/cross converter and Dual scaler
- *GMC-4KUPXD*: 4K Up/Down/Cross Converter
- *GMC-HDREvie+*:
- *GMC-4FS*: 4x3Gbit/s Frame Synchronizer
- *GMC-BiDi-Transport*: Bi-directional Transport

The greenMachine hardware can be configured for a different broadcast application by re-deploying a different application called "constellation". These perpetual licenses are and application deployment on the greenMachine.

For greenMachine the following regulatory and safety standards apply:

CE: EN 55103-1/1996, EN 55103-2 /1996, EN 60950-1/2006
Following the provisions of 2004/108/EC and 2006/95/EC directives.

FCC: This equipment has been tested and found to comply with the limits for a
Class B digital device, pursuant to Part 15, Subpart B of the FCC Rules.

The RPS A100 power supply (EA11011D-1200) complies with the following safety standards:
UL/cUL 62368-1, TUV EN 62368-1, CB IEC 62368-1, FCC, CE, BSMI, PSE, RCM, IRAM