greenMachine®

HDR enhanced video image engine Evie+©

Segmented Dynamic HDR to SDR converter

The greenMachine HDR Evie+ (Enhanced Video Image Engine), 1 RU half 19" rackmount, is a real-time segmented frame-by-frame broadcast-quality High Dynamic Range (HDR) to Standard Dynamic Range (SDR) converter, with frame sync supporting formats up to 4K UHD (3840x2160). It is the world's first system that uses the advanced algorithm for sectional dynamic tone mapping which automatically analyzes different sections of an image in HDR stream and applies optimal corrections on a frame by frame basis in real-time. This unique capability is unlike any other solution today and is the perfect real-time production tool for sports or any live broadcast event needing high-quality real-time HDR to SDR conversions. HDR EVIE+ fits best in the single native HDR workflow reducing cost on equipment and manual operations.

HDR EVIE+ provides 1x 4K/UHD processing channel supporting down-conversion from HDR transfer characteristics to SDR through appropriate sectional dynamic tone mapping. It also supports **Wide Color Gamut** (WCG) needs of broadcasters, and professional AV live events requirement. HDR Evie+ package also includes HDR **Static** configuration for Static HDR <> SDR conversions, which performs static tone mapping to realize UP/Down/Cross conversions between HDR and SDR, suited best for the studios or the environments where the light conditions do not change dynamically.

Features

Sectional Dynamic HDR Down-Conversion

Input Transfer Characteristics	PQ ST-2084, PQ BT-2100, HLG, Sony SLog3, Arri LogC, Red Log3G10, BMD Film, Panasonic V-Log, Canon C-Log2
Output Transfer Characteristics	Standard Dynamic Range (SDR)

Colorimetry Supported

Input Colorimetry	BT.2020, BT.709, Sony S-Gamut, ACES, DCI-P3, Panasonic V-Gamut, BMD Film, Canon Cinema Gamut, Arri Alexa, Red Wide Gamut
Output Colorimetry	BT.2020, BT. 709

Color Processing

- RGB gain and offset adjustment
- CMYW gain and offset adjustment

Operation Modes

- 4K UHD single 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) representation from 64 to 940 decimal values

Dynamic Processing

- *Local Dynamic to Global Dynamic Ratio engine* allows a user to mix sectional tone mapping and global tone mapping proportionally
- *Global Dynamic to Static Ratio engine* allows a user to mix dynamic tone mapping and static tone mapping proportionally
- *Dynamic adaptation speed engine* (frame-by-frame) allows a user to adjust tone mapping calculation speed to get smooth and consistent viewing impression
- *Automated Scene Detection engine* allows a user to adjust the parameter that detects a scene change for automated adjustment of image brightness levels
- User-adjustable *target brightness*, *contrast,* and *saturation*

Other included features

- Frame Synchronizer
- Embedding /De-embedding with DolbyE™ embedding support
- Basic Audio & Video Test Generator
- Audio Processing with gain adjustment, mute, inversion, and stereo to mono mix-down
- MetaData Management
- Video Adjustment include saturation, gain, black and hue adjustment
- Color matching
- Timing with available video and audio delay per channels is 30 frames and 1.3 seconds respectively
- Nova controller with full SNMP v2 support and custom control

Package includes HDR Static*

- Static HDR <> SDR Conversion- provides the best "roundtrip" (HDR>SDR>HDR or SDR>HDR>SDR)
- 3G Quad channel or 4K UHD single chanel configuration
- MADI input and output

*The greenMachine hardware will support only one configuration at a time. It can be either be used in HDR Evie+ configuration or HDR Static configuration.

Other broadcast applications*

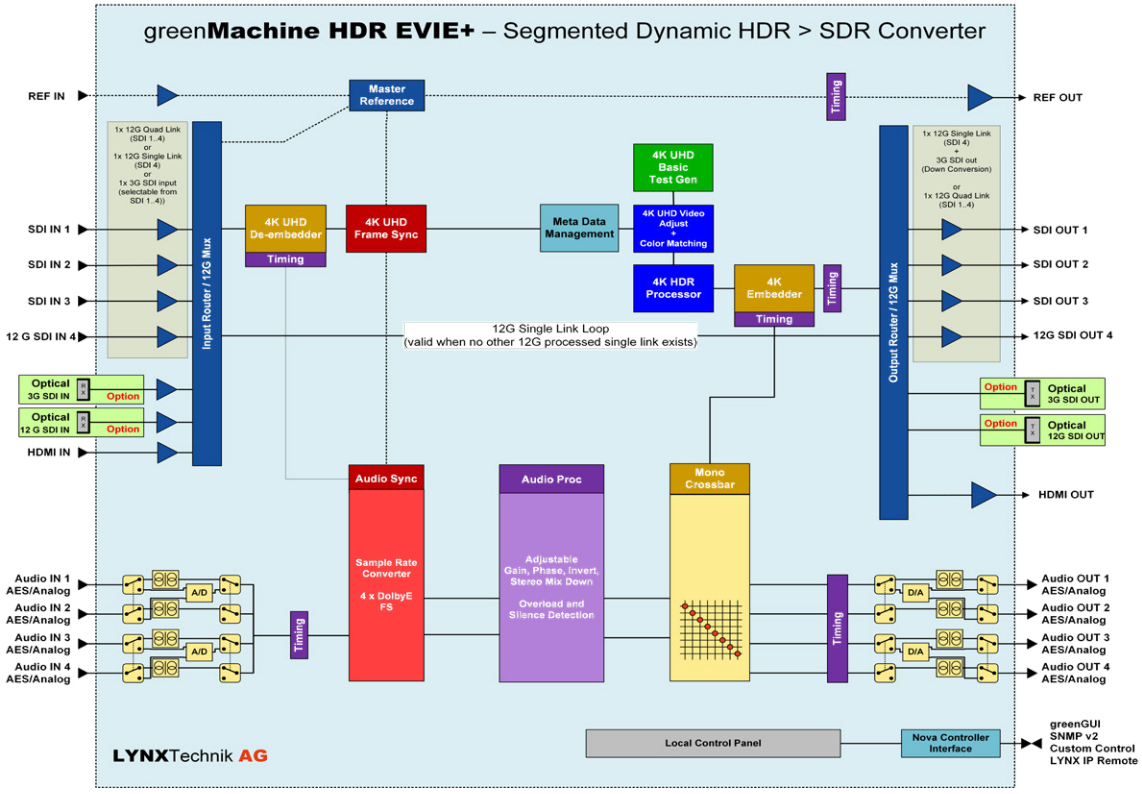
- *GMC-HDR-EVIE:* Dynamic HDR > SDR converter
- *GMC-TESTOR*: Audio & Video Test signal generator in 4K UHD or Quad 3G mode including HDR test patterns
- *GMC-4KUPXD*:4K Up/down/cross converter
- *GMC-3GUPXD*:Dual 3G Up/down/cross converter and Dual scaler
- *GMC-Quad3G-FS*: 4x3Gbit/s Frame Synchronizer
- *GMC-BiDi-Transport*: Bi-directional Transport (requires two greenMachine working in Master & slave configuration.

*The greenMachine hardware can be configured for a different broadcast application independent of HDR Evie via the purchase of perpetual licenses and application deployment on the greenMachine.

Supported SDI Formats

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

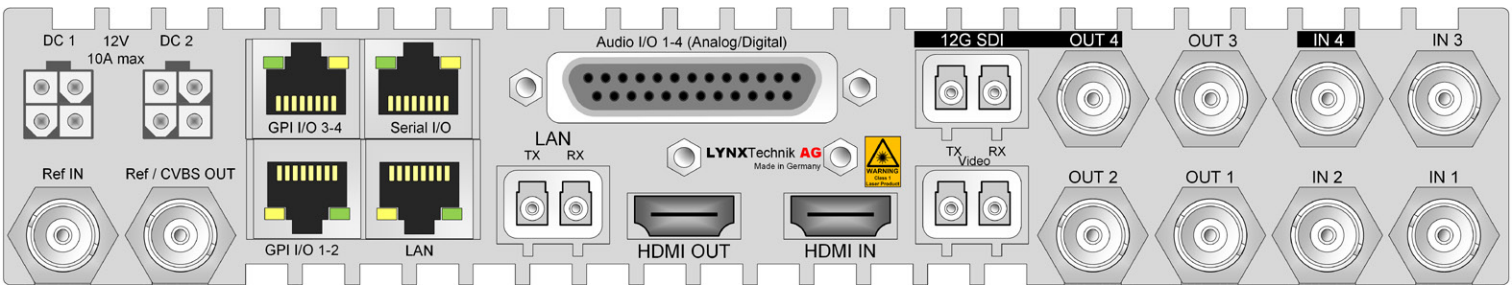
Functional Diagram Single 4K UHD Channel



Hardware Specifications

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@2.97Gbit/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: same as 3G SDI; >7dB to 6GHz; >4dB to 12GHz*
HDMI Input / Output	*1x 10 bit HDMI 4K/UHD 1.4b*
Optical 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)*
Ethernet (LAN)	*1x 10/100/1000 BaseT RJ45 Connector*
Optical Ethernet (Optional)	*IEEE 802.3z* *1000Base-X Gbit/s Ethernet over Fiber at 1 Gbit/s (125 MB/s)*
GPI I/O	*4x general purpose inputs + 4x general purpose outputs - RJ45 Connectors*
Reference Input	*1x analog video reference on 75 Ohm BNC connector*
	Analog bi-level (SDTV) or tri-level (HDTV) auto detect
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 @ 2.97Gbit/s
	Alignment jitter: < 0.2 UI @ 270Mbit/s, < 0.2 UI @ 1.5Gbit/s, < 0.3 UI @ 2.97Gbit/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: same as 3G SDI; >7dB to 6GHz; >4dB to 12GHz*
Serial Data	*EIA/ETA RS232C / RS422 /RS 485 (selectable through greenGUI) - RJ45 connector* *ESD protection for up to 16kV*
Reference Output	*1x analog video reference on 75 Ohm BNC connector*
	Analog bi-level (SDTV) or ri-level (HDTV), cross lock capability
Audio I/O	*4x input and 4x output on Sub-D 25 female connector*
	Analog: input impedance >10k Ohm, Output Impedance 150 Ohm
	Analog I/O full scale level: selectable 12, 15, 18, 20, 22, 24 dBu
	Digital: AES3 balanced transformer isolated; Digital output level: 4V peak to peak nom
Power	*12VDC @ 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
Model #	*GMPT HDREVIE EU- (EAN# 4250479326392)*
	GMPT HDREVIE UK - (EAN# 4250479326408)
	GMPT HDREVIE US - (EAN# 4250479326415)
Includes	*greenMachine Titan: GM6840* *Dynamic HDR to SDR Converter Constellation: GMC-HDR-EVIE-titan* *Static HDR to SDR Converter Constellation: GMC-HDR-STATIC-titan* *Primary Power Supply: R PS 6120 with EU/UK/US power cord*



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

RPS 6120 - Redundant Power Supply

The second external in line power supply for redundant power protection.

ABS Case for greenMachine

The hard shell case protects your greenMachine® from most impacts in an average, busy work environment, while the inner foam coating prevents it from being scratched by cables, connectors or other equipment that can also be stored inside the case. The foam pocket inside the top lid of the case is ideal for storing quick reference guide, notes or any documentation.

RXT6001 19” Rack Extension for RFR 6000

The greenMachine is ideally suited for standalone applications but this powerful processing platform reaches its full potential when used within a system design.
The RXT 6001 is a compact and flexible rack extension for RFR 6000. It can be setup to hold up to four RPS 6120 power supplies.

RXT 6001 installed in RFR 6000

Fiber Options

Basic 3G SDI Video Fiber Transmitter		**Power**	
OH-TX-1-Y-LC/ST/SC	SDI Fiber TX SFP - LC/SC or ST - 1310nm	-5dBm	
Basic 3G SDI Video Fiber Receiver		**Sensitivity**	
OH-RX-1-LC/ST/SC	SDI Fiber RX SFP - LC/SC or ST - 1270-1610nm	-16dBm	
Basic 3G SDI Video Fiber Transceiver		**Power / Sensitivity**	
OH-TR-1-LC	SDI Fiber Transceiver, Singlemode - LC - 1310nm	-5dBm	-18dBm
OH-TR-0-850-MM	SDI Fiber Transceiver, Multimode - LC - 850nm	-5dBm	-15dBm
12G SDI Video Fiber (support 1.5G/3G/6G and 12G SDI)		**Power / Sensitivity**	
OH-TR-12G-LC	12G SDI Fiber Transceiver, Singlemode - LC - 1310nm	-5dBm	-12dBm
OH-TX-12G-LC	12G SDI Fiber Transmitter, Singlemode - LC - 1310nm	-5dBm	–
OH-RX-12G-LC	12G SDi Fiber Receiver, Singlemode - LC	–	-12dBm
CWDM SDI Video Fiber Transmitter (TX) and Transceiver (TR) (12G variants support 1.5G/3G/6G and 12G SDI)		**Power / Sensitivity**	
OH-TR-12G-XXXX-Y-LC **XXXX** = Wavelength	12G SDI Fiber Transceiver - CWDM capable - 10km* - LC 17 wavelengths acc. to ITU T G692.2 1270nm through 1590nm.	-2...+3 (dBm)	-10dBm (6G,12G) -14dBm (1.5G,3G)
OH-TX-12G-XXXX-LC **XXXX** = Wavelength	12G SDI Fiber Transmitter - CWDM capable - 10km* - LC 8 wavelengths acc. to ITU T G692.2: 270nmn-1330nm & 1550nm-1610nm	-3dBm	–
OH-TX-4-XXXX-Y-LC **XXXX** = Wavelength	SDI Fiber Transceiver, Singlemode - CWDM capable - 40km* - LC 18 wavelengths acc. to ITU T G692.2: 1270nm through 1610nm.	-1dBm	–
12G SDI Video Fiber Bidirectional Transceiver (support 1.5G/3G/6G and 12G SDI)		**Power / Sensitivity**	
OH-BD-12G-1270-LC	SDI Fiber Bidirectional Transceiver - WDM capable - 10km* - LC OH-BD-12G-1330-LC required at opposing end	-3...+3 dBm	-10dBm (6G,12G) -14dBm (1.5G,3G)
OH-BD-12G-1330-LC	SDI Fiber Bidirectional Transceiver - WDM capable - 10km* - LC OH-BD-12G-1270-LC required at opposing end	-3...+3 dBm	-10dBm (6G,12G) -14dBm (1.5G,3G)
Basic Ethernet Fiber Transceiver		**Power / Sensitivity**	
OH-TR-51-LC	Ethernet Fiber Transceiver, Singlemode - 10km* - LC - 1310nm	-3dBm	-21dBm
CWDM Ethernet Fiber Transceiver		**Power / Sensitivity**	
OH-TR-54-XXXX-LC **XXXX** = Wavelength	Ethernet Fiber Transceiver, Singlemode - CWDM capable - 40km* - LC 18 wavelengths acc. to ITU T G692.2 1270nm through 1610nm.	0dBm	-21dBm

* Distance is an approximation. Actual distances achieved can be longer or shorter depending on the type of fiber cable and accumulated optical losses in the fiber link. Determine link losses and perform optical budget calculations to ensure correct operation.

More SFP options are available.

Ordering Information

GMPT HDR EVIE+ EU	Segmented Dynamic HDR to SDR converter EU	EAN: 4250479327269
GMPT HDR EVIE+ UK	Segmented Dynamic HDR to SDR converter UK	EAN: 4250479327276
GMPT HDR EVIE+ US	Segmented Dynamic HDR to SDR converter US	EAN: 4250479327283
GMC-HDR-STATIC-titan	Static HDR <> SDR converter	EAN: 4250479326118
GMC-HDR-EVIE-titan	Dynamic HDR to SDR Converter	EAN: 4250479326187
GMC-quad3G-FS	4x3Gbit/s Frame Synchronizer	EAN: 4250479326057
GMC-3GUPXD	Dual 3G Up/Down/Cross Converter + Dual Scaler	EAN: 4250479326521
GMC-4KUPXD	4K Up/Down/Cross Converter	EAN: 4250479326064
GMC-TESTOR-titan	Audio Video Test Signal Generator	EAN: 4250479326101
GMC-BiDi-Transport	Bi-directional Transport	EAN: 4250479326088
RFR 6000	1 RU 19" Rack Mount Chassis	EAN: 4250479324466
RXT6001	19" Rack Frame Extension for RFR 6000	EAN: 4250479326507
RPS 6120 EU	Desk Power supply with EU cord	EAN: 4250479324343
RPS 6120 UK	Desk Power supply with UK cord	EAN: 4250479324350
RPS 6120 US	Desk Power supply with US cord	EAN: 4250479324367

This project (HA project no. 549/17-31) is financed with funds of LOEWE (Landes-Offensive zur Entwicklung Wissenschaftlich-ökonomischer Exzellenz)
Förderlinie 3: KMU-Verbundvorhaben
in cooperation with:

LOEWE – Exzellente Forschung für Hessens Zukunft
Hochschule RheinMain University of Applied Sciences Wiesbaden Rüsselsheim
HESSEN – Hessisches Ministerium für Wissenschaft und Kunst

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 6120 power supply (EA11011H-120) complies with the following safety standards:
UL, **CCC**, **PSE**