greenMachine®

Testor

Video and Audio Testing

Quick Reference Guide
AV Sync
greenMachine titan

Rev 1.2 – April 2023

LYNXTechnik AG®

Broadcast Television Equipment

THIS Quick Reference Guide SUPPORTS:	
titan version	903
LynxCentraal version	1.1.4

Contents

1. Introduction

This quick reference guide provides information related to the greenMachine Testor AV Sync feature. The function of an AV Sync is to generate a specific test signal overlay with embedded audio on the generator side and to detect the presence of an AV sync test signal and measure/verify the audio/video time delays on the analyzer side. It is also used for verifying if the audio channels are swapped.

The AV Sync Generator allows multiple existing test signals in gM Testor constellation to be be overlayed with a specific AV Sync overlay. 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 AV Sync Analyzer is able to measure signals with the generated AV Sync overlay. Measurements can be shown via GUI as well as in the form of measurement overlays on the output of the analyzer. The measurement results refresh every 4 seconds.
The analyzer enables simultaneous timing measurement of up to four AV sync input test signals (in Testor Quad mode) in LynxCentraal or via 3rd party applications using **RemoteIF,** a LYNX Technik Protocol.
Additionally, in Testor Quad mode one input can be overlayed with the sync measurements and routed to the SDI Out 4 or to the optical/HDMI ports. In Testor 4K mode, for quad-link 12G signals, the output with overlay will be available on all ports (electrical, optical, HDMI). For single link 12G signal, the output will be available on Out 4 electrical port and Opt Out 2 optical port.

In Testor quad mode, the overlay feature is available on only one processing channel, while the remaining inputs can be used as additional simultaneous measurement inputs. Testor 4K mode consists of only one processing channel and therefore when AV Sync overlays are activated, the test generator functionality will be disabled.

This *Quick Reference Guide* is designed to help you setup a greenMachine Testor AV Sync and provides step-by-step instruction on its operation.

2. Application

The application of AV Sync as below:

1. Allows generating and measuring of audio and video timing in a broadcast signal chain
2. It allows an operator to identify AV timing mismatch via GUI/overlay promptly and make adjustments accordingly.
3. It avoids guesswork and provides a more accurate measurement. It reduces unwanted errors significantly.

3. Setup requirements

Before setting and configuring the Testor AV Sync Analyzer, ensure the following requirement are met:

1. The greenMachine Titan version used is **903** and above.
2. The LynxCentraal version installed must be **1.1.4** for Windows
3. The Testor constellation is deployed on the greenMachine.

Note: The Testor AV Sync is supported on both Testor 3G Quad and 4K mode.

4. Quick-Setup Guide

4.1. Supported Formats

The greenMachine Testor AV sync supports the same video format as supported by the greenMachine Testor constellation.

Testor Quad Mode

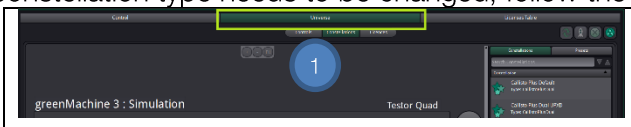
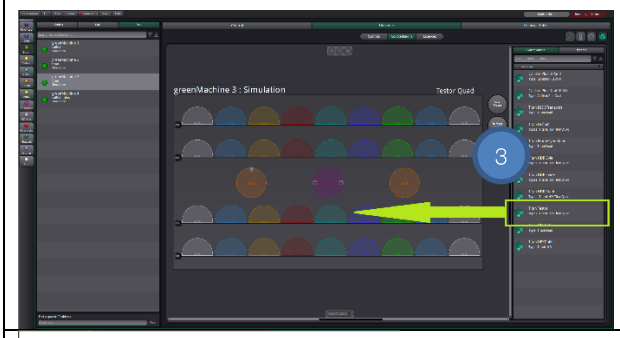
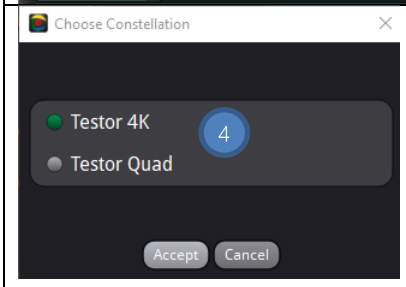
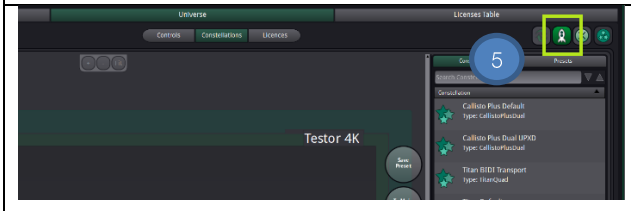
Data Rates	Video Format	Refresh Rate
SD	525	59.94Hz
	625	50Hz
1.5G	720p	23.98/ 24/ 25/ 29.97/ 30/ 50/ 59.94/ 60Hz
	1080i	50/ 59.94/ 60Hz
	1080p	23.98/ 24/ 25/ 29.97/ 30Hz
	1080psf	23.98/ 24/ 25Hz
3G	1080p	50/ 59.94/ 60Hz

Testor 4K Mode

Data Rates	Video Format	Refresh Rate
SD	525	59.94Hz
	625	50Hz
1.5G	720p	23.98/ 24/ 25/ 29.97/ 30/ 50/ 59.94/ 60Hz
	1080i	50/ 59.94/ 60Hz
	1080p	23.98/ 24/ 25/ 29.97/ 30Hz
	1080psf	23.98/ 24/ 25Hz
3G	1080p	50/ 59.94/ 60Hz
12G (Single Link)	2160p	50/ 59.94/ 60Hz

4.2. Deploying Testor Constellation

A new greenMachine Testor comes with the pre-deployed Testor constellation. In case the constellation type needs to be changed, follow the below steps:

	1 On the LynxCentraal software, click *Green* and then on the *Universe* page
	2 Zoom in to greenMachine. Verify the name or the IP address of the greenMachine for which the constellation type needs to be changed. (Reconfirm if the correct greenMachine is selected). In case there are many greenMachines connected on the network, double-click on the greenMachine box on the left of the UI on the Rolodex, as shown in the picture and the system will zoom on to the correct machine.
	3 On the right pane under the Constellation tab, use the mouse to scroll down to *Testor*. Press the left mouse button on the Testor box and drag and drop it on the left inside the greenMachine GUI window. The user will see a green border around the greenMachine GUI window if done correctly.
	4 Choose the correct type of Testor constellation from the two options: • Testor 4K • Testor Quad
	5 Click on the *Deploy* button to deploy the Testor constellation

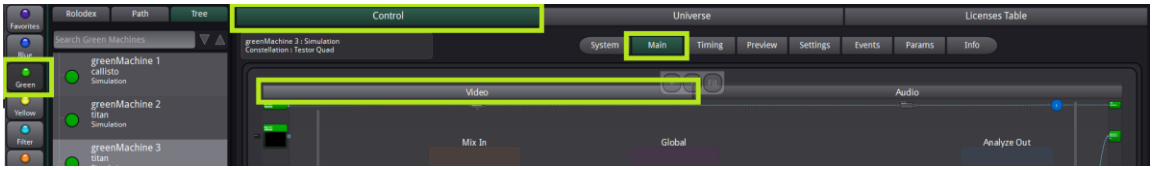
4.3. AV Sync Generator

The Testor AV Sync Generator allows to add AV Sync test signal requirements to some of the existing test signals in the Testor constellation.

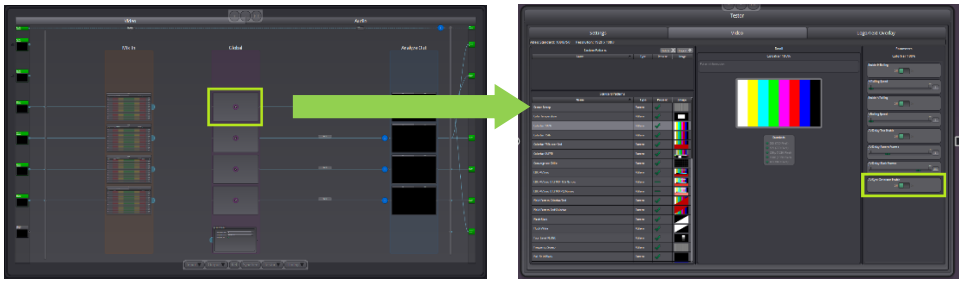
4.3.1. Enable AV Sync Generator in LynxCentraal

The behavior and setup for the AV Sync Test Generator works the same way in Testor Quad and 4K mode. The example below shows the Quad mode.

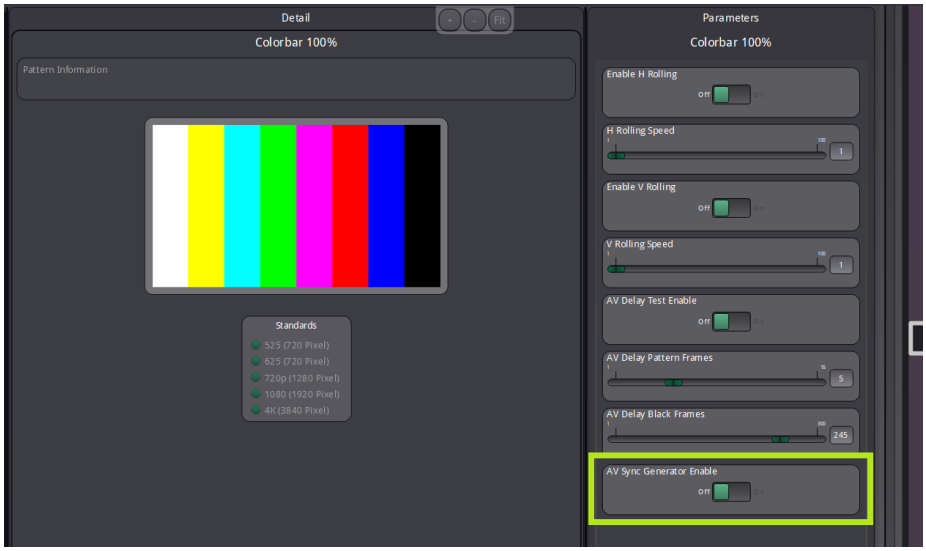
Step 1: Go to **Green** > **Control** > **Main** > **Video;** the following page is displayed:



Step 2: Zoom into the global section to the Generator tab of the channel, by double-clicking on the Generator tab you like to use. The example below shows the first channel:



Step 3: Choose the test signal, you like to use and enable the AV Sync Generator with the corresponding On/Off switch in the settings of the test signal.

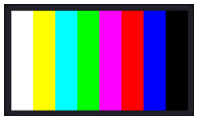


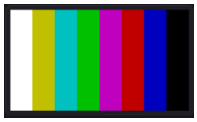
The greenMachine will now overlay the AV Sync Overlay to the test signal fill the audio channels automatically with the different dinus tones.

4.3.2.AV Sync Generator supported test signals

Center Sweep 

Color Temperature 

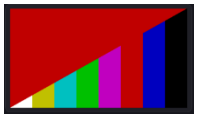
Color Bar 100% 

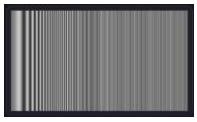
Color Bar 75% 

Color Bar 75% over Red 

Colorbar SMPTE 

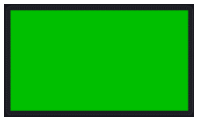
Field Pattern Colorbar/Red 

Field Pattern Red/Colorbar 

Frequency Sweep 

Full field Blue 

Full field Cyan 

Full field Green 

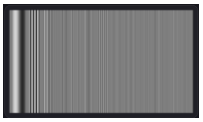
Full field Magenta 

Full field Red 

Full field White 

Full field Yellow 

Grey 15% 

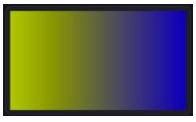
Multiburst 

Pathological EQ 

Pathological EQ/PLL 

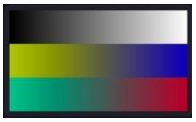
Pathological PLL 

Ramp Down Y 

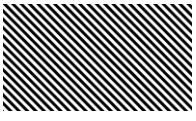
Ramp Up CB 

Ramp Up CR 

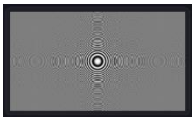
Ramp Up Y 

Ramp Up YCbCr 

Staircase 

Zebra 

Zoneplate 

Zoneplate Moving 

HDR Colorbar BT.2111 HLG Narrow 

HDR Colorbar BT.2111 PQ Full 

HDR Colorbar BT.2111 PQ Narrow 

HDR Colorbar BT.2111 Slog3 Full 

Note: The test patterns Convergence Grille, EBU AV Sync, Flash Black, Flash White, Four-Level PLUGE, Full field Black, HDR PLUGE BT.814 HLG, HDR PLUGE BT.814 PQ, Persistence Test and Strobe are not supported by the AV Sync Generator.

4.4. AV Sync Analyzer

The Testor AV Sync Analyzer allows viewing of timing sync of a AV sync input test signal via the output overlay of the greenMachine or via LynxCentraal. The third party application can also use RemoteIF for timing measurement information.

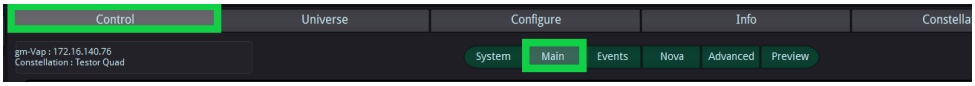
Note: The Testor Quad mode consists of four 3G processing channel while Testor 4K mode consists of one 12G single link processing channel. The Testor AV Sync analyzer overlay is supported only on one channel.

4.4.1.Viewing AV timing sync on greenGUI

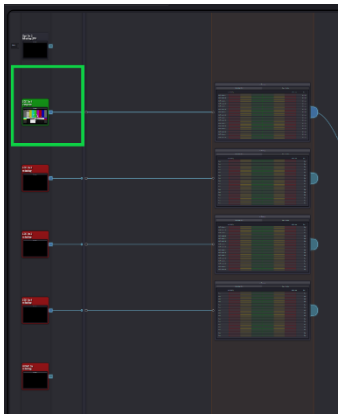
A user can get the AV timing sync information on the greenGUI by following the below steps:

4.4.1.1. Testor Quad Mode

Step 1: Go to **Control** > **Main** > **Video;** the following page is displayed:



Step 2: Connect the AV sync test signal on any SDI input port 1-4. The example below shows the SDI input connected to input port 1.



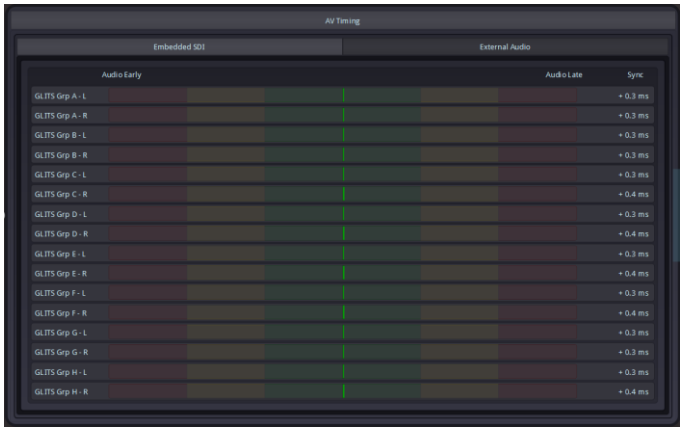
Note: An AV sync input test signal, for AV sync timing analysis, is only supported on Input 1 to 4 and the optical inputs. The HDMI input does not support this functionality yet.

Step 3: Zoom into the **AV timing block** on the corresponding processing channel to which the AV sync input test singal is connected:

Step 4: The AV timing gives the following information:
1. Embedded SDI AV timing
2. External Audio AV timing

Step 5: The **Embedded SDI** tab will provide timing information of the embedded audio on the AV sync input test signal. The information will be displayed based on the scenarios discussed below:

Scenario 1: An AV sync test signal connected at the input source:



In this scenario, the left column provides information on whether the audio channel consists of a “Glits” tone or not.

Groups	Glitz Frequency
Group A	980 Hz
Group B	432 Hz
Group C	990 Hz
Group D	436 Hz
Group E	1005 Hz
Group F	444 Hz
Group G	1013 Hz

If the audio channel frequency does not match with the Glits tone frequency, then the actual audio channel frequency will be displayed as shown in the picture below:

An audio channel-swap can be easily identified by checking the sequence of the audio group and the left and right channels, as shown below:

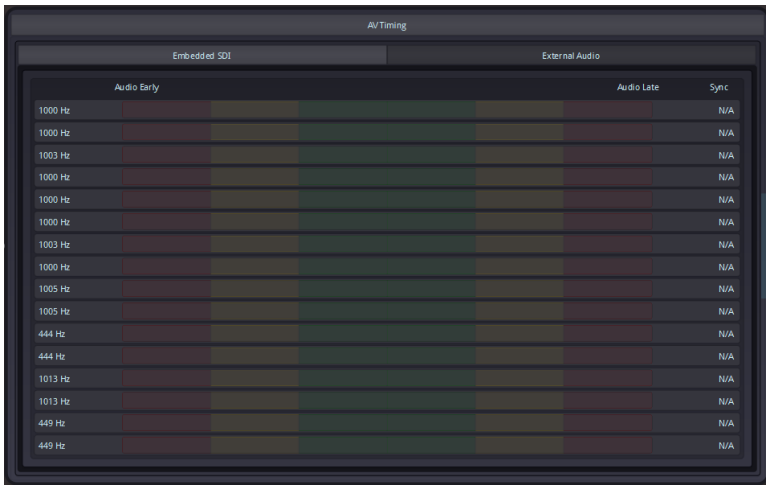
In the example above, AES 2 (Group B) is swapped with AES 1 (Group A).

The middle section will represent the audio early or audio delay graphically

The “Sync” column will provide the audio delay measurement in ms. Delayed audio will have a measurement in +ms and early audio will have a measurement in -ms.

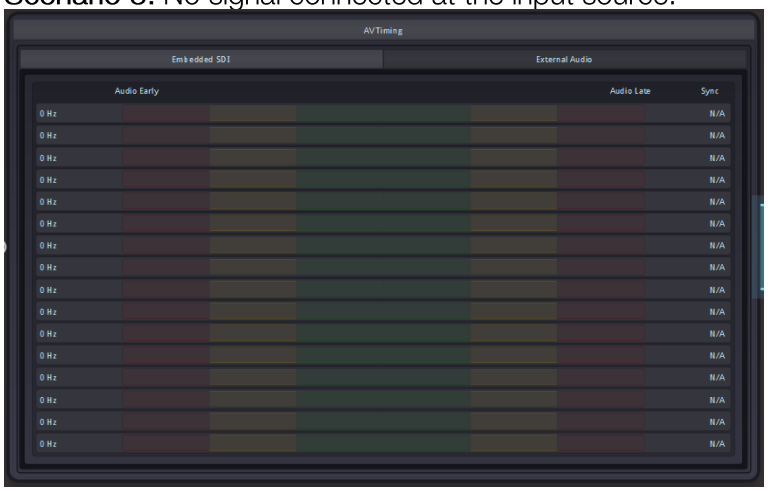
Status	Color	Range
Audio Early	Green	0ms to -10ms
	Yellow	-10ms to -20ms
	Red	-20ms to -2s
Audio Late	Green	0ms to +20ms
	Yellow	+20ms to +40ms
	Red	+40ms to +2s

Scenario 2: A video signal without a AV sync test signal connected to the input (No Glitz test tone present)



In this scenario, the left column will indicate the actual frequency in Hz of the audio channels but will not indicate the Glitz tone.
The “Sync” column will indicate N/A as the AV sync test signal is absent.

Scenario 3: No signal connected at the input source.

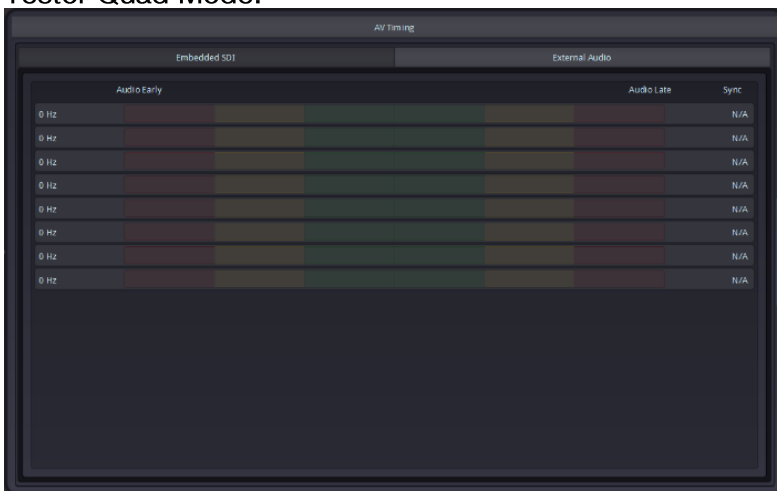


In this scenario, the left column will indicate “0Hz,” and the Sync column will display N/A.

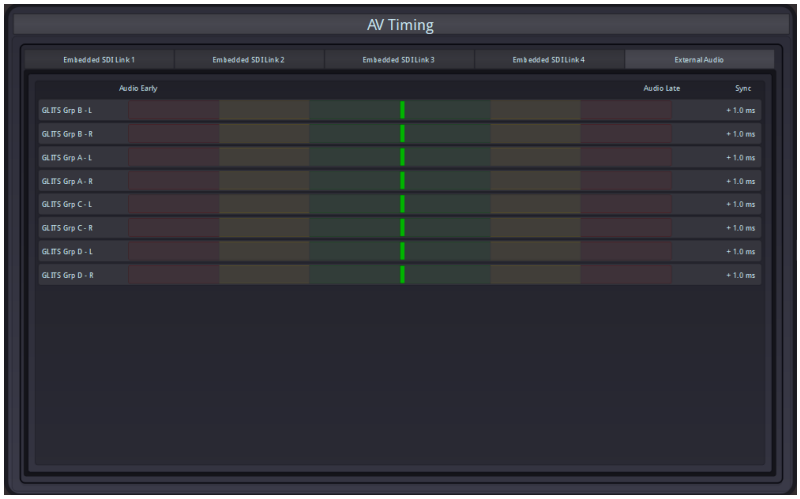
Note: When an existing AV sync test signal is disconnected from the greenMachine, the values displayed in the A/V timing will remain and will not reset to 0. This may also happen to the audio channels that are not present on the SDI. This is a known issue and will be resolved in subsequent releases.

Step 6: To get the external audio timing information, click on **External Audio,** the following page will be shown:

Testor Quad Mode:



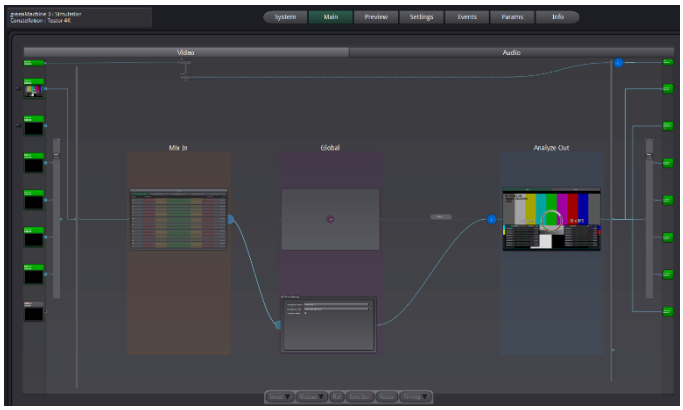
Testor 4K Mode:



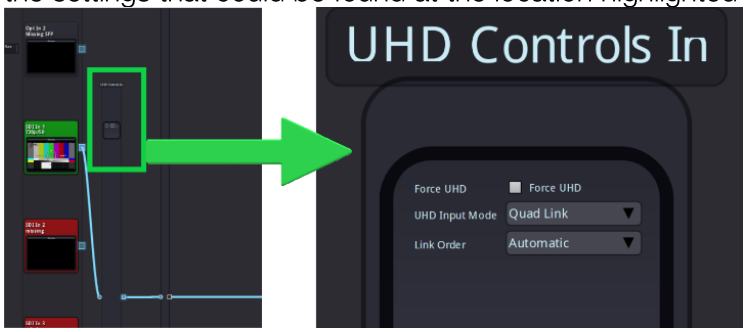
The external audio page will provide AV sync information of 8 external Analog/digital audio channels.

4.4.1.2. Testor 4K Mode

Step 1: Go to **Control** > **Main** > **Video;** the following page is displayed:

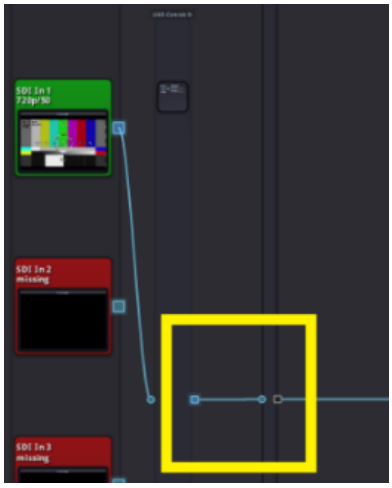


Step 2: Connect a AV sync test signal on SDI input port IN 1-4 for 2SI 12G SDI 2SI or IN 4 for 12G SDI.
Configure the UHD Controls information as per the connected SDI signal in the settings that could be found at the location highlighted below:

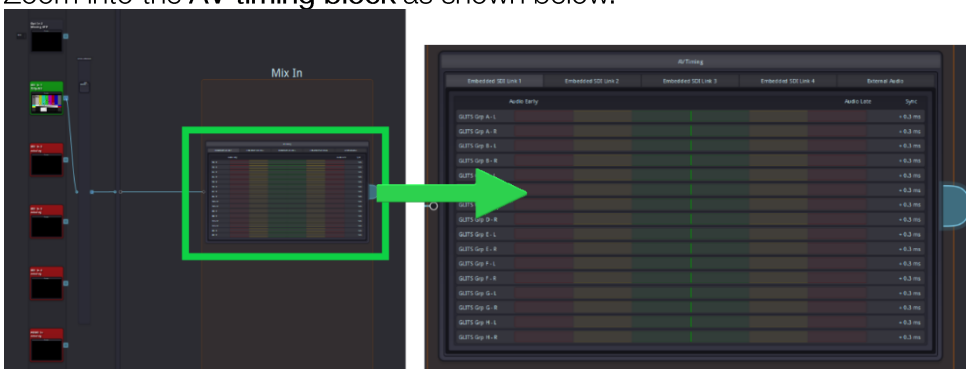


Note: Ensure that the correct input source is selected via Input crossbar.

The link is connected to the **UHD Control In** container as highlighted below:



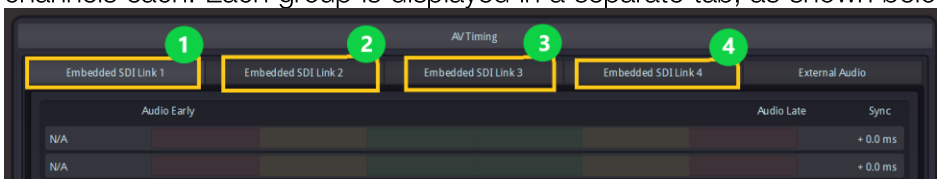
Step 3: Zoom into the **AV timing block** as shown below:



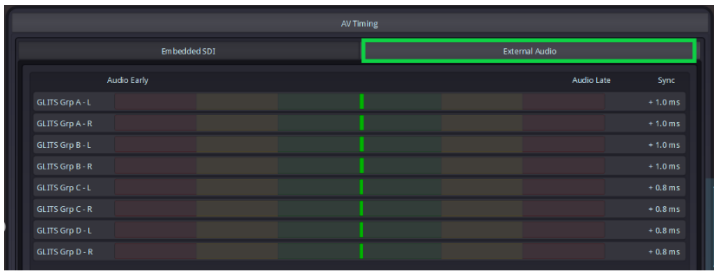
The AV timing gives the following information:

1. Embedded SDI AV timing (Link 1 to Link 4)
2. External Audio AV timing

Step 4: The **Embedded SDI (Link 1 to 4)** tab will provide timing information of the embedded audio on the AV sync test signal. A 12G SDI signal supports 64 audio channels. These audio channels are arranged in 4 groups with 16 channels each. Each group is displayed in a separate tab, as shown below:



Step 5: The **External Audio AV Timing** provides sync information on the external audio interface:

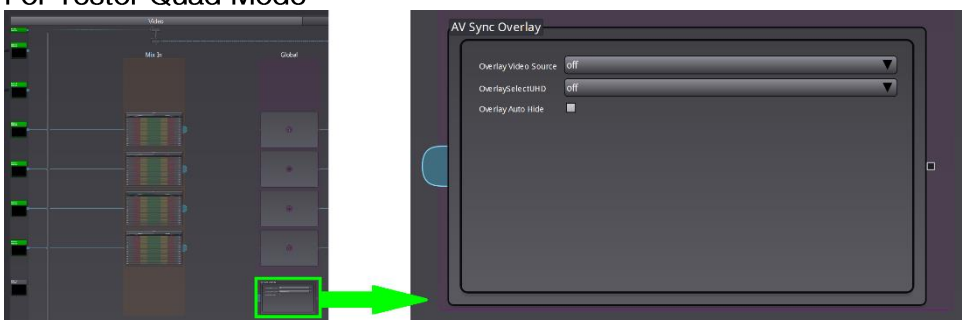


4.4.2. Viewing AV timing sync via overlays

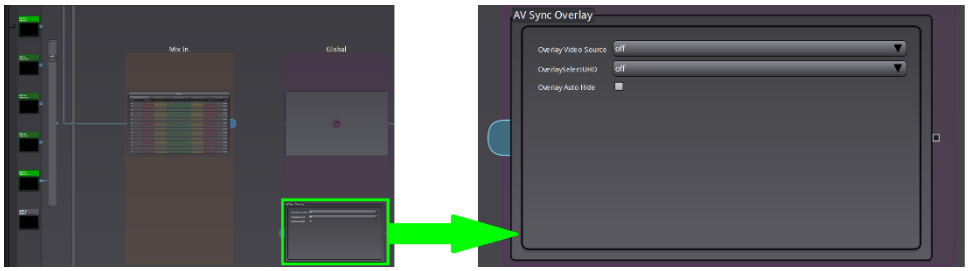
A user can get the AV timing sync information via overlays by following the below steps:

Step 1: On the **Control** > **Main** > **Video** page, zoom into the **AV Sync** block inside the **Global** container as shown below:

For Testor Quad Mode

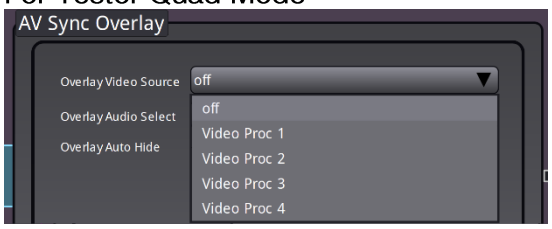


For Testor 4K mode

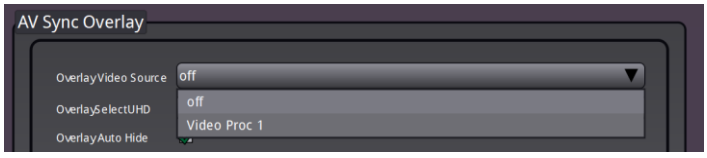


Step 2: Select **AV Sync overlay source** from the drop-down options, as shown below:

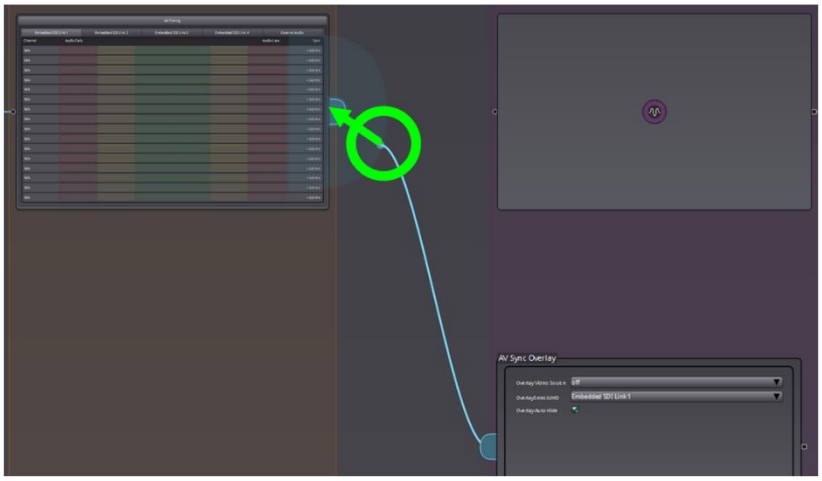
For Testor Quad Mode



For Testor 4K Mode



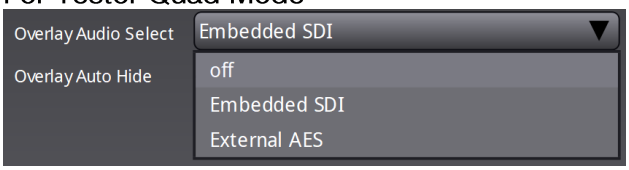
The AV Sync overlay source can also be configured by selecting the signaling flow from the GUI as shown below:



Note: When **AV Sync Overlay Source** is selected, the **AV Sync** block will be automatically connected to **Path 4** output in Testor Quad mode or **Path 1** in Testor 4K Mode. The connected path can no longer be used as a Test Generator.

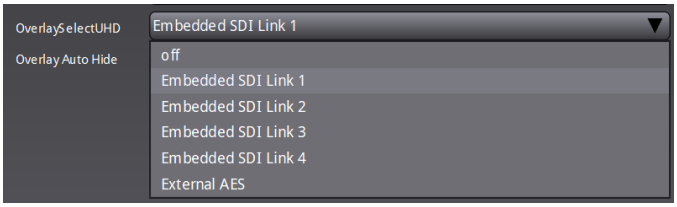
Step 3: Select **Overlay Select** in Testor Quad Mode or **Overlay Select UHD** in Testor 4K Mode from the drop-down options as shown below:

For Testor Quad Mode



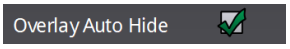
Select **Embedded SDI** for the audio sync information overlay embedded in the SDI signal. Select **External AES** for the audio sync information overlay on the external audio interface.

For Testor 4K Mode



Select **Embedded SDI Link 1 to 4** for the audio sync information overlay embedded in the SDI signal. Select **External AES** for the audio sync information overlay on the external audio interface.

Step 4: Optional: Choose “Overlay Auto Hide” if you like to have the Overly hided, if no compatible AV sync test signal is connected to the channel input, on the check-box shown below:



Step 5: Connect output port for monitoring.

Testor Quad Mode:

In Testor Quad mode, the electrical output for the AV Sync Analyzer overlay is fixed to OUT 4. Alternatively, the HDMI and optical ports can also be routed via output video crossbar to receive AV Sync measurement overlay. Electrical output 1 to 3 are fixed for the Test generator purpose.

Testor 4K Mode:

In Testor 4K Mode, for signals up to 3G, the selected overlay will be displayed on all the output ports including electrical, HDMI and optical ports. For 12G SDI single link, the video signal with the selected overlay will be available on OUT 4 electrical port, Optical OUT 2 and HDMI out.

Step 6: Connect Out 4 port for monitoring and viewing the AV Sync information overlay as shown below:

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.

Technical Support

If you have any questions or require support, please contact your local distributor for further assistance.

Technical support is also available from our website:

http://support.lynx-technik.com/

Please do not return products to LYNX without an RMA. Please contact your authorized dealer or reseller for more details.

More detailed product information and product updates may be available on our website:

www.lynx-technik.com

Contact Information

Please contact your local distributor; this is your local and fastest method for obtaining support and sales information.

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LYNX Technik manufactures a complete range of high-quality modular interface solutions for broadcast and Professional markets, please contact your local representative or visit our web site for more product information.

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