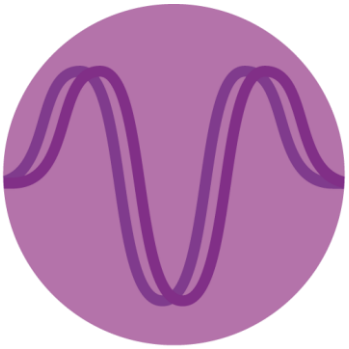
greenMachine®



Testor AV

Video and Audio Testing with
AV Sync Generator and Analyzer

Quick Reference Guide
AV Sync
greenMachine titan

Rev 1.4 – July 2024

LYNXTechnik AG®

Broadcast Television Equipment

THIS Quick Reference Guide SUPPORTS:	
titan version	903
LynxCentraal version	1.6.0

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 patterns in gM Testor constellation to be be overlayed with a specific AV Sync signal. 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 third 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 outputs can be used for test signal generation.
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. Measure and correct audio and video timing in up to 3G and 12G for a broadcast signal chain with a simple automated process (incl. options for manual settings)
2. Extensive Test Pattern generator for SDR, HDR, Segment LED Screens, and more.
3. Overlay options for remote screen analysis of Audio and Video Timing

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** or above.
2. The LynxCentraal version installed must be **1.6.0** for Windows or MAC
3. The Testor AV constellation is deployed on the greenMachine titan.
4. Optionally a second greenMachine having a constellation compatible with AV delay compensation.

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 3G Mode

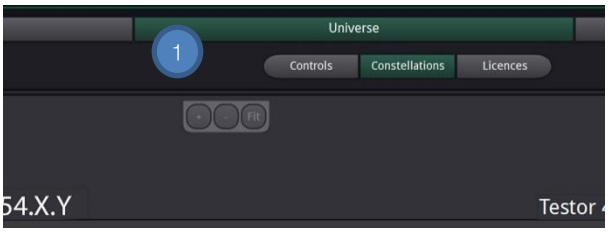
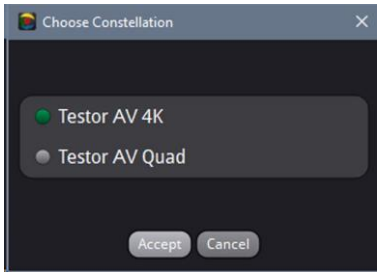
Data Rates	Video Format	Refresh Rate
SD	525	59.94Hz
	625	50Hz
1.5G	720p	23.98/ 24/ 25/ 29.97/ 30/ 50/ 59.94/ 60Hz
	1080i	50/ 59.94/ 60Hz
	1080p	23.98/ 24/ 25/ 29.97/ 30Hz
	1080psf	23.98/ 24/ 25Hz
3G	1080p	50/ 59.94/ 60Hz

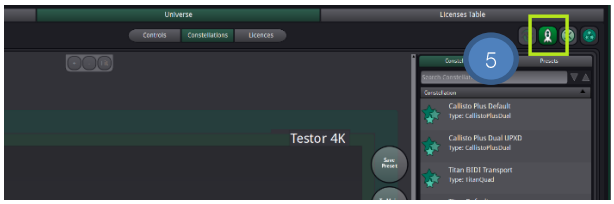
Testor 4K Mode

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 AV comes with the pre-deployed Testor AV 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 Double click the target greenMachine. If you have trouble identifying the target greenMachine locate it in either the rolodex, tree or path view on the left.
	3 On the right panel click and drag *Testor AV* onto the device in the middle.
	4 Choose the type of Testor AV constellation from the two options: • Testor AV 4K • Testor AV Quad

	5 Click on the ***Deploy*** button to deploy the Testor AV constellation

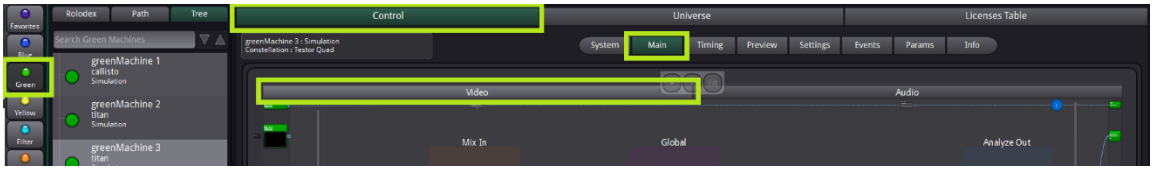
4.3. AV Sync Generator

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

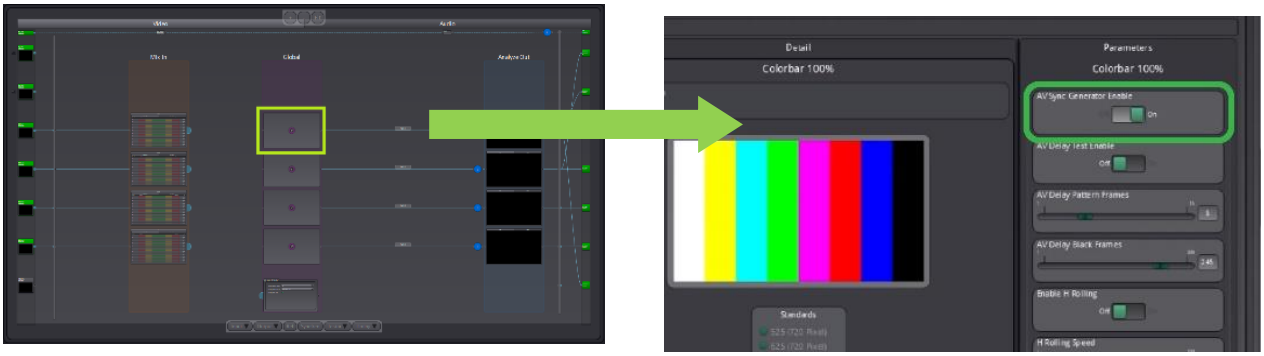
4.3.1. Enable AV Sync Generator in LynxCentraal

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.

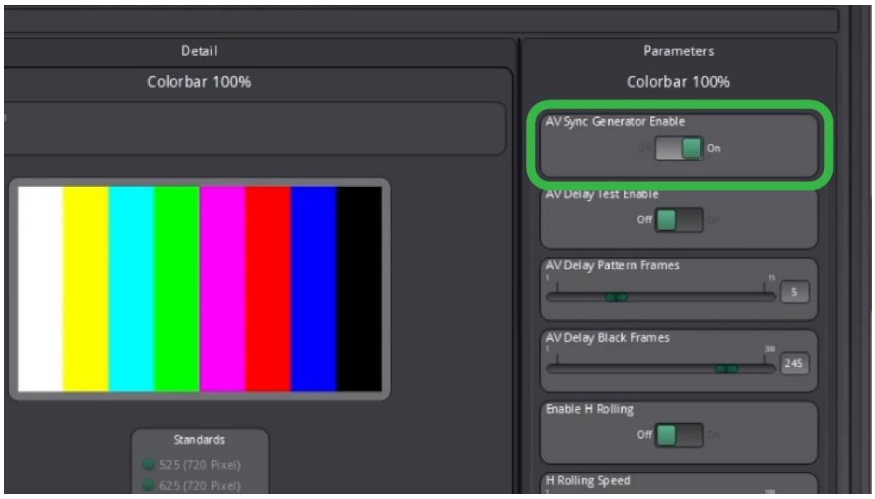
Step 1: Go to **Green** > **Control** > **Main** > **Video;** the following page is displayed:



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.

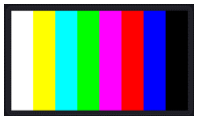


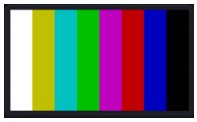
The greenMachine will now add the AV Sync Overlay to the test signal fill the audio channels automatically with the different sinus tones.

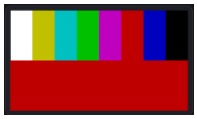
4.3.2.AV Sync Generator supported Test Patterns

Center Sweep 

Color Temperature 

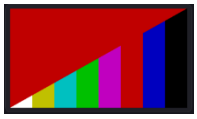
Color Bar 100% 

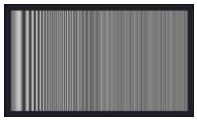
Color Bar 75% 

Color Bar 75% over Red 

Colorbar SMPTE 

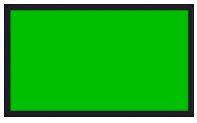
Field Pattern Colorbar/Red 

Field Pattern Red/Colorbar 

Frequency Sweep 

Full field Blue 

Full field Cyan 

Full field Green 

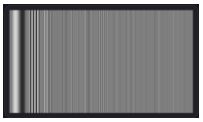
Full field Magenta 

Full field Red 

Full field White 

Full field Yellow 

Grey 15% 

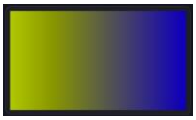
Multiburst 

Pathological EQ 

Pathological EQ/PLL 

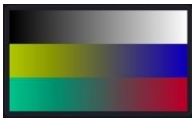
Pathological PLL 

Ramp Down Y 

Ramp Up CB 

Ramp Up CR 

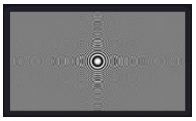
Ramp Up Y 

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 detects the signal sent by the Testor AV Generator with GLITS Test tone ON and compares it to what it expects to receive. It then calculates the discrepancy between expected and actual AV synchronization, providing precise measurements of AV timing. Third-party applications can query the measurement results if the AV Sync Analyzer via SNMP or the LYNX RemoteIF protocol.

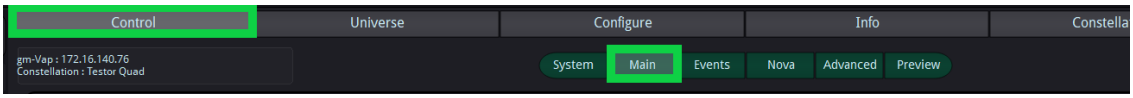
Note: The Testor Quad mode consists of four 3G processing channel while Testor 4K mode consists of one 12G single link processing channel. The Testor AV Sync analyzer overlay is supported only on one channel.

4.4.1.Viewing AV timing sync in LynxCentraal

A user can get the AV timing sync information in LynxCentraal by following the steps below:

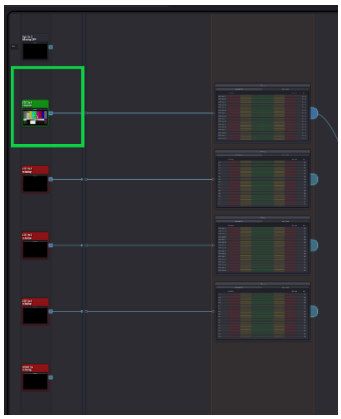
4.4.1.1. Testor Quad Mode

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.



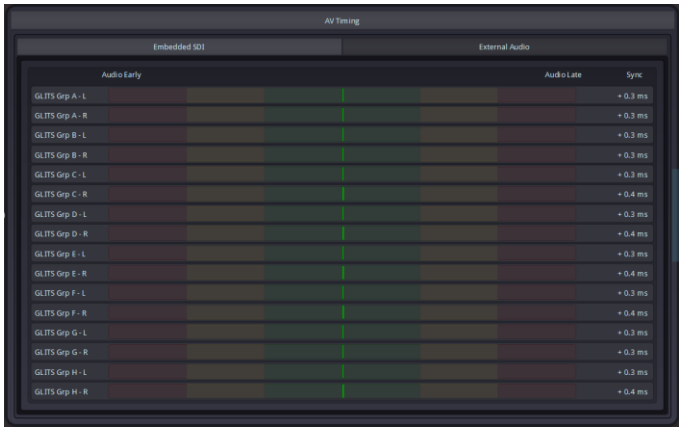
Step 3: Zoom into the **AV timing block** on the corresponding processing channel to which the AV sync input test singal is connected:

The AV timing gives the following information:

1. Embedded SDI AV timing
2. External Audio AV timing

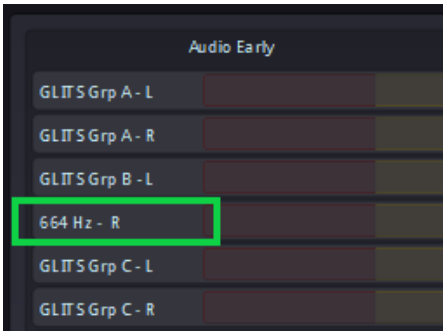
Step 4: The **Embedded SDI** tab will provide timing information of the embedded audio on the AV sync input test signal. The information will be displayed based on the scenarios discussed below:

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:

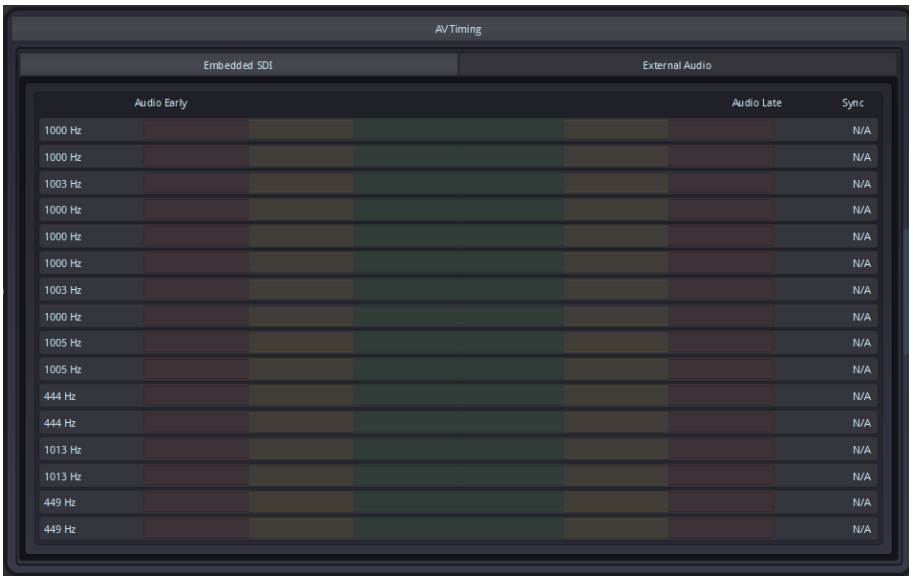
In the example to the right, AES 2 (Group B) is swapped with AES 1 (Group A).

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

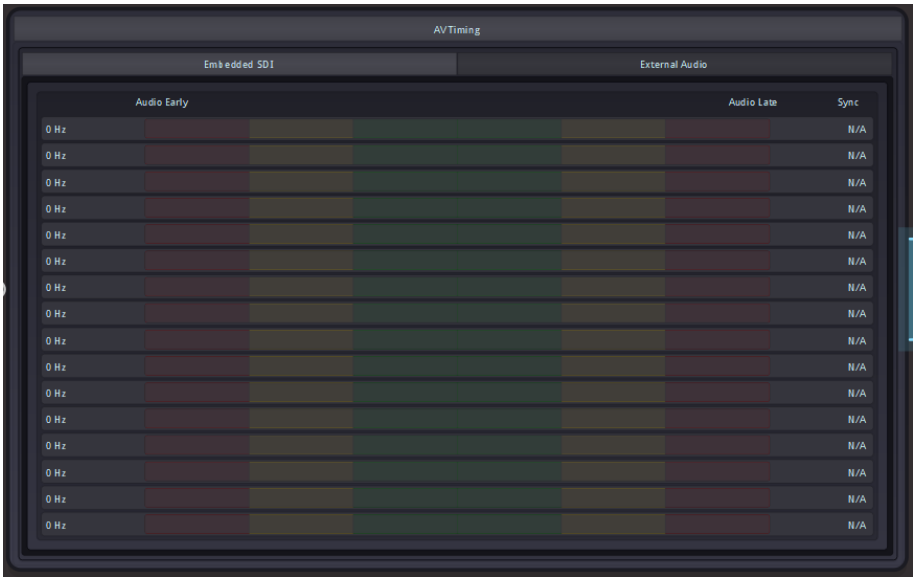
Scenario 2: A video signal without a AV sync test signal connected to the input (No GLITS test tone present)



In this scenario, the left column will indicate the actual frequency in Hz of the audio channels but will not indicate the GLITS tone.

The “Sync” column will indicate N/A as the AV sync test signal is absent.

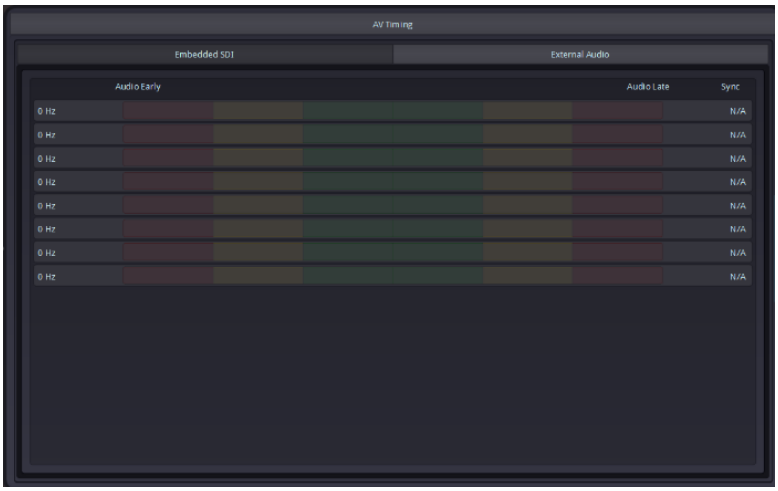
Scenario 3: No signal connected at the input source.



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 AV 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.

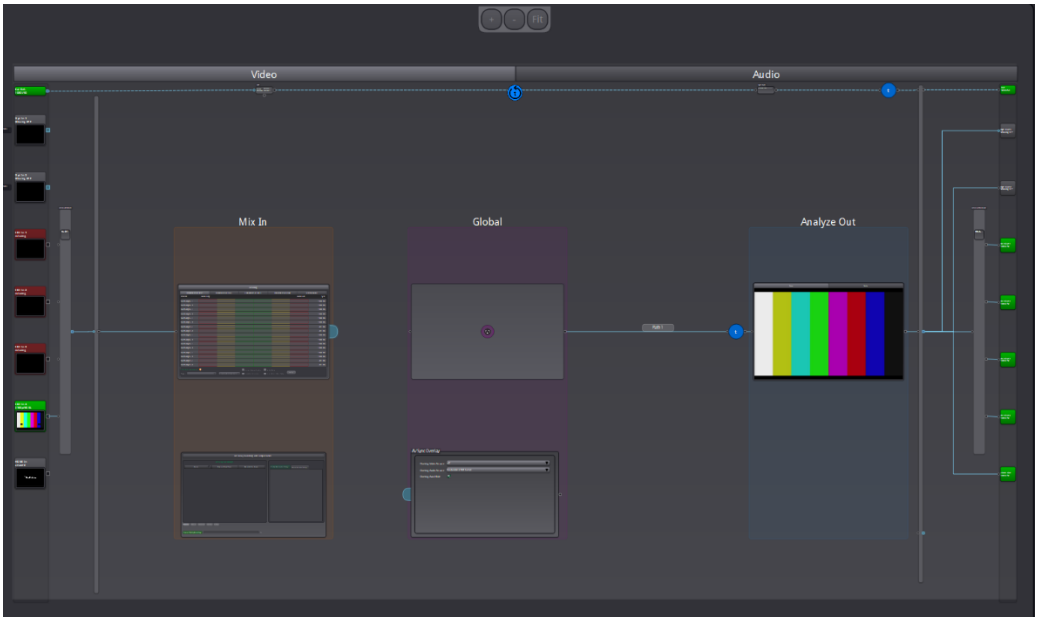
Step 5: To get the external audio timing information, click on **External Audio,** the following page will be shown:



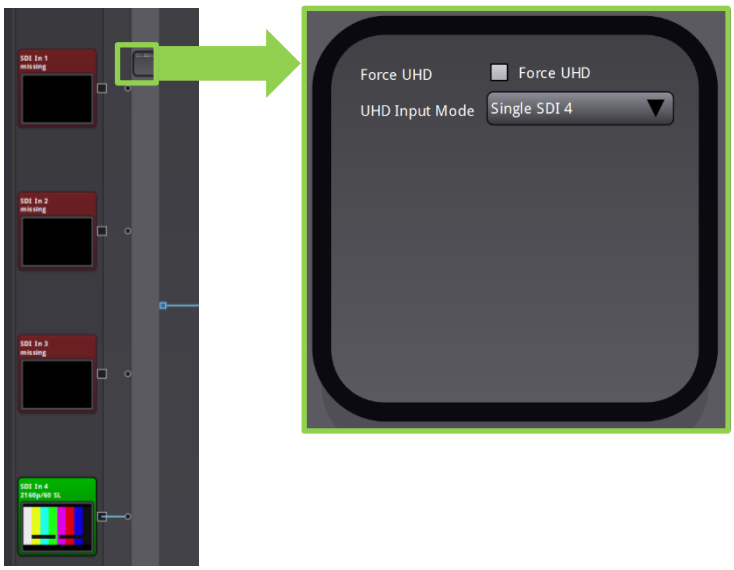
The external audio page will provide AV sync information of 8 external Analog/digital audio channels.

4.4.1.2. Testor 4K Mode

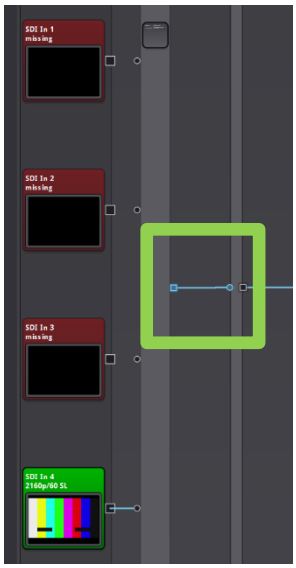
Step 1: Go to **Control** > **Main** > **Video;** the following page is displayed:



Step 2: Connect an AV sync test signal on SDI input port SDI IN 1-4 for Quad Link 2SI 12G or SDI IN 4 for Single Link12G 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 "IN" container** as highlighted.

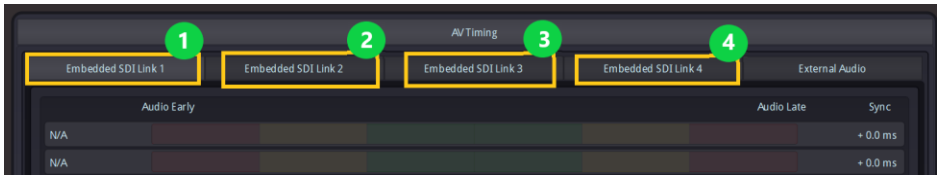


Step 3: Zoom into the **AV timing block** as shown below:

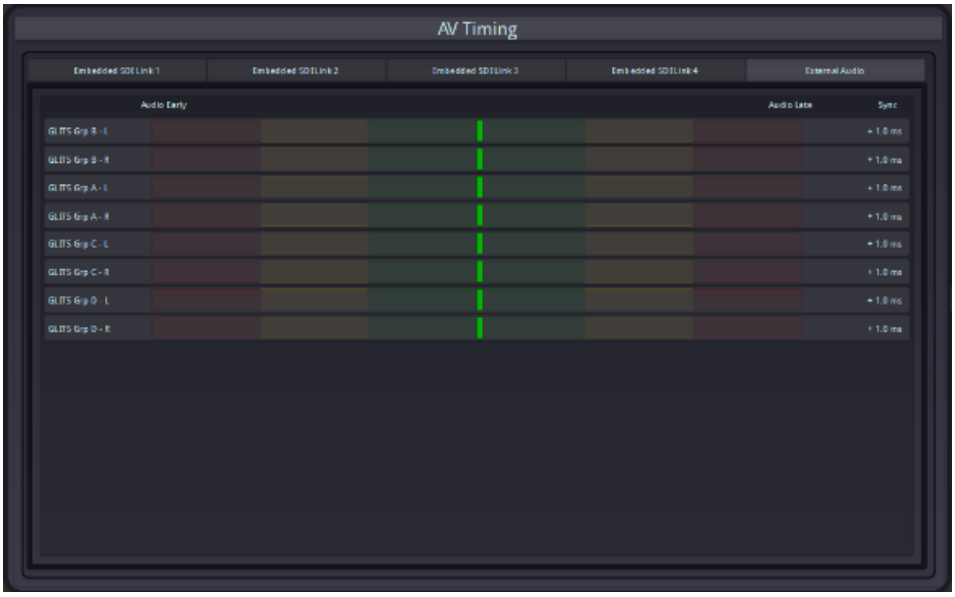
The AV timing gives the following information:

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:

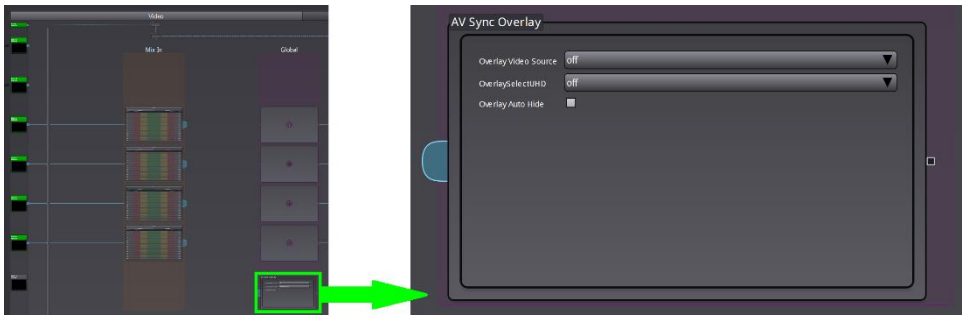


4.4.2.Viewing AV timing sync via overlays

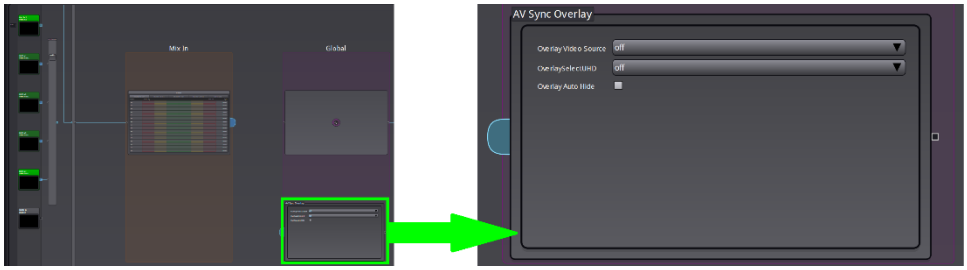
A user can get the AV timing sync information via overlays by following the below steps:

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

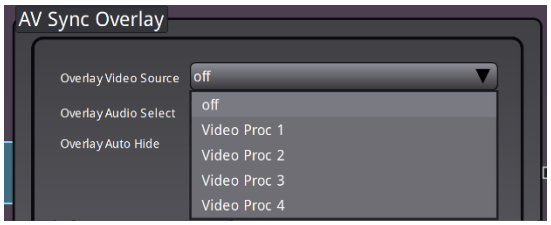


For Testor 4K mode

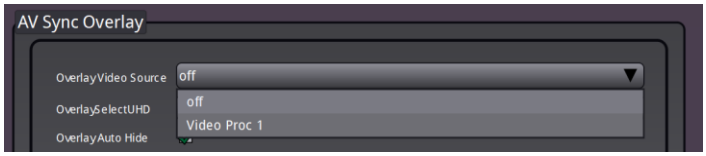


Step 2: Select **AV Sync overlay source** from the drop-down options, as shown below:

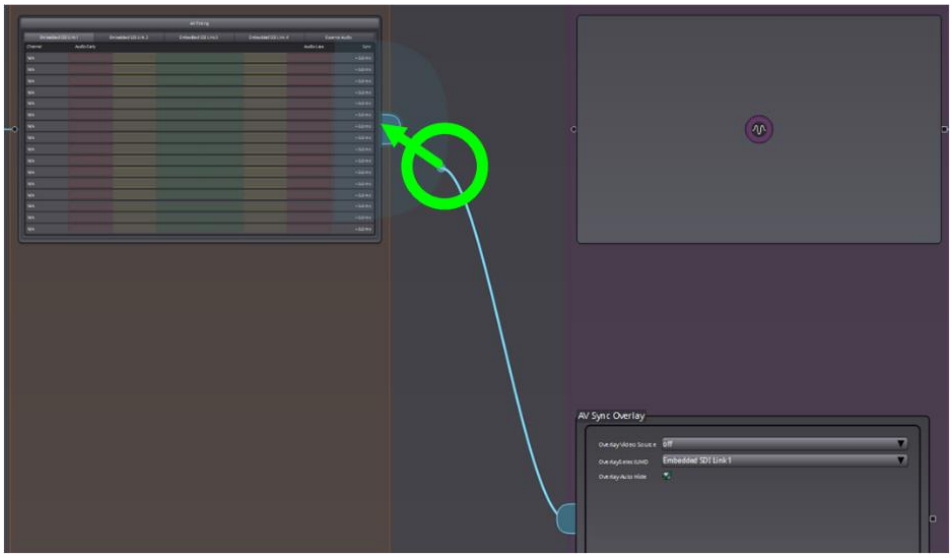
For Testor Quad Mode



For Testor 4K Mode



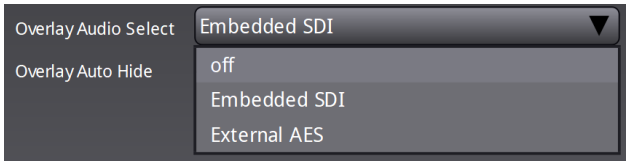
The AV Sync overlay source can also be configured by selecting the signaling flow in LynxCentraal as shown below:



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.*

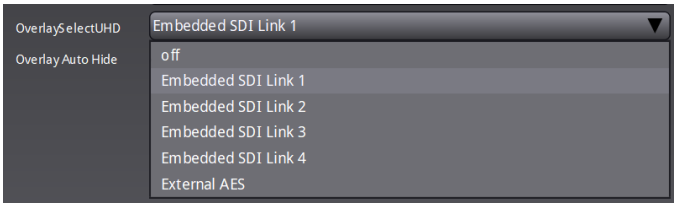
Step 3: Select **Overlay Select** in Testor Quad Mode or **Overlay Select UHD** in Testor 4K Mode from the drop-down options as shown below:

For Testor Quad Mode



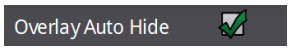
Select **Embedded SDI** for the audio sync information overlay embedded in the SDI signal. Select **External AES** for the audio sync information overlay on the external audio interface.

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 overlay hidden, while no compatible AV sync test signal is connected to the channel input, on the check-box shown below:

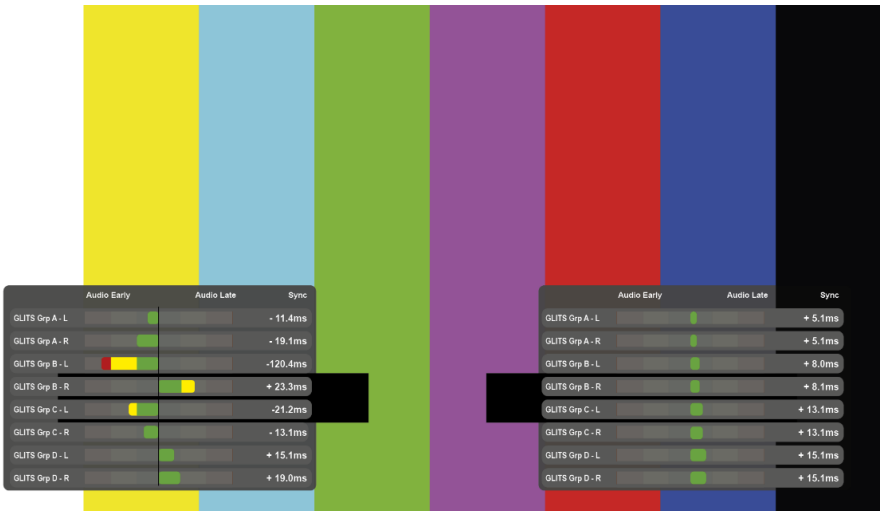


Step 5: Connect output port for monitoring.

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:

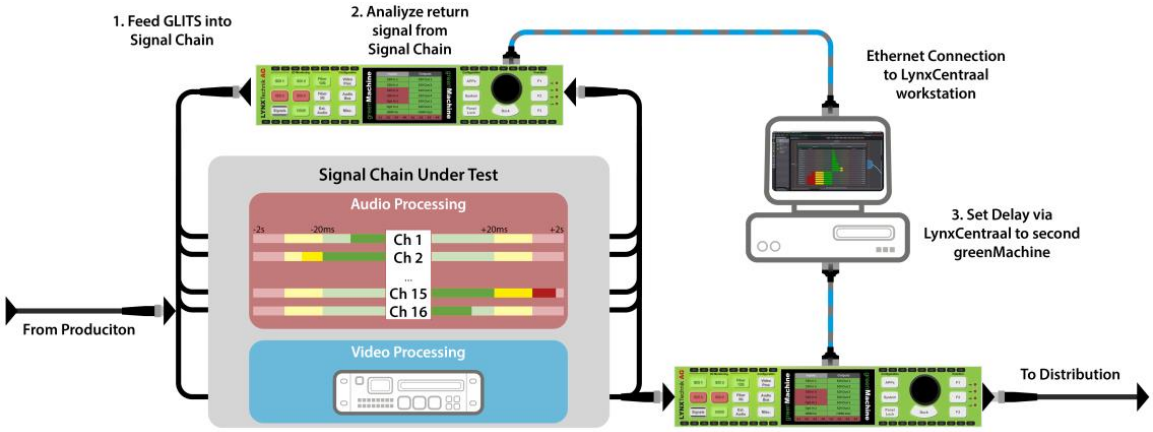


Note: If the AV Sync overlay output is enabled, the reference source automatically jumps to the selected Overlay Video Source. If you want to use the Overlay feature with only one greenMachine, the signal chain under test must be synchronized to an external reference clock. It must not use the TestorAV signal as its reference source.

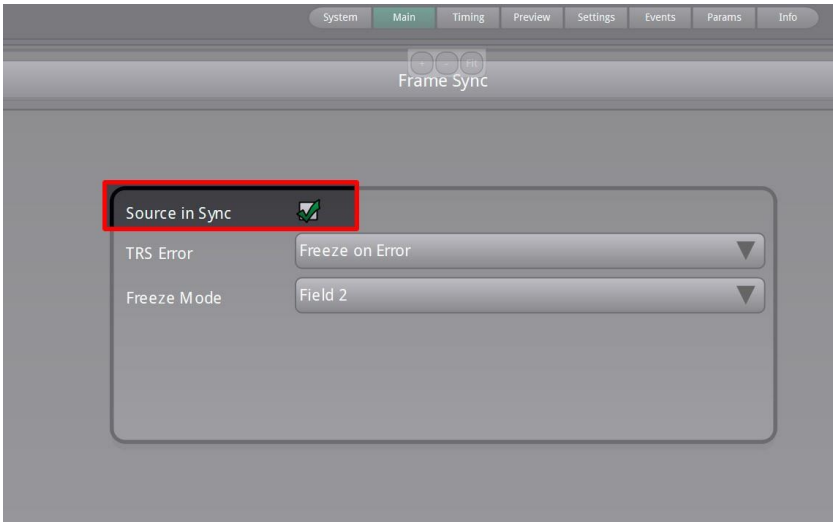
4.5. Testor AV Delay Compensation

Testor AV delay compensation feature facilitates Testor AV to implement the correction of the measured Audio to Video delay in simple steps, either within the same greenMachine unit or across different units in the same network simultaneously processing and pass-through video signals without latency or quality degradation. This feature requires an additional greenMachine with a compatible constellation like UPXD, HDR Static and EVIE+.

4.5.1. Setup Overview

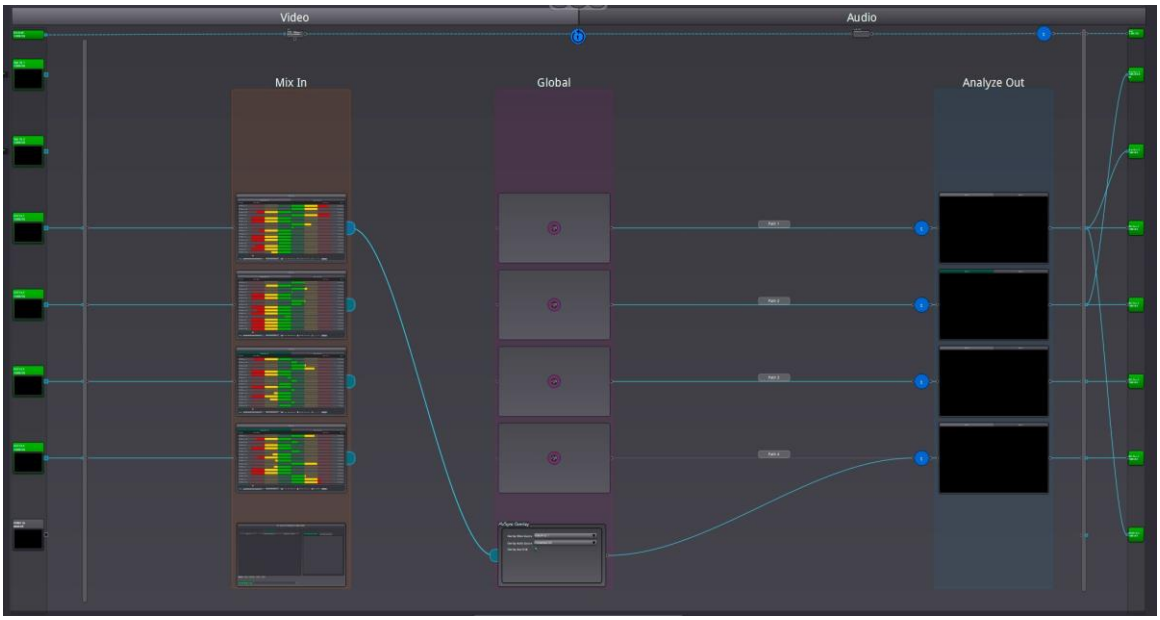


1. Make sure both your greenMachines are connected to a PC running LynxCentraal
2. Connect one output of your AV Processing path to a greenMachine with Testor AV deployed.
3. Make sure the greenMachine with Testor AV deployed uses the same Sync Reference source as your path to test and that "Source in Sync" is enabled in the Frame Sync designated for the delay compensation.



4. Optional: To test if the delay and channel correction worked, a signal from the correction machine can be routed to the greenMachine with Testor AV deployed.

4.5.2. AV Delay Measurement



The return signal from the output of the AV Processing path will now show the measured delay.

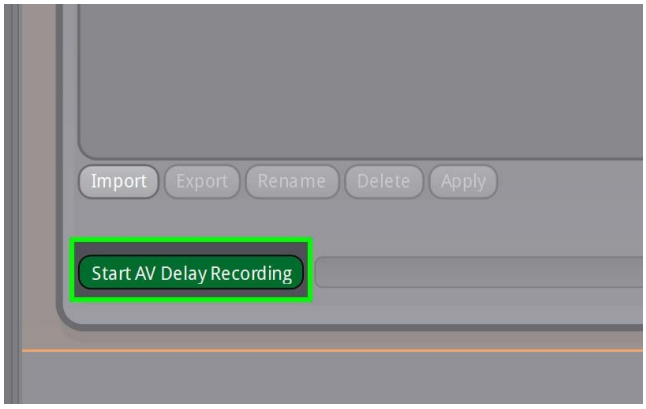
For quick use LynxCentraal also offers a one-click solution. Please note however, that this approach will not produce a delay preset file that can be restored.

In the lower section the "Mix In" Column the expanded AV Delay Compensation Dialog can be started.

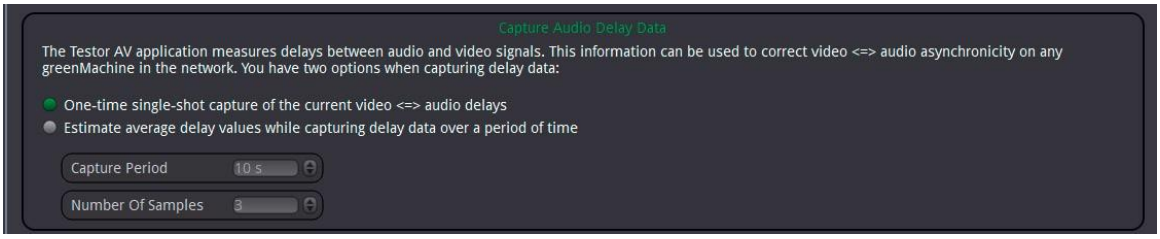
4.5.3. AV Delay Recording and Channel Mismatch Detection

There are multiple ways to correct AV delay with LynxCentraal and Testor AV. This section explains how to record AV delay data for later use in a correction scenario. This is useful if the processing paths change predictably or if multiple paths are tested.

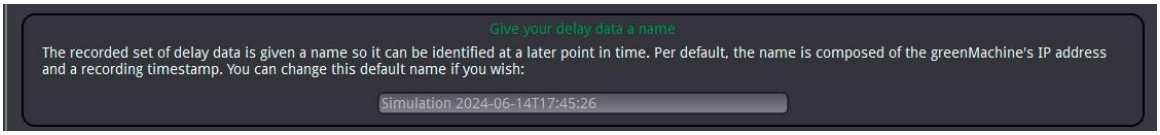
Step 1: Press the Start AV Delay Recording Button (Bottom of MIX IN Column)



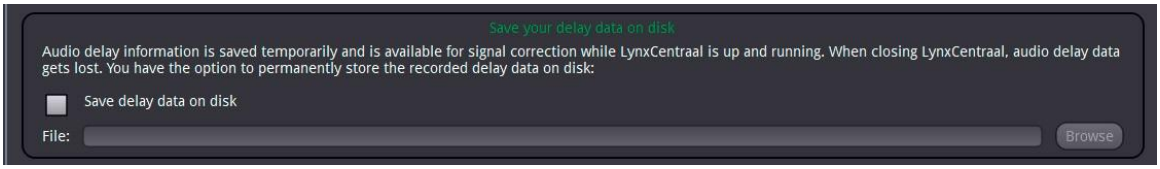
Step 2: Choose how you want to measure the delay



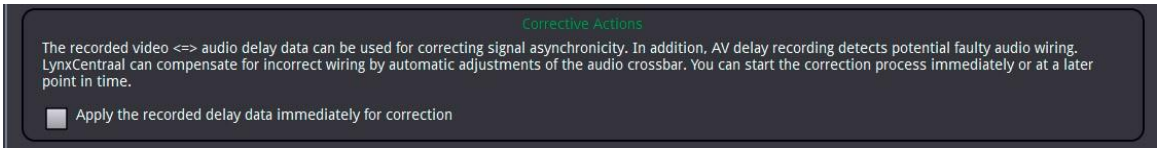
Step 3: Optional: Give this Measurement a custom name.



Step 4: Optional: Save the measured delay as a file on your PC/MAC for later retieval (Otherwise delay results will just exist temporarily while LynxCentraal runs).



Step 5: Optional: Proceed with the correction immediately. This will cover the delay copensation as well as the correction of switched audio channels.



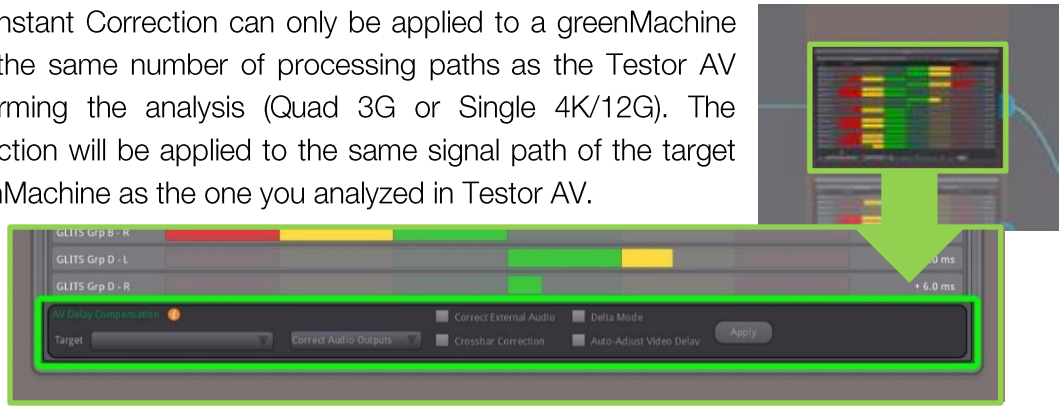
4.5.4. AV Delay and Channel Correction

AV delay can be corrected in three ways: with an instant correction, centralized correction via LynxCentraal and TestorAV or decentral correction in the control panel of a target device.

4.5.4.1. Instant Correction

For an instant correction, go to the main control panel of Testor AV and double click into the analyzer node of the signal chain to be corrected. Select a target greenMachine in the area below the analyzer results, choose the suitable options and click the apply button.

The Instant Correction can only be applied to a greenMachine with the same number of processing paths as the Testor AV performing the analysis (Quad 3G or Single 4K/12G). The correction will be applied to the same signal path of the target greenMachine as the one you analyzed in Testor AV.

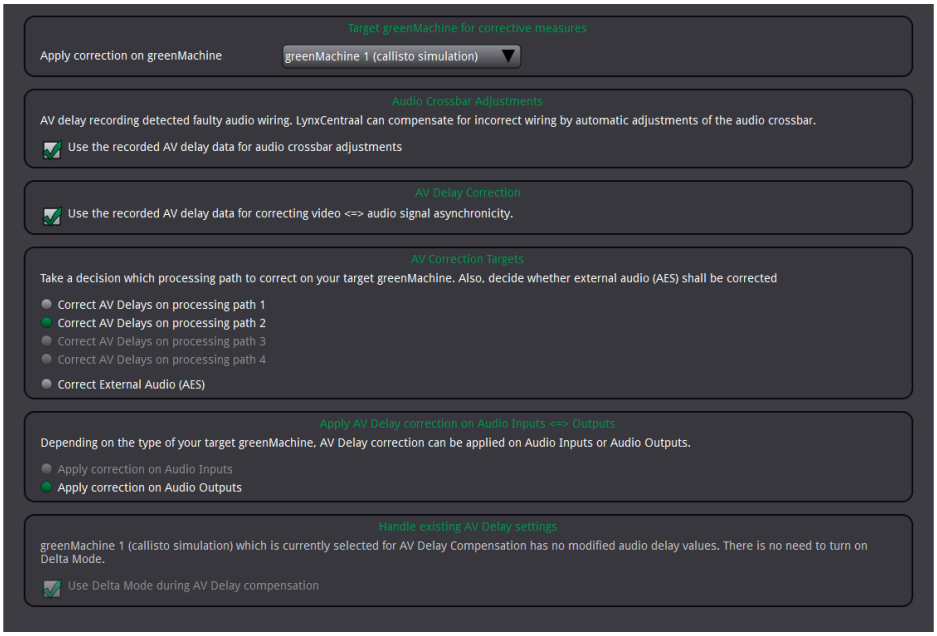


4.5.4.2. Centralized Correction

This type of correction is ideal if you have multiple individual installations where you wish to apply different corrections.

Step 1: In LynxCentraal, switch to the greenMachine with Testor AV and go to the bottom of the MIX IN column.

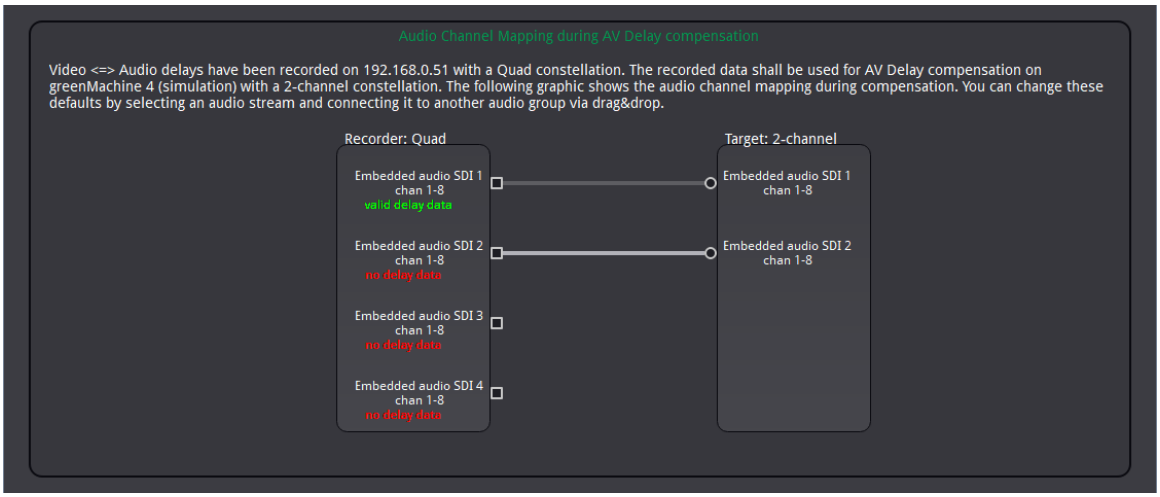
Step 2: Choose a recording and click “Apply”. A delay and Audio Crossbar Correction dialogue box opens to select more details.



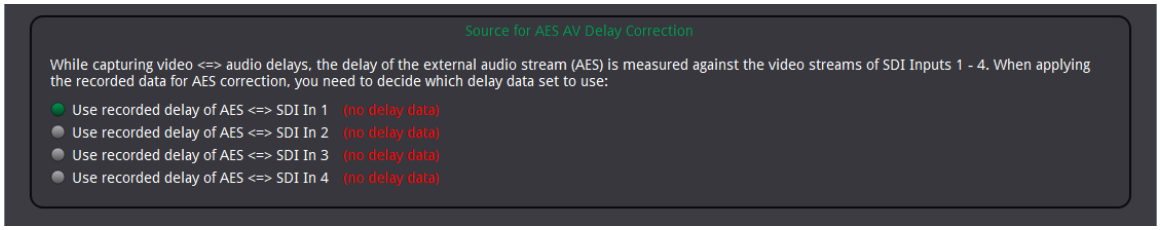
Step 3: Select the greenMachine to apply the correction to, and which corrections you want to apply. Multiple processing paths can be selected with the AV Correction targets.

Step 4: If the target machine has less or more audio channels the following page will ask you for details on how you want to map your delay compensation. By default the recorder and target channels are mapped identical, with an overshoot of channels being either dropped.

Note: It is possible to use the same recorder values on multiple target channels



Step 5: If External (AES) Correction is enabled you will also be prompted to choose which AES ⇔ SDI Delay to regard.

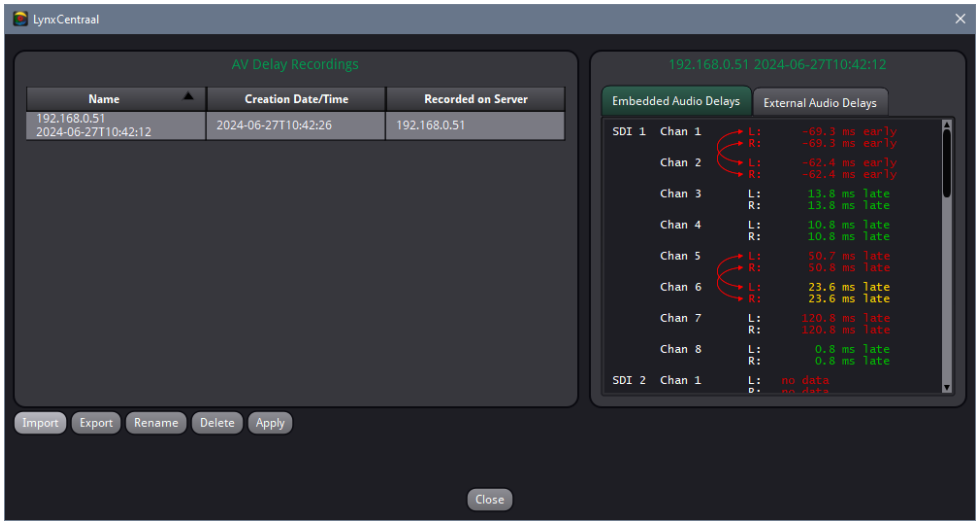


NOTE: All steps and options after the opening of the Delay and Audio Crossbar Corrections Dialog popup are identical for the Decentral Correction!

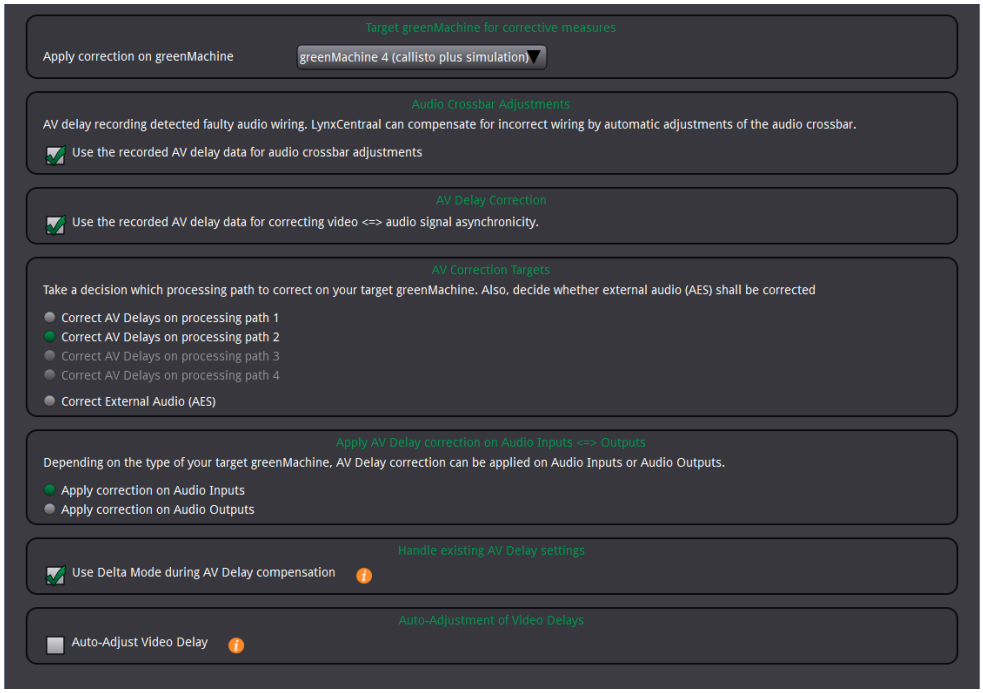
4.5.4.3. Decentral Correction

Corrections can also be applied via LynxCentraal on a target machine. Just click on the AV Correction Logo on top of the main page of any compatible constellation.

The dialog box that opens is similar to the AV Delay Recording and Compensation option in Textor AV's MIX IN column. The only difference being that these AV Compensation dialogs don't offer the option to record a delay.



The dialog from clicking "Apply" is identical to the Delay and Audio Crossbar Corrections Dialog, with the difference that a target machine cannot be selected here.

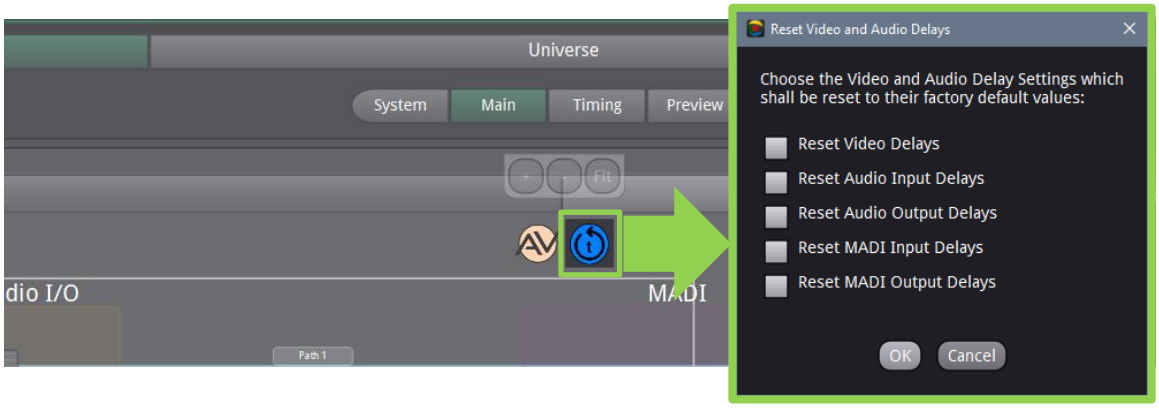


4.5.5.Reset Audio Delays

LynxCentraal offers the possibility to reset the audio delay specifically to zero without the necessity of a factory reset.

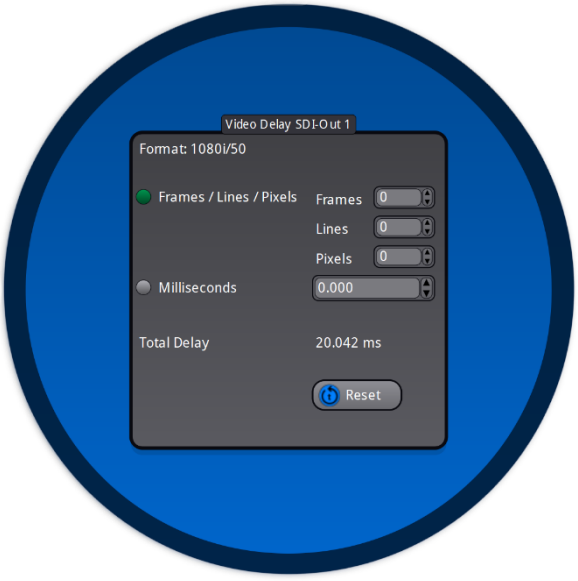
4.5.5.1. Global Reset

This function can either be used globally or locally. To access it globally click the “Reset Audio Delay” icon on top of your “main” screen. This will open up a dialog box where you can choose which delays to reset.



4.5.5.2. Local Reset

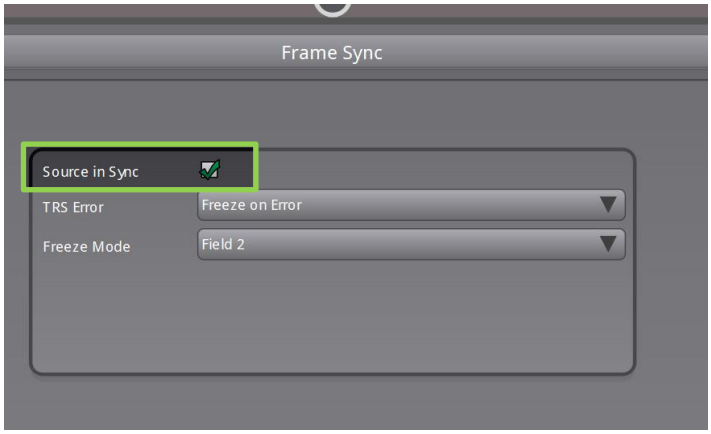
A local reset can be achieved by simply preessing the “Reset” button in any individual delay bubble.



4.5.6.FAQ

Q: Why is the corrected delay off by 20-80ms?

A: Please re-check if your greenMachines receive a valid reference signal and if that reference signal is used to synchronize the greenMachines.
Your target greenMachine will also need to have the “Source in Sync” Option in it’s Frame Sync activated.



Q: Why is the delay still off by 0.4-0.6ms?

A: Some delay may be caused by internal processesing. This is to be expected, but should be negligeable.

Q: Why can't I find my target greenMachine in the list of delay compensation devices?

A: If your device is listed in your LynxCentraal Green section, but does not show up as a possible target device for delay compensation, check if the constellation deployed is compatible as a delay compensation device (Callisto Plus: Dual UPXD. Titan: FrameSync Quad, HDR Evie, HDR Evie+, HDR Static, UPXD 3G, UPXD 4K).

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.

LYNX Technik can be contacted directly using the information below.

LYNX Technik AG Brunnenweg 3 D-64331 Weiterstadt Germany Phone: +49 (0)6150 18170 Fax: +49 (0)6150 1817100	LYNX Technik, Inc. 26366 Ruether Ave, Santa Clarita CA, 91350 USA Phone: (661) 251 8600 Fax: (661) 251 8088	Lynx-Technik Pte Lt 114 Lavender Street CT Hub2 #05-92 Singapore 338729 Phone: +65 6702 5277 Fax: +65 6385 5221 Mobile: +65 97127252
info@lynx-technik.com www.lynx-technik.com	info@lynx-usa.com www.lynx-usa.com	infoasia@lynx-technik.com

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.

LYNXTechnik **AG**

Broadcast Television Equipment