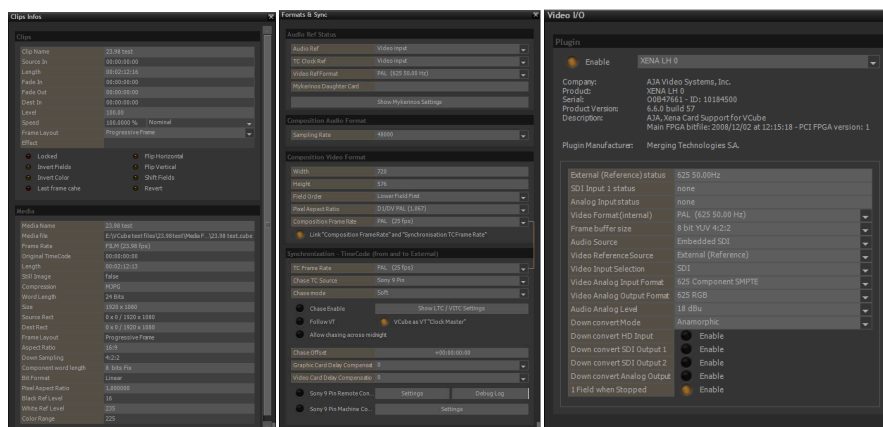


-VCube synchronization setup guide for standard and cross locked video play out-

There are many VCube hardware configurations possible and even more settings combinations that you need to understand to properly configure VCube and get up and running. In order for VCube to properly play out picture and sound while locked to incoming time code and video reference signals here are a few guide lines to follow to avoid choppy playback, stalls and even frozen picture. You need to be aware of the following factors to determine which guidelines apply for use with your particular setup. A few basic things must first be determined inside and outside of your VCube and in doing so you may better understand their relationships to each other and avoid needless headaches when setting up your system.

First determine the incoming time code frame rate, the actual video frame rate, the video format and resolution size in finding all the following points;

1. **The video media's frame rate** which will determine the composition's frame rate (ie: 29.94fps, 25fps, 24fps, 23.98fps, etc.).
2. **The video media's format and size** which will determine the composition's video format and size (ie: NTSC 720x486, PAL 720x576, HDV 1080i 1440x1080, DVCPro HD 960x720, "2K" 1920x1080, etc.).
3. **Your external time code source's frame rate** to which you wish to chase VCube which will determine your VCube's TC frame rate from either your LTC input, VT, VITC or 9-pin serial time code (ie: 23.98, 24, 25, 29.97, 30 fps).
4. **Your primary video sync reference source for time code** to which you will reference VCube's time code resolution engine which must be in concordance with VCube's video ref format and VCube's TC Frame rate (ie: Bi-level PAL, NTSC, Tri-level 720p, 1080i, 1080p sf, etc.).
5. **Your secondary video reference source for picture** to which you will reference VCube's AJA video board if present. *This secondary video reference source cabled directly to the AJA board allows you to independently reference the AJA's internal playback from that of VCube and play out video that does not correspond to incoming time code. This mixing of frame rates between time code and video frame rate is called "cross locking" and is possible if your VCube has both an AJA board and a Mykerinos.* (ie: Bi-level PAL, NTSC, Tri-level 720p, 1080i, 1080p sf, etc.).



The next thing to determine is the hardware configuration of your particular VCube.

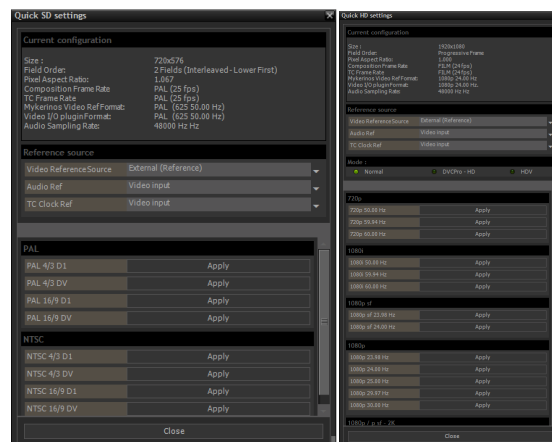
1. Does your VCube have a **Mykerinos board** or a Merging **USB sync board** or is it running in **ASIO** mode with no dedicated Merging board for time code, reference inputs and audio?
2. Does your VCube have an **AJA video board**? If so, is the AJA model a standard definition (LS, LSe) or HD capable board (HS, LH, LHe LHi, 2Ke)?

Special message concerning newer HD style content in relation to PAL and NTSC standards:

The historical tape based Pal (720x576@25 fps) and NTSC (720x486@29.97 fps) video standards were designed to strictly conform to their respective resolutions and frame rates. They were never intended for use at other resolutions or frame rates and neither was the conventional hardware manufactured for their creation and diffusion whether in a professional or consumer context. Although modern virtual video allows for just about any resolution one could imagine and frame rates derived in part from tri-level HD formats or even completely arbitrary speeds, try to avoid using other resolutions and frame rates with PAL and NTSC than their designated specifications. If you need to deliver a small 24 fps video file, for example, then use an HD codec and base resolution and downsize your output to display it. Don't try stuffing a hybrid format into a standard shoe. The results will more often than not be choppy, cumbersome to process and poorly displayed (if at all). The HD engine of VCube is far better equipped to handle 23.98, 24, 50, 59.94, 60 fps frame rates and a wider range of resolutions, *including standard definition PAL and NTSC sizes*, than could ever be expected out of a standard definition video deck. The AJA board (and most other high-end video boards available today) reflects this "SD legacy" and operates in PAL and NTSC as would be expected by standard PAL or NTSC gear. *So if it's not PAL or NTSC you want to see then it's HD you've got to be.*

Important Tip!!!

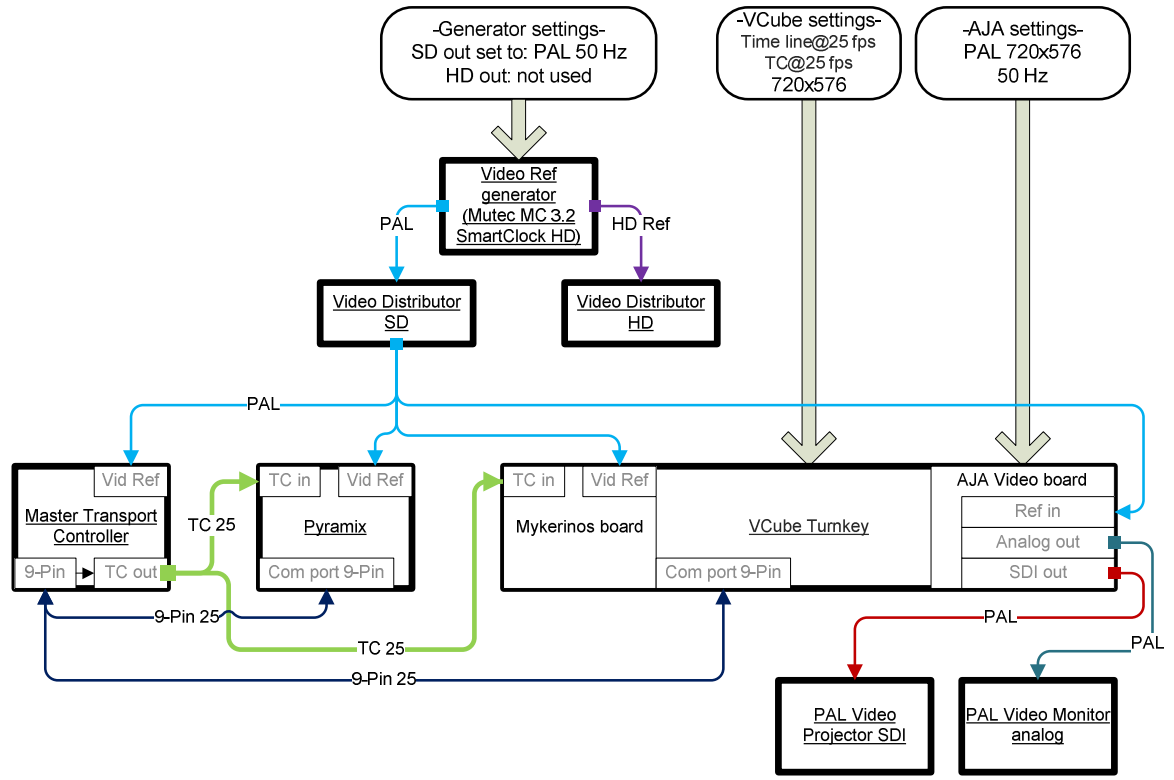
After determining the video frame rate, video format, and resolution of your picture ***always begin setting up your composition by using the Quick SD settings or the Quick HD settings menus*** (Alt+F5, Alt+F6) and choosing the preset which best corresponds to your picture. If adjustments need to be made to fine tune your settings manually than do these adjustments ***after*** using the Quick settings presets. You will see below there are a total of potentially eight important settings in this example alone concerning VCube, the Mykerinos, the AJA video board and Virtual Transport that are automatically set to the correct values. As of version 2 of VCube these values are spread out over multiple pages and menus and can be difficult to retain every time a new composition is created so use the Quick settings first when you start a composition and you will avoid many configuration errors.



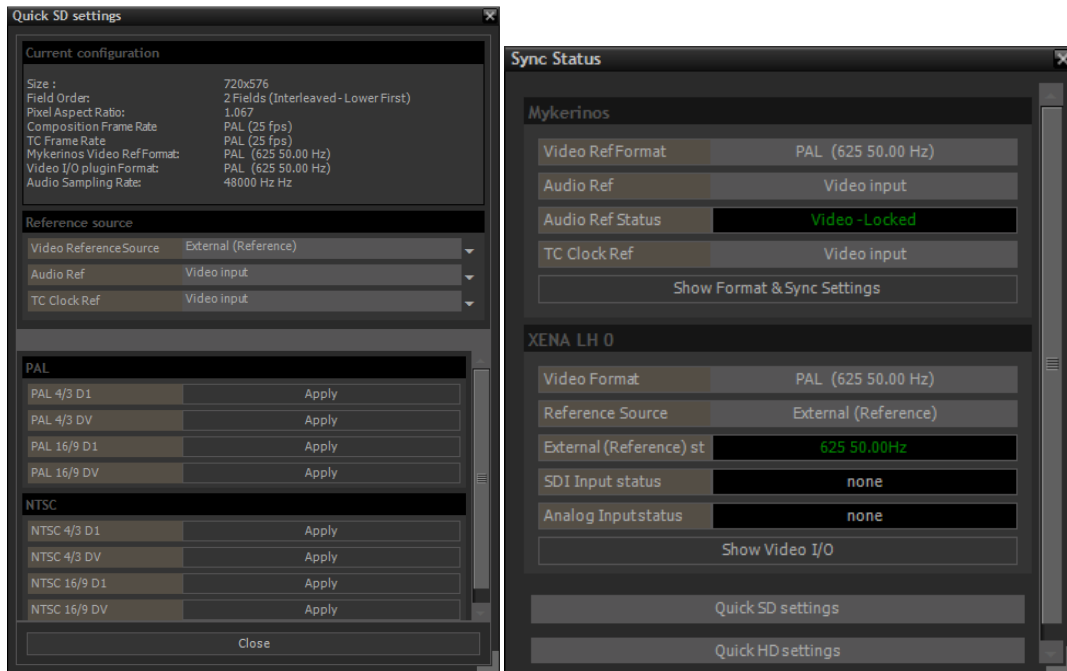
Standard definition configuration in a full turnkey system-

VCube standard PAL sync flowchart

Configuration in a full turnkey VCube with an AJA video board and a Mykerinos



When a VCube with both a Merging board (Mykerinos or a USB Sync board) and an AJA is running standard definition picture at the same frame rate as the incoming time code the setup is pretty straight forward. You must simply supply the Mykerinos and the AJA with the same video reference as the time code's frame rate and set both board's references to video input and use the Quick settings to align the rest of the parameters. Here is an example in standard definition PAL:



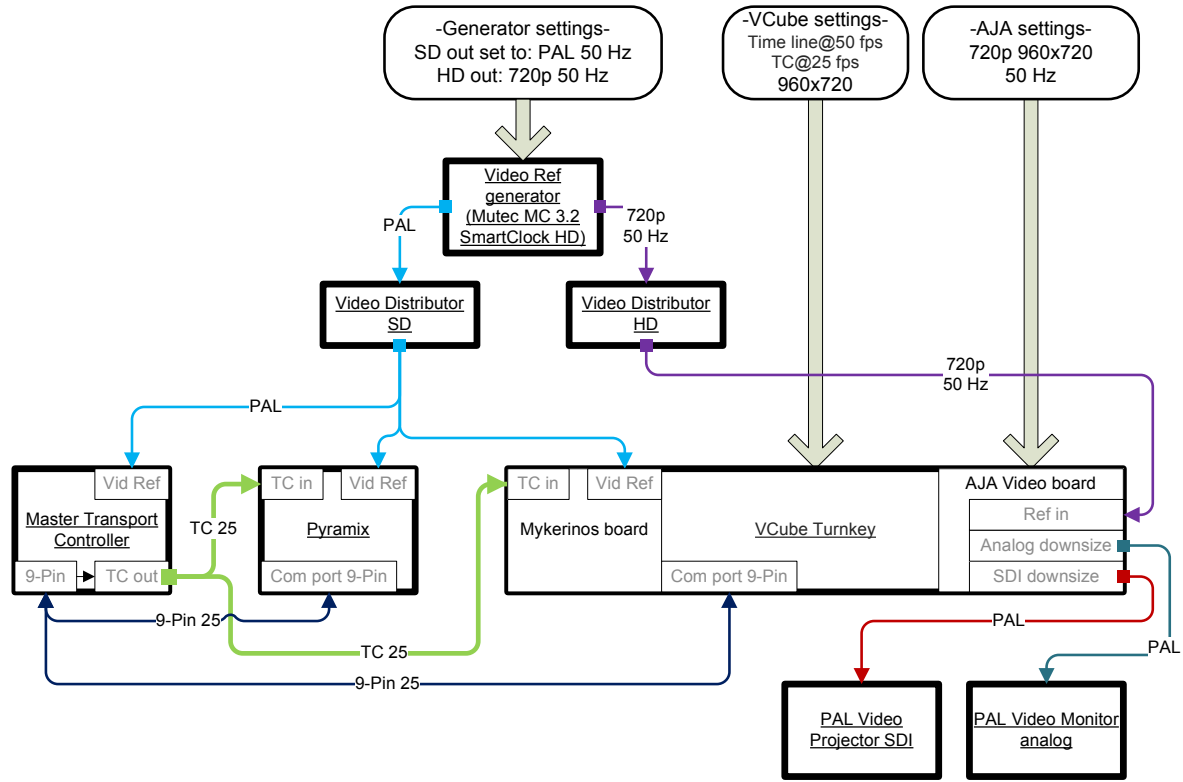
Scenario: The video file in VCube is PAL (25fps 720x576) using PAL (25 fps) time code in a PAL equipped studio (PAL display monitors) with a PAL black burst video reference signal fed to the Merging Video Ref In BNC and the AJA Ref In BNC connectors.

1. Manually set TC Clock Ref of the Mykerinos to **“Video input”** on the Formats & sync page or the Quick settings page.
2. Manually set the Video Reference Source of the AJA to **“External (Reference)”** on the Video I/O page or the Quick settings page.
3. **Use the Quick SD Settings (Alt+F5)** and choose **“PAL 4/3 D1”** to set all of the following parameters in one click;
 - VCube Video Ref Format to PAL (625 50.00 Hz)
 - VCube Sampling Rate to 48000
 - VCube Composition Video Format to 720x576, Upper Field First, Pixel aspect ratio to D1/DV PAL (1.067)
 - VCube Composition Frame Rate to PAL (25 fps)
 - VCube TC Frame Rate to PAL (25 fps)
 - AJA Video Format (internal) to PAL (625 50.00 Hz)
 - AJA Frame buffer size to 8 bit YUV 4:2:2
 - Virtual Transport Frame Rate to PAL (25 fps)

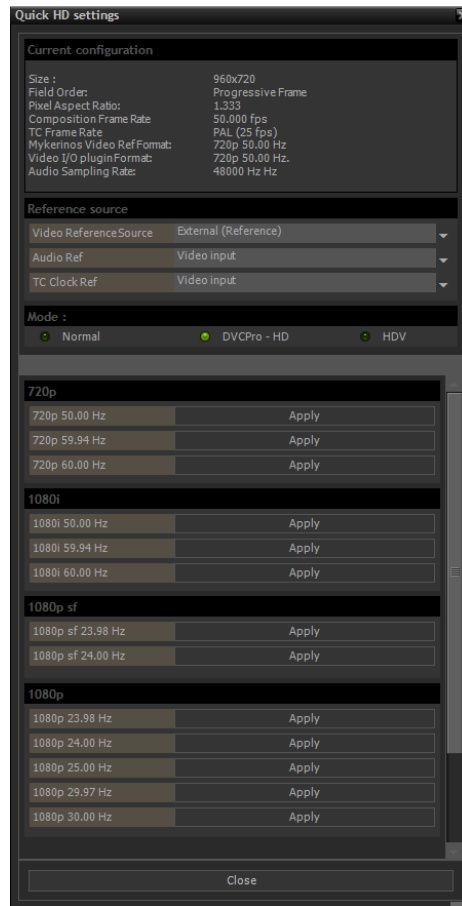
High definition configuration in a full turnkey system-

VCube HD 720p 50 Hz/PAL TC sync flowchart

Configuration in a full turnkey VCube with an AJA video board and a Mykerinos



When a VCube with both a Merging board (Mykerinos or a USB Sync board) and an AJA HD board is running picture at the same relative base frame rate as the incoming time code the setup is also relatively straight forward. You must supply the Mykerinos with the same primary video reference as the time code's frame rate and the AJA board with a secondary tri-level video reference source that corresponds to the video content you wish to play out of VCube. *These primary SD and secondary HD video reference sources must be perfectly in phase and preferably generated by the same source device.* Set both the Mykerinos and the AJA references to video input and use the Quick HD settings to align the rest of the parameters. Here is an example in DVCPro – HD 720p @ 50.00 Hz with a PAL (25 fps) time code:

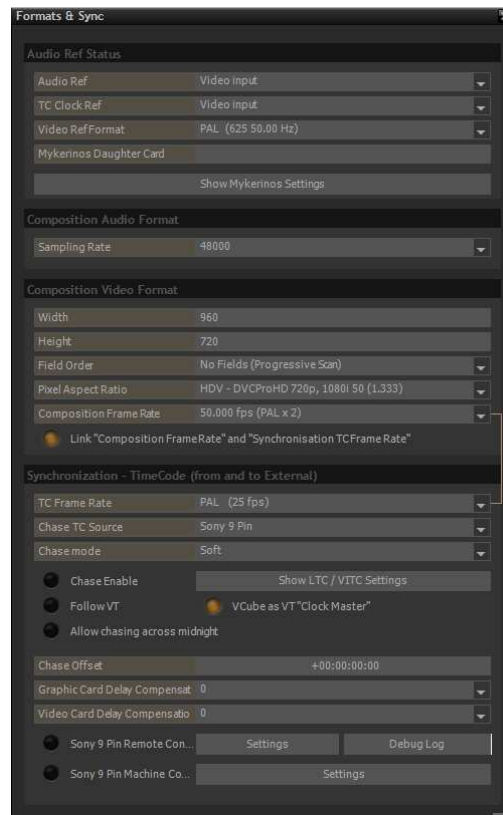


Scenario: The video file in VCube is DVCPro – HD 720p (50fps 960x720) using PAL (25 fps) time code in a studio equipped with a PAL monitor and an HD SDI projector using a PAL black burst video reference signal fed to the Merging Video Ref In BNC and a tri-level 720p @ 50.00 Hz sent to the AJA Ref In BNC connector.

1. Manually set TC Clock Ref of the Mykerinos to **“Video input”** on the Formats & sync page or the Quick settings page.
2. Manually set the Video Reference Source of the AJA to **“External (Reference)”** on the Video I/O page or the Quick settings page.
3. **Use the Quick HD Settings (Alt+F6)** and click first on the green mode button **“DVCPro – HD”** to have the corresponding resolution values in DVCPro HD and then choose **“720p 50.00 Hz”** to set all of the following parameters;
 - VCube Video Ref Format to 720p 50.00 Hz
 - VCube Sampling Rate to 48000
 - VCube Composition Video Format to 960x720, No Fields (Progressive Scan), Pixel aspect ratio to HDV – DVCPROHD 720p, 1080i 50(1.333)
 - VCube Composition Frame Rate to 50.00 fps (PALx2)
 - VCube TC Frame Rate to PAL (25 fps)
 - AJA Video Format (internal) to 720p 50.00 Hz
 - AJA Frame buffer size to 8 bit DVCPRO 720p
 - Virtual Transport Frame Rate to PAL (25 fps)

Now that these settings are automatically set we still need to modify a couple of parameters manually to fit our example. The VCube is set to receive 720p 50.00 Hz video reference to the Mykerinos but we have provided a black burst PAL reference from our generator to all machines in the studio locking to PAL (25 fps) time code so we need to change this in the Formats & Sync page.

- Set Video Ref Format to PAL (625 50.00 Hz) manually so that the incoming black burst PAL signal corresponds to the incoming PAL time code.

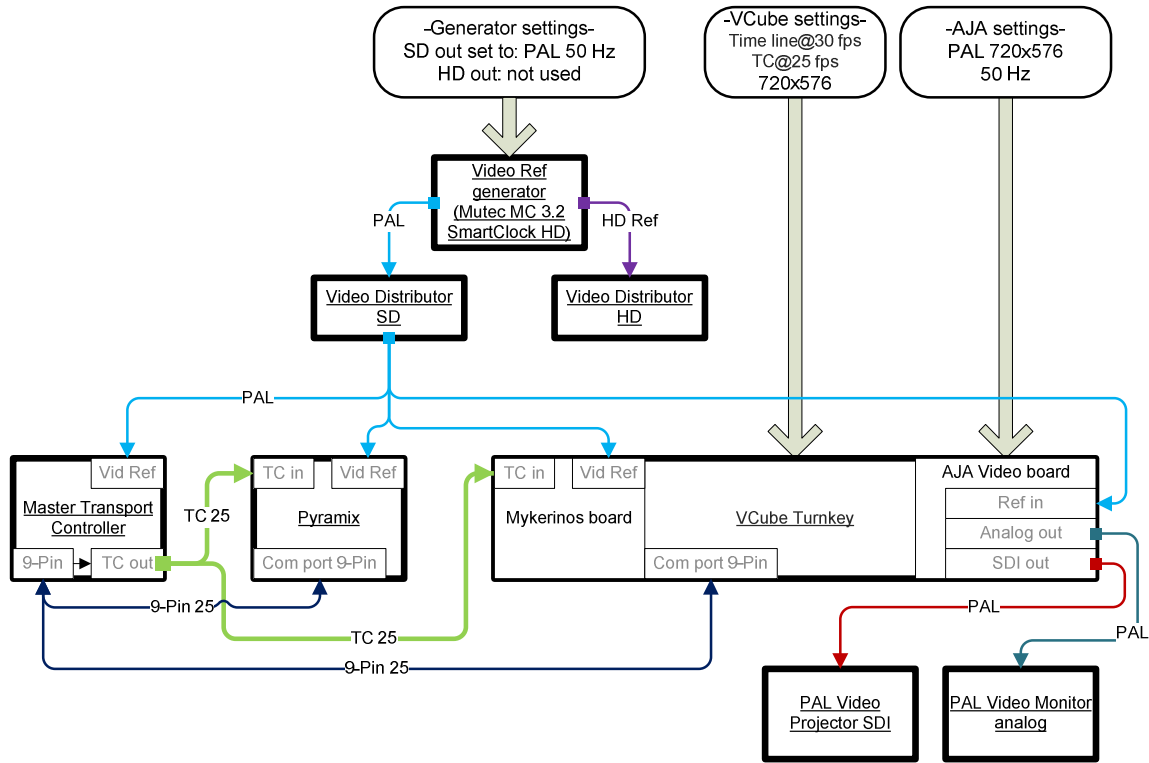


Note: If we had used a 720p tri-level ref signal to feed the Mykerinos like the one provided to the AJA this final step would not have been necessary but it serves our example to describe one possible real-world variation of the Quick HD settings.

Standard definition cross lock configuration in a full turnkey system –

VCube SD NTSC/PAL TC cross lock sync flowchart

Configuration in a full turnkey VCube with an AJA video board and a Mykerinos



When a VCube with both a Mykerinos board and an AJA board is running standard definition picture at a different frame rate than the incoming time code the setup is a little trickier and requires a few extra steps to achieve a “cross lock” configuration. As always you must supply the Mykerinos with the same primary SD video reference as the time code’s frame rate and the AJA board with a secondary SD video reference source that corresponds to the video display equipment you will use to display the picture. If the video display gear used is PAL, as in this example, then the AJA must receive PAL ref and the final play out picture will be compensated making play back of the NTSC picture only very slightly “jerky” due to framing compensation (visible motion slowdowns every second of playback) on a PAL display device. (see *note)

**NOTE: This “jerkiness” is not a defect of VCube but a real time process called “framing” due to VCube compensating for the differences in frames per second between a video file and the video playback engine of VCube which happens to be set to a different frame rate. It should also be noted that there are two video engines within VCube and one separate video engine in the AJA video board itself all working together to display the best possible picture to all outputs. One engine is to display video to the Preview window; one engine which feeds the AJA video board’s outgoing buffers and the AJA’s onboard internal video engine itself. The VCube’s two internal engines may be offset to accommodate for display devices that require a delay to output their signals, like digital monitors and projectors.*

The primary and secondary SD video reference sources used to synchronize the Mykerinos and the AJA must be perfectly in phase. Set both the Mykerinos and the AJA references to video

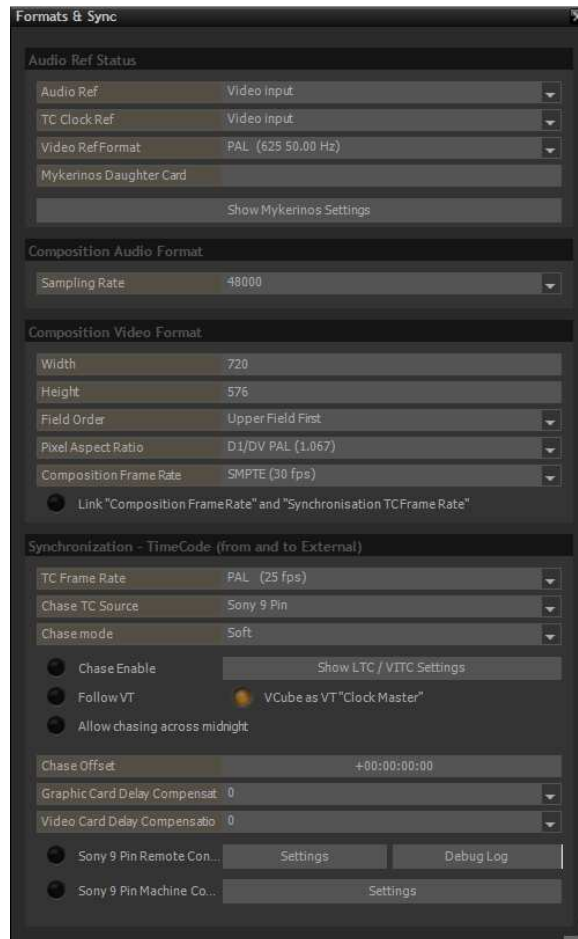
input and use the Quick SD settings to begin aligning the parameters within VCube so as to begin on a uniform basis of all the settings within VCube before modifying the parameters to provide for cross locking. Here is an example of NTSC (720x486) @ 29.97 fps picture with a PAL (25 fps) time code to a PAL monitor (720x576).

Scenario: The video file in VCube is NTSC (720x486) @ 29.97 fps using PAL (25 fps) time code in a PAL equipped studio (PAL display monitors) with a PAL black burst video reference signal fed to the Merging Video Ref In BNC and to the AJA Ref In BNC connector.

1. Manually set TC Clock Ref of the Mykerinos to **“Video input”** on the Formats & sync page *or the Quick settings page*.
2. Manually set the Video Reference Source of the AJA to **“External (Reference)”** on the Video I/O page *or the Quick settings page*.
3. **Use the Quick SD Settings (Alt+F5)** and choose **“PAL 4/3 D1”** to set all of the following parameters;
 - VCube Video Ref Format to PAL (625 50.00 Hz)
 - VCube Sampling Rate to 48000
 - VCube Composition Video Format to 720x576, Upper Field First, Pixel aspect ratio to D1/DV PAL (1.067)
 - VCube Composition Frame Rate to PAL (25 fps)
 - VCube TC Frame Rate to PAL (25 fps)
 - AJA Video Format (internal) to PAL (625 50.00 Hz)
 - AJA Frame buffer size to 8 bit YUV 4:2:2
 - Virtual Transport Frame Rate to PAL (25 fps)

Now that these settings are automatically set we still need to modify a couple of parameters manually to actually cross lock VCube. Cross locking is a relation between the composition frame rate and the TC Frame Rate on the Formats & Sync page that have different values. By default VCube links these values after a Quick Setting is applied so we first need to unlink them.

- Click on the yellow button labeled – Link “Composition Frame Rate” and “Synchronization TCFrame Rate” to turn it off. *We may now change these parameters independently.*
- Set the Composition Frame Rate to **“SMPTE (30 fps)”**. *Playback to the preview window should now be totally smooth and the playback to the AJA should appear only very slightly compensated due to 30/25 framing and overall, look good.*



Note: If we had set the Composition Frame Rate to "NTSC (29.97 fps)" the VCube preview window would have shown a certain amount of -0.1% framing compensation due to the difference between the PAL TC being set at 1000 milliseconds for 25 frames and the NTSC picture being at 1001 milliseconds for 30 frames. In fact this is what makes the NTSC frame rate 29.97 instead of a flat 30 fps. NTSC at 29.97 fps is nothing more than 30 fps @ 1001 milliseconds. In other words NTSC is 30 frames of program playing back at a 0.1% slower tape speed stretching a second of its program to 1001 milliseconds, ergo 29.97 fps. In setting the VCube's time line at 30 fps the internal video engine to the preview window is operating in a 1000 millisecond program frame cycle, which corresponds perfectly to the time code's frame cycle of PAL (25 fps@1000ms) and does not need to juggle frames to compensate for the extra millisecond of NTSC (29.97 fps@1001ms) or derivative formats like; 23.98, 59.94, etc.. In this way every cross lock scenario should take into account this difference in program frame cycles and align the 1001 millisecond program formats of the time line to the 1000 millisecond equivalents of the incoming time code (or vice verse). Example: 29.97 to 30, 23.98 to 24, 59.94 to 60, etc..

It is also worth mentioning here that if the display gear can handle NTSC picture (like most multi-sync monitors today) the best is to setup the AJA engine in NTSC and provide an NTSC black burst as reference to it. After all, if the video display gear is the same format as the source video the display will be totally smooth no matter what time code is used to chase the VCube as there will be no framing process happening at playback. The original program time will also remain exactly the same in any case as VCube does not alter video program times of clips that are placed in a time line with a different frame rate.

Formats & Sync

Audio Ref Status

Audio Ref: Video input

TC Clock Ref: Video input

Video RefFormat: PAL (625 50.00 Hz)

Mykerinos Daughter Card

Show Mykerinos Settings

Composition Audio Format

Sampling Rate: 48000

Composition Video Format

Width: 720

Height: 576

Field Order: Upper Field First

Pixel Aspect Ratio: D1/DV PAL (1.067)

Composition Frame Rate: SMPTE (30 fps)

Link "Composition FrameRate" and "Synchronisation TCFrameRate"

Synchronization - TimeCode (from and to External)

TC Frame Rate: PAL (25 fps)

Chase TC Source: Sony 9 Pin

Chase mode: Soft

Chase Enable Show LTC / VITC Settings

Follow VT VCube as VT "Clock Master"

Allow chasing across midnight

Chase Offset: +00:00:00:00

Graphic Card Delay Compensat: 0

Video Card Delay Compensatio: 0

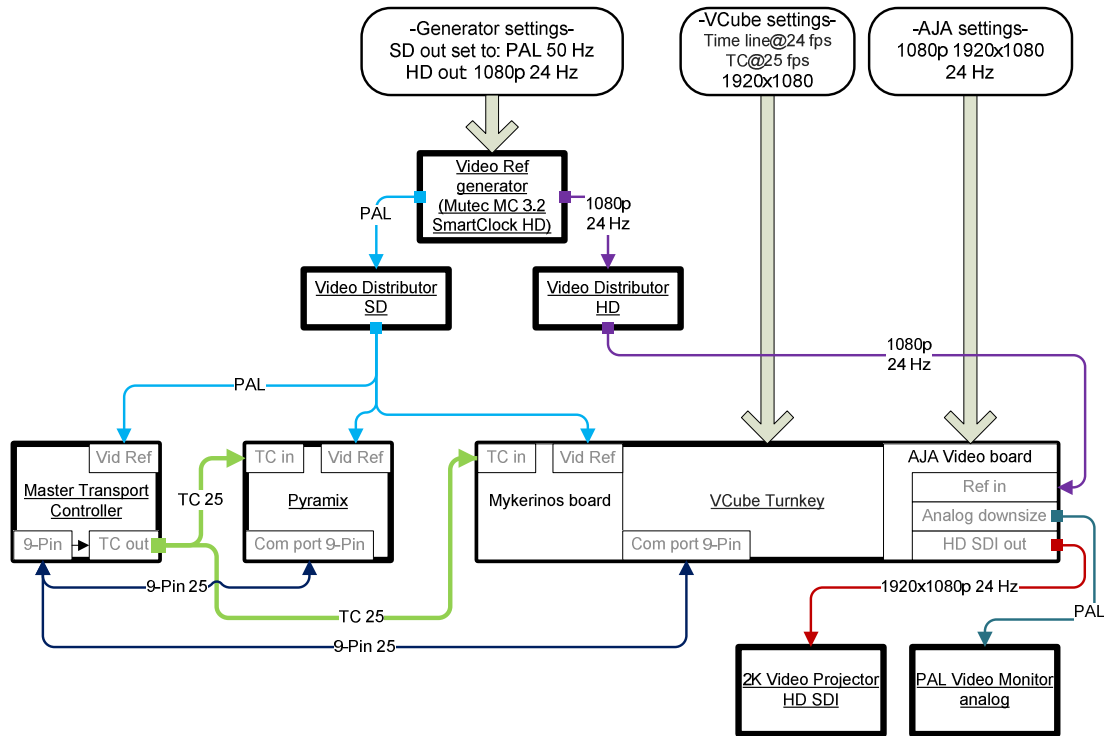
Sony 9 Pin Remote Con... Settings Debug Log

Sony 9 Pin Machine Co... Settings

High definition cross lock configuration in a full turnkey system –

VCube HD 1080p/PAL TC cross lock sync flowchart

Configuration in a full turnkey VCube with an AJA video board and a Mykerinos



When a VCube with both a Mykerinos board and an AJA board is running high definition picture at a different frame rate than the incoming time code the setup requires a few extra steps to achieve a “cross lock” configuration after using a Quick HD settings preset. As always you must supply the Mykerinos with the same primary video reference as the time code’s frame rate and the AJA board with a secondary HD video reference source that corresponds to the format of the video you wish to play out. If the video display gear used is PAL, as in this example, then the AJA (LHe used in this example) may down-size the HD picture in real time for proper display on the PAL display gear. The AJA must receive a tri-level ref which corresponds to its internal engine’s HD video format which in turn should correspond to the VCube’s Composition Video Format. Remember that cross locking is just a question of dissociating VCubes incoming time code with the frame rate of the composition and providing for all the proper external sync sources to insure smooth frame accurate lock no matter what the time code source is.

The primary video reference sources to your Mykerinos may either be SD bi-level or HD tri-level cadencies depending on the actual incoming time code used in your studio. The video ref sources used to synchronize the Mykerinos and the AJA must as always be perfectly in phase. Set both the Mykerinos and the AJA references to video input and use the Quick HD settings to align the parameters within VCube so as to begin on a uniform basis of all the settings within VCube

before modifying the parameters to provide for cross locking. Here is an example of 1080p @ 24 fps picture with a PAL (25 fps) time code to a PAL monitor (720x586).

Scenario: The video file in VCube is 1080p (1920x1080) @ 24 fps using PAL (25 fps) time code in a PAL equipped studio (PAL display monitors) with a PAL black burst video reference signal fed to the Merging Video Ref In BNC and tri-level 1080p @ 24 fps to the AJA Ref In BNC connector.

1. Manually set TC Clock Ref of the Mykerinos to **“Video input”** on the Formats & sync page or the *Quick settings page*.
2. Manually set the Video Reference Source of the AJA to **“External (Reference)”** on the Video I/O page or the *Quick settings page*.
3. **Use the Quick HD Settings (Alt+F6)** and choose “1080p 24 Hz” to set all of the following parameters;
 - VCube Video Ref Format to 1080p 24.00 Hz
 - VCube Sampling Rate to 48000
 - VCube Composition Video Format to 1920x1080, No Fields (Progressive Scan), Pixel aspect ratio Square Pixels (1.0)
 - VCube Composition Frame Rate to Film (24 fps)
 - VCube TC Frame Rate to Film (24 fps)
 - AJA Video Format (internal) to 1080p 24.00 Hz
 - AJA Frame buffer size to 8 bit YUV 4:2:2
 - Virtual Transport Frame Rate to Film (24 fps)

Now that these settings are automatically set we still need to modify several parameters manually to actually cross lock VCube.

- Set the Video Ref Format of the Mykerinos to PAL (625 50.00 Hz)
- Click on the yellow button labeled – Link “Composition Frame Rate” and “Synchronization TCFrame Rate” to turn it off.
- Set the TC Frame Rate to “PAL (25 fps)”.
- If your video display gear is HD capable you should now see smooth play back but if your display is SD you will need to downsize your HD picture by choosing the down convert switches for the appropriate AJA outputs in the “Video I/O” menu of VCube. *In addition to this if you are using the analog outputs of the AJA LHe to display downsized HD film you will see the best results with NTSC 525 formats in the “Video Analog Output From” drop down menu and not the proper PAL 625 choices. Try them for yourself if there is any doubt as to which AJA downsize format looks best on your display gear.*

Formats & Sync

Audio Ref Status

Audio Ref: Video Input

TC Clock Ref: Video Input

Video Ref Format: PAL (625 50.00 Hz)

Mykerinos Daughter Card

Show Mykerinos Settings

Composition Audio Format

Sampling Rate: 48000

Composition Video Format

Width: 1920

Height: 1080

Field Order: No Fields (Progressive Scan)

Pixel Aspect Ratio: Square Pixels (1.0)

Composition Frame Rate: Film (24 fps)

Link "CompositionFrameRate" and "Synchronisation TCFrameRate"

Synchronization - TimeCode (from and to External)

TC Frame Rate: PAL (25 fps)

Chase TC Source: Sony 9 Pin

Chase mode: Soft

Chase Enable: Show LTC / VITC Settings

Follow VT: VCube as VT "Clock Master"

Allow chasing across midnight

Chase Offset: +00:00:00:00

Graphic Card Delay Compensat: 0

Video Card Delay Compensabo: 0

Sony 9 Pin Remote Con... Settings Debug Log

Sony 9 Pin Machine Co... Settings

Video I/O

Plugin: Enable XENA LH 0

Company: AJA Video Systems, Inc.

Product: XENA LH 0

Serial: 00B47661 - ID: 10184500

Product Version: 6.6.0 build 57

Description: AJA, Xena Card Support for VCube
Main FPGA bitfile: 2008/12/02 at 12:15:18 - PCI FPGA version: 1

Plugin Manufacturer: Merging Technologies SA

External (Reference) status	1080p 24.00 Hz.
SDI Input 1 status	none
Analog Input status	none Locked
Video Format (internal)	1080p 24.00 Hz.
Frame buffer size	8 bit YUV 4:2:2
Audio Source	Embedded SDI
Video Reference Source	External (Reference)
Video Input Selection	SDI
Video Analog Input Format	1080i 50 Hz
Video Analog Output Format	1080psf SMPTE
Audio Analog Level	18 dBu
Down convert Mode	Anamorphic
Down convert HD Input	Enable
Down convert SDI Output 1	Enable
Down convert SDI Output 2	Enable
Down convert Analog Output	Enable
1 Field when Stopped	Enable

Sync Status

Mykerinos

Video Ref Format: PAL (625 50.00 Hz)

Audio Ref: Video input

Audio Ref Status: Video - Locked

TC Clock Ref: Video input

Show Format & Sync Settings

XENA LH 0

Video Format: 1080p 24.00 Hz.

Reference Source: External (Reference)

External (Reference) st: 1080p 24.00 Hz.

SDI Input status: none

Analog Input status: none

Show Video I/O

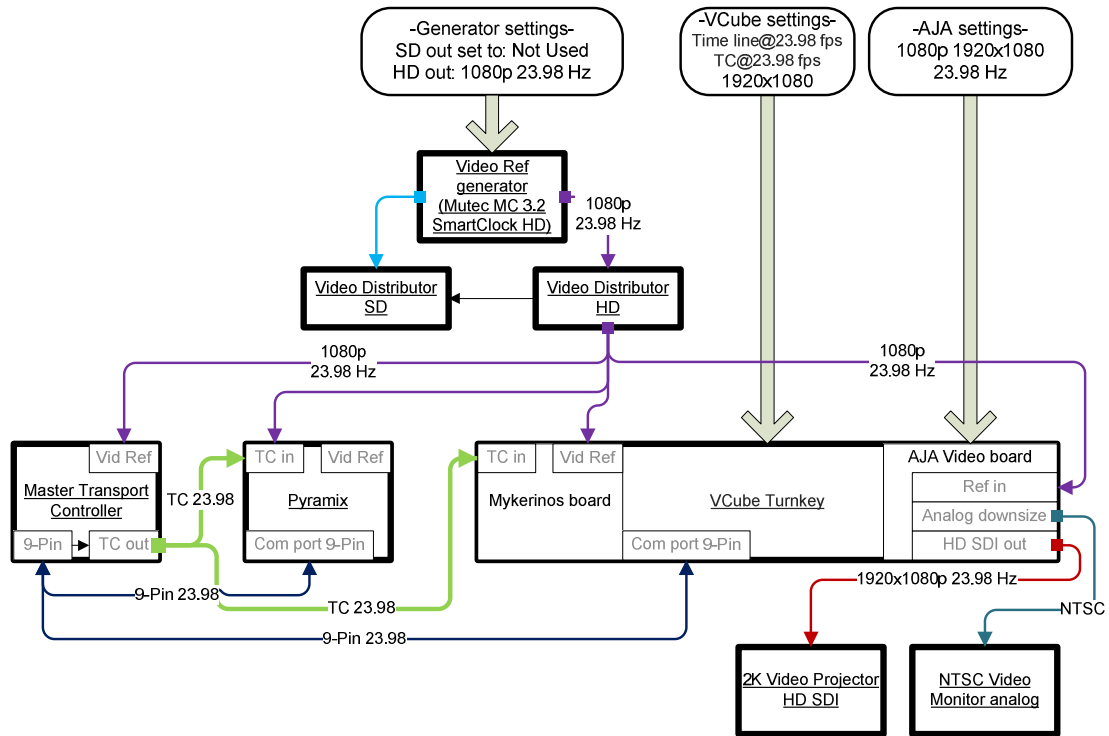
Quick SD settings

Quick HD settings

High definition configuration in a full turnkey system –

VCube HD 1080p 23.98fps/23.98TC sync flowchart

Configuration in a full turnkey VCube with an AJA video board and a Mykerinos



When a VCube with both a Mykerinos board and an AJA board is running high definition 23.98fps picture with 23.98 time code the relatively simple setup is as follows. You must supply the Mykerinos and the AJA board with a 23.98 Hz tri-level HD video reference source. If the video display gear used is NTSC compatible, as in this example, then the AJA (LHe used in this example) may down-size the HD picture in real time for proper display on the NTSC compatible display device.

The video ref sources used to synchronize the Mykerinos and the AJA must as always be perfectly in phase. Set both the Mykerinos and the AJA references to video input and use the Quick HD settings to align the parameters within VCube automatically so as to begin with uniform settings within VCube before modifying the parameters further to fit your display gear. Here is an example of 1080p @ 23.98 fps picture with a 23.98fps time code (24fps TC @ -0.1% play back speed) to an NTSC monitor (720x586) and a 2K HD projector.

Scenario: The video file in VCube is 1080p (1920x1080) @ 23.98 fps using 23.98 fps time code in an NTSC/HD 2K equipped studio (NTSC display monitors) with a 23.98 Hz tri-level video reference signal fed to the Merging Video Ref In BNC and the AJA Ref In BNC connectors.

1. Manually set TC Clock Ref of the Mykerinos to **“Video input”** on the Formats & sync page *or the Quick settings page*.
2. Manually set the Video Reference Source of the AJA to **“External (Reference)”** on the Video I/O page *or the Quick settings page*.
3. **Use the Quick HD Settings (Alt+F6)** and choose **“1080p 23.98 Hz”** to set all of the following parameters;
 - VCube Video Ref Format to 1080p 23.98 Hz
 - VCube Sampling Rate to 48000
 - VCube Composition Video Format to 1920x1080, No Fields (Progressive Scan), Pixel aspect ratio Square Pixels (1.0)
 - VCube Composition Frame Rate to Film (23.98 fps)
 - VCube TC Frame Rate to Film (23.98 fps)
 - AJA Video Format (internal) to 1080p 23.98 Hz
 - AJA Frame buffer size to 8 bit YUV 4:2:2
 - Virtual Transport Frame Rate to Film (23.98 fps)

Now that these settings are automatically set we still need to modify several parameters manually to actually output the HD picture to an NTSC monitor.

- Set the Video Analog Output Format (of the AJA LHe in this example) to an NTSC format which corresponds to the actual monitor used. (In this example 525 RGB is shown)
- For the analog output of the AJA board enable the **“Down convert Analog Output”** button to force the AJA to convert the 1920x 1080 progressive picture to 720x486 interleaved NTSC. *NOTE: When the AJA’s internal video engine is running at 24 or 23.98 (-0.1% pull down) the analog outputs of the AJA board should down convert to an NTSC (525 59.94Hz) format and NOT a PAL (625 50.00 Hz) to avoid syncing problems on your display monitor (flipping picture).*
- If your video display gear is HD SDI capable you should now see smooth playback from the HD SDI connectors on the AJA board but if your display is SDI you will need to downsize your HD picture by choosing the down convert switches for the appropriate AJA outputs in the **“Video I/O”** menu of VCube.

Plugin

Enable
 XENA LH 0

Company: AJA Video Systems, Inc.
 Product: XENA LH 0
 Serial: 00B44457 - ID: 10184500
 Product Version: 6.6.0 build 57
 Description: AJA, Xena Card Support for VCube
 Main FPGA bitfile: 2008/12/02 at 12:15:18 - PCI FPGA version: 1

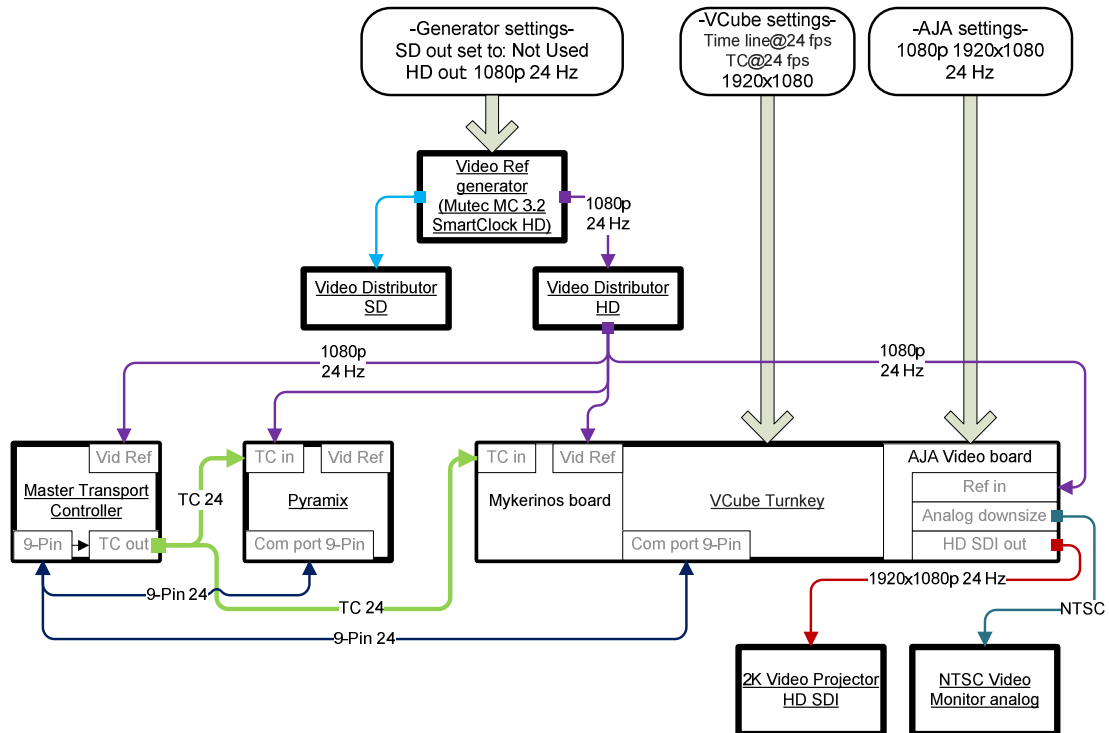
Plugin Manufacturer: Merging Technologies S.A.

Video Reference Source	External (Reference)	▼
Video Input Selection	SDI	▼
Video Analog Input Format	1080i 50 Hz	▼
Video Analog Output Format	525 RGB	▼
Audio Analog Level	18 dBu	▼
Down convert Mode	Letter box	▼
Down convert HD Input	<input type="radio"/> Enable	
Down convert SDI Output 1	<input checked="" type="radio"/> Enable	
Down convert SDI Output 2	<input checked="" type="radio"/> Enable	
Down convert Analog Output	<input checked="" type="radio"/> Enable	
1 Field when Stopped	<input checked="" type="radio"/> Enable	

High definition configuration in a full turnkey system –

VCube HD 1080p 23.98fps/24TC sync flowchart

Configuration in a full turnkey VCube with an AJA video board and a Mykerinos



When a VCube with both a Mykerinos board and an AJA board is running high definition 23.98fps picture with 24fps time code the setup is simple but deserves a little explanation. You must supply the Mykerinos and the AJA board with a 24 Hz tri-level HD video reference source. If the video display gear used is NTSC compatible, as in this example, then the AJA (LHe used in this example) may down-size the HD picture in real time for proper display on the NTSC compatible display device.

The video ref sources used to synchronize the Mykerinos and the AJA must as always be perfectly in phase. Set both the Mykerinos and the AJA references to video input and use the Quick HD settings to align the parameters within VCube so as to begin with uniform settings within VCube before modifying the parameters further to fit your display gear. Here is an example of 1080p @ 23.98 fps picture with a 24fps time code to an NTSC monitor (720x586) and a 2K HD projector.

Scenario: The video file in VCube is 1080p (1920x1080) @ 23.98 fps using 24 fps time code in an NTSC/HD 2K equipped studio (NTSC display monitors) with a 23.98 Hz tri-level video reference signal fed to the Merging Video Ref In BNC and the AJA Ref In BNC connectors.

1. Manually set TC Clock Ref of the Mykerinos to **“Video input”** on the Formats & sync page or the Quick settings page.
2. Manually set the Video Reference Source of the AJA to **“External (Reference)”** on the Video I/O page or the Quick settings page.
3. **Use the Quick HD Settings (Alt+F6)** and choose “1080p 24 Hz” to set all of the following parameters;
 - VCube Video Ref Format to 1080p 24 Hz
 - VCube Sampling Rate to 48000
 - VCube Composition Video Format to 1920x1080, No Fields (Progressive Scan), Pixel aspect ratio Square Pixels (1.0)
 - VCube Composition Frame Rate to Film (24 fps)
 - VCube TC Frame Rate to Film (24 fps)
 - AJA Video Format (internal) to 1080p 24 Hz
 - AJA Frame buffer size to 8 bit YUV 4:2:2
 - Virtual Transport Frame Rate to Film (24 fps)

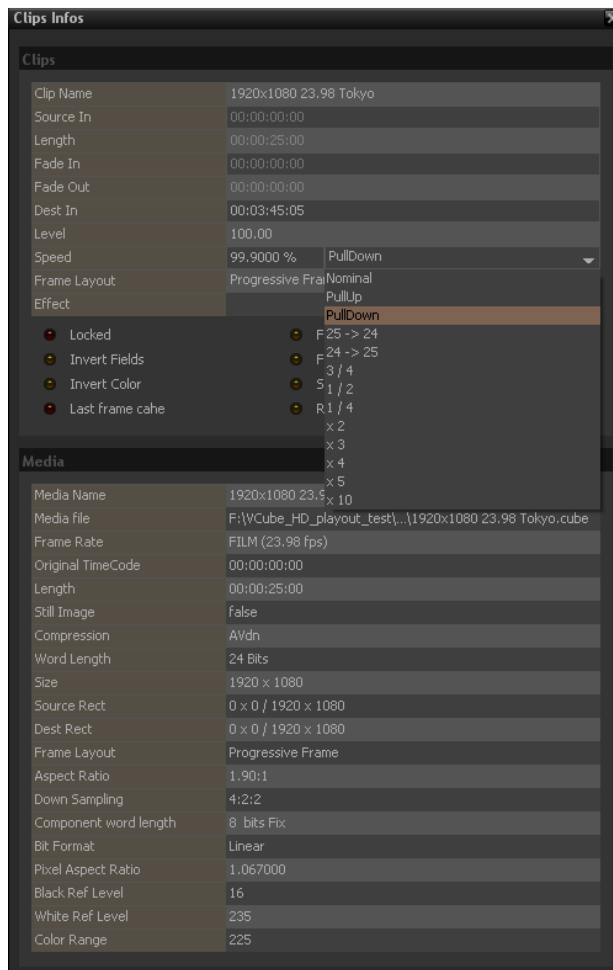
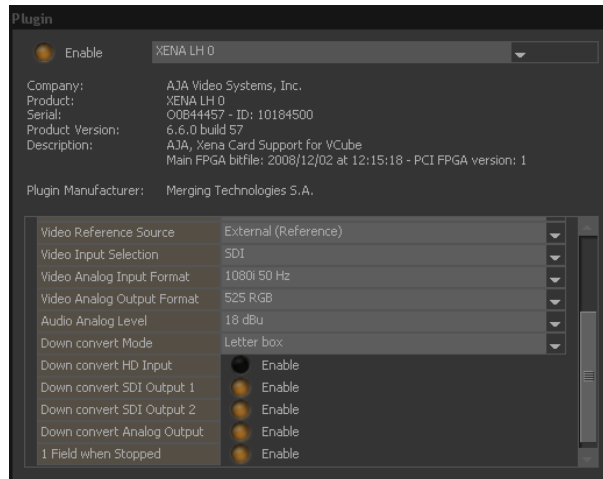
Now that these settings are automatically set we still need to modify several parameters manually to actually output the HD picture to an NTSC monitor.

- Set the Video Analog Output Format (of the AJA LHe in this example) to an NTSC format which corresponds to the actual monitor used. (In this example 525 RGB is shown)
- For the analog output of the AJA board enable the “Down convert Analog Output” button to force the AJA to convert the 1920x 1080 progressive picture to 720x486 interleaved NTSC. *NOTE: When the AJA’s internal video engine is running 24 or 23.98 fps the analog outputs of the AJA board should down convert to an NTSC (525 59.94Hz) format and NOT a PAL (625 50.00 Hz) to avoid syncing problems on your display monitor (flipping picture).*
- If your video display gear is HD SDI capable you should now see smooth playback from the HD SDI connectors on the AJA board but if your display is SDI you will need to downsize your HD picture by choosing the down convert switches for the appropriate AJA outputs in the “Video I/O” menu of VCube.

NOTE: VCube does not change the program length of a video clip placed in the time line. If you place a clip into the time line which does not correspond to the current composition frame rate you may just hit play and watch the video directly. VCube automatically finds the best framing ratio and plays out the file at its original speed regardless of the time line’s ruler marks or the incoming time code. For this reason you never need to pull-down 24 fps video to a 23.98 time line or vice versa. In fact if you look closely at the end of a “slow” 23.98 fps video file placed in a 24 fps composition you will notice that the end of each frame is slightly longer than the frames of the time line’s ruler marks. This shows the true length of each frame of the 23.98 fps video.

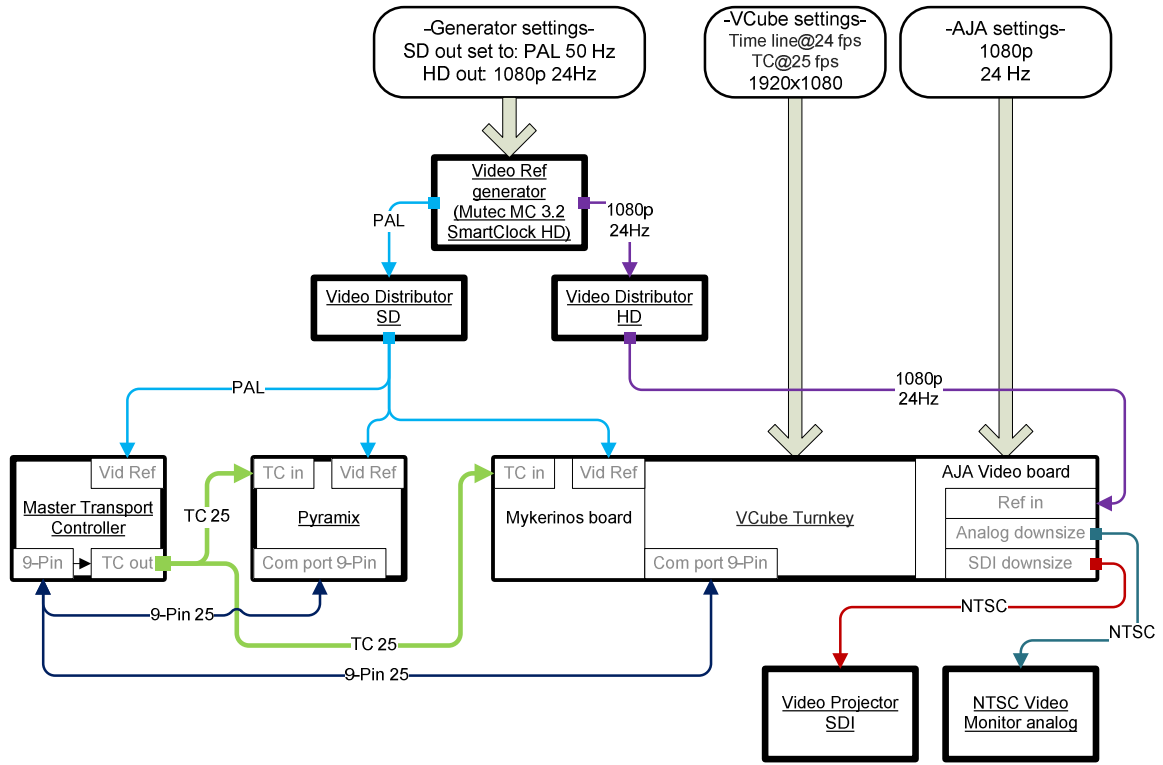
You may also choose to manually pull-down a 24 fps file to 23.98 fps or pull-up a 23.98 fps video file to 24 fps from within the “Clips Infos” page (double click on a single video clip or choose from the

View tab). To pull down click the “PullDown” option from the Speed drop-down menu. All of the speed options change the actual length of the clip in real time by modifying the framing ratio without re-rendering anything at all. To complete this pull-down speed change you must resize the end of the clip in the time line manually by dragging its out point to its new ending so as to see the last frames of your newly slowed down clip. *The same applies for clips that you change from a faster to a slower frame rate like 25 ->24, or x2.*



PAL sized 24fps/PAL 25TC cross lock sync flowchart

Configuration in a full turnkey VCube with an AJA video board and a Mykerinos



When a VCube with both a Mykerinos board and an AJA board is running non-standard definition picture at an HD frame rate *like 24 fps (SD size or higher)* out to standard definition gear with 25 fps time code then the setup is very tricky and requires extra steps to achieve a “cross locked” and “down sized” configuration. This often happens in cinema post production situations (unfortunately) where an editor has provided pseudo PAL or NTSC sized video files in a codec intended for SD use (like DV standard) in an effort to save disk space when rendering video files. The problem is that neither PAL nor NTSC standards were designed to handle frame rates than their own (ie: 25, 29.97fps respectively) and virtual SD video hardware generally respects these tolerances as well. VCube allows for a work around to this providing for smooth playback on both the preview screen and the AJA’s outputs without re-rendering these pseudo SD medias running at HD frame rates by using its own HD engine, upsizing the composition’s resolution, running the time line and AJA at the non standard frame rate (in this example 24 fps) and downsizing the video outputs of the AJA itself back to NTSC. *A PAL downsize is not possible due to the AJA’s engine running at 1080p 24Hz internally so it is best to use NTSC downsizing to avoid picture flipping to your display gear.* You must supply the Mykerinos with the same SD video reference as the incoming time code’s frame rate and the AJA board with a secondary HD video reference source that corresponds to the HD engine you will be using to smoothly play out your 24 fps picture.

The primary SD and secondary HD video reference sources used to synchronize the Mykerinos and the AJA must be perfectly in phase. Set both the Mykerinos and the AJA references to video input and use the Quick SD settings to begin aligning VCube's parameters so that all of the basic settings within VCube are uniformly aligned before modifying the additional parameters to provide for cross locking and downsizing. Here is an example of a PAL sized picture (720x576) @ 24 fps picture running PAL (25 fps) time code to an NTSC monitor (720x486).

Scenario: The video file in VCube is *pseudo* DV PAL (720x576) @ 24 fps using PAL (25 fps) time code in a PAL equipped studio (NTSC compatible display monitors) with a PAL black burst video reference signal fed to the Merging Video Ref In BNC and a 1080p 24 Hz tri-level video reference signal sent to the AJA Ref In BNC connector.

1. Manually set TC Clock Ref of the Mykerinos to **"Video input"** on the Formats & sync page *or the Quick settings page*.
2. Manually set the Video Reference Source of the AJA to **"External (Reference)"** on the Video I/O page *or the Quick settings page*.
3. **Use the Quick SD Settings (Alt+F5)** and choose "PAL 4/3 D1" to set all of the following parameters;
 - VCube Video Ref Format to PAL (625 50.00 Hz)
 - VCube Sampling Rate to 48000
 - VCube Composition Video Format to 720x576, Upper Field First, Pixel aspect ratio to D1/DV PAL (1.067)
 - VCube Composition Frame Rate to PAL (25 fps)
 - VCube TC Frame Rate to PAL (25 fps)
 - AJA Video Format (internal) to PAL (625 50.00 Hz)
 - AJA Frame buffer size to 8 bit YUV 4:2:2
 - Virtual Transport Frame Rate to PAL (25 fps)

Now that these settings are automatically set we still need to modify all of the following parameters manually to actually cross lock and downsize VCube. Cross locking is the relation between the composition frame rate and the TC Frame Rate on the Formats & Sync page that have different values. By default VCube links these values after a Quick Setting is applied so we first need to unlink them.

- On the Formats & Sync page click on the yellow button labeled – Link "Composition Frame Rate" and "Synchronization TCFrame Rate" to turn it off. *We may now change these parameters independently.*
- Set the Composition Frame Rate to "FILM (24 fps)".
- Set the resolution of the "composition video format" to 1920x1080.
- On the Video I/O page set the "Video Format (internal)" to 1080p 24.00 Hz.
- Set the "Video Analog Output Format" to the appropriate 525 (NTSC) for use with your analog display device (in this example 525 RGB).
- Click the "Down convert SDI Outputs" and "Down convert Analog Outputs" to activate the AJA's downsizing.

Composition Video Format

Width: 1920
 Height: 1080
 Field Order: Upper Field First
 Pixel Aspect Ratio: D1/DV PAL (1.067)
 Composition Frame Rate: Film (24 fps)

Link "Composition Frame Rate" and "Synchronisation TC Frame Rate"

Synchronization - TimeCode (from and to External)

TC Frame Rate: PAL (25 fps)
 Chase TC Source: Sony 9 Pin
 Chase mode: Hard

Chase Enable Show LTC / VITC Settings
 Follow VT VCube as VT "Clock Master"
 Allow chasing across midnight

Chase Offset: +00:00:00:00
 Graphic Card Delay Compensation: 0
 Video Card Delay Compensation: 0

Sony 9 Pin Remote Control Settings Debug Log
 Sony 9 Pin Machine Control Settings

Plugin

Enable XENA LH 0

Company: AJA Video Systems, Inc.
 Product: XENA LH 0
 Serial: 00847661 - ID: 10184500
 Product Version: 6.6.0 build 57
 Description: AJA, Xena Card Support for VCube
 Main FPGA bitfile: 2008/12/02 at 12:15:18 - PCI FPGA version: 1

Plugin Manufacturer: Merging Technologies S.A.

Video Reference Source: External (Reference)
 Video Input Selection: SDI
 Video Analog Input Format: 525 Component Beta US
 Video Analog Output Format: 525 RGB
 Audio Analog Level: 18 dBu
 Down convert Mode: Letter box

Down convert HD Input: Enable
 Down convert SDI Output 1: Enable
 Down convert SDI Output 2: Enable
 Down convert Analog Output: Enable
 1 Field when Stopped: Enable

Plugin

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 Product Version: 6.6.0 build 57
 Description: AJA, Xena Card Support for VCube
 Main FPGA bitfile: 2008/12/02 at 12:15:18 - PCI FPGA version: 1

Plugin Manufacturer: Merging Technologies S.A.

External (Reference) status: 1080p 24.00 Hz.
 SDI Input 1 status: none
 Analog Input status: none Locked
 Video Format (Internal): 1080p 24.00 Hz.
 Frame buffer size: 8 bit YUV 4:2:2
 Audio Source: AES
 Video Reference Source: External (Reference)
 Video Input Selection: SDI
 Video Analog Input Format: 525 Component Beta US
 Video Analog Output Format: 525 RGB
 Audio Analog Level: 18 dBu

Sync Status

Mykerinos

Video Ref Format: PAL (625 50.00 Hz)
 Audio Ref: Video input
 Audio Ref Status: Video - Locked
 TC Clock Ref: Video input

Show Format & Sync Settings

XENA LH 0

Video Format: 1080p 24.00 Hz.
 Reference Source: External (Reference)
 External (Reference) statu: 1080p 24.00 Hz.
 SDI Input status: none
 Analog Input status: none

Show Video I/O

Quick SD settings

Quick HD settings