grass valley
A BELDEN BRAND

ADVC G-Series Integrating Consumer and Prosumer Devices into a Production Workflow

Joe Paryzek, Solutions Engineer, Grass Valley, a Belden Brand

APPLICATION NOTE

January 2014

Grass Valley ADVC G-Series converters are designed to properly convert, aspect-correct, signal format, buffer and synchronize (when genlocked).

The G-Series offers much more functionality than converters that simply perform as media extenders. This Application Note gives practical examples of the benefits of using them in a production environment.

ADVC G-Series – An Introduction

In the converter market space, there are many products intended to be "media converters" or "display extenders" which address converting between analog, HDMI and SDI. They are generally low-cost, and come in a wide variety of shapes and sizes. They do their jobs, and do them quite well — for the most part.

Where such products become problematic however, is when they are introduced into a production path. One example of this is where multiple signals must be mixed through a production switcher/vision mixer. This will probably be the case in almost any broadcast station, production house or live event (whether televised or for in-house viewing/IMAG).

Many of these devices offer little protection, if any, to the integrity of the SDI output signals they generate from the input source. Most of them do a poor job of mapping color space to the constraints of the SDI formats they support, resulting in a wide variety of artifacts, ranging from random "twitching" to constant "tearing" on the SDI content.

As a general rule, if the converter has no frame synchronization capability, there will almost certainly be issues when introducing consumer devices — including computers (Mac or PC), Blu-ray players, DVD players or camcorders — into a professional AV or broadcast environment. Therefore when comparing converter devices, it is important to understand that not all converters are created equal, and that none of the lower-cost converters offer frame synchronization.

The ADVC G1 will convert, and/or upscale, sources from HDMI, DVI, component, composite, S-Video, AES/EBU and analog audio to HD/SD-SDI. It is the professional solution for incorporating Mac or PC graphics into production and routing switchers, and it can also be used as an audio embedder.

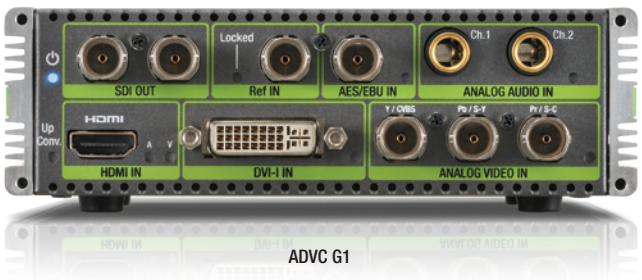
With output support of resolutions up to 1080p/60, and an upscaling feature that incorporates resolution enhancement technology, the ADVC G1 is the perfect "stream cleaner," and makes the most efficient use of bandwidth when used in front of compression/transmission devices.

The ADVC G2 has similar inputs and outputs to the G1, but the signal path is reversed to create a downconverter — useful, for example, for moving digital production content into legacy SD analog distribution, production and recording environments. SDI input supports resolutions up to 1080p/60 from 1080p/60 HDMI or SDI source. The ADVC G2 can be used as a monitoring device for HDMI and HD/SD-SDI sources.

The ADVC G3 is an HD/SD-SDI to HDMI converter, with 3G and HDMI 1.4a connection support, designed for 3D monitoring and multiplexing. It can multiplex, in real time, two SDI signals (left-eye & right-eye), up to 1080p/60 Level A/B, for a 3D output through HDMI, either side-by-side, top-and-bottom or sequential frame packing. The G3 can also be used as a standard HD/SD-SDI to HDMI converter.

While most sync generators have only six outputs and restrictions on SD and HD signals, the ADVC G4 has nine outputs that can be individually controlled in groups of three. For example, three outputs can be SD, the other six can be HD or it can be configured to do the opposite.

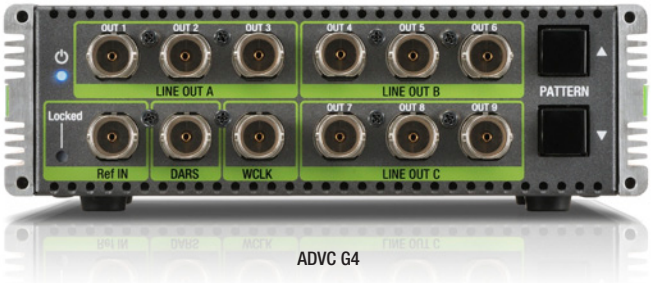
The ADVC G4 also includes a 48 kHz wordclock as well as a reference input. This reference input allows the G4 to be used as an "expander" for a master reference signal when more than nine outputs are needed, or when multiple "extension" outputs from the main sync system are necessary.



ADVC G1

ADVC G2

ADVC G3



ADVC G4

Practical Case Study – IMAG

There are two universal problems in the live events market where IMAG (image magnification) is used to supplement the live action on-stage.

The first is the seemingly inevitable lip-sync delay caused by system latencies between the lenses of the cameras and the final output on the projection screens. This is especially true of smaller systems depending on a switcher/scalar/synchronizer device to connect together all the video components.

The second is the long-term reliability, and short-term dependency, of the converters used between various computers' outputs and the SDI/HD-SDI video world.

In Figure 1, the signal flow between the camera and the projection lens is delayed by a number of processing steps. This is clearly no fault of the equipment itself, but is an unfortunate side effect — of depending on the capabilities of some devices to make up for deficiencies in others. The main causes — and their potential effects — are shown in red text.

Most consumer cameras are almost certainly "free-running," meaning that they generate a video signal using their own internal sync generation. Over time, such a camera will be almost a frame "early" compared to what is being processed by the video switcher. The switcher adds just enough delay to this early signal so that it appears to be in time with the switcher's own matrix, but there are additional processes downstream which can sometimes add up to six frames of latency.

The system needs some upgrades and re-engineering so that the dependencies on "self-synchronizing" or "scaling" features can be eliminated, which would remove most of the causes of system latency (see Figure 2).

Upgrading the cameras to accept a genlock (reference) signal is the first job. By installing a Grass Valley ADVC G4, the cameras and the production switcher will be operating on the same reference signal, which eliminates the need to frame-synchronize the cameras. As to the output, installing a projector that does not have to "scale" the image in any way (including digital keystone/size/position functions), and depends mostly on optical (in-the-lens) correction, reduces yet another contributing factor to the latency issue.

Deploying the ADVC G1 as a "synchronizing converter" provides a rock-solid interface between the computer and the SDI/HD-SDI/3G production world. It properly buffers and synchronizes the computer's DVI/HDMI output to feed the production switcher, resulting in a system which minimizes latency to the smallest possible amount.

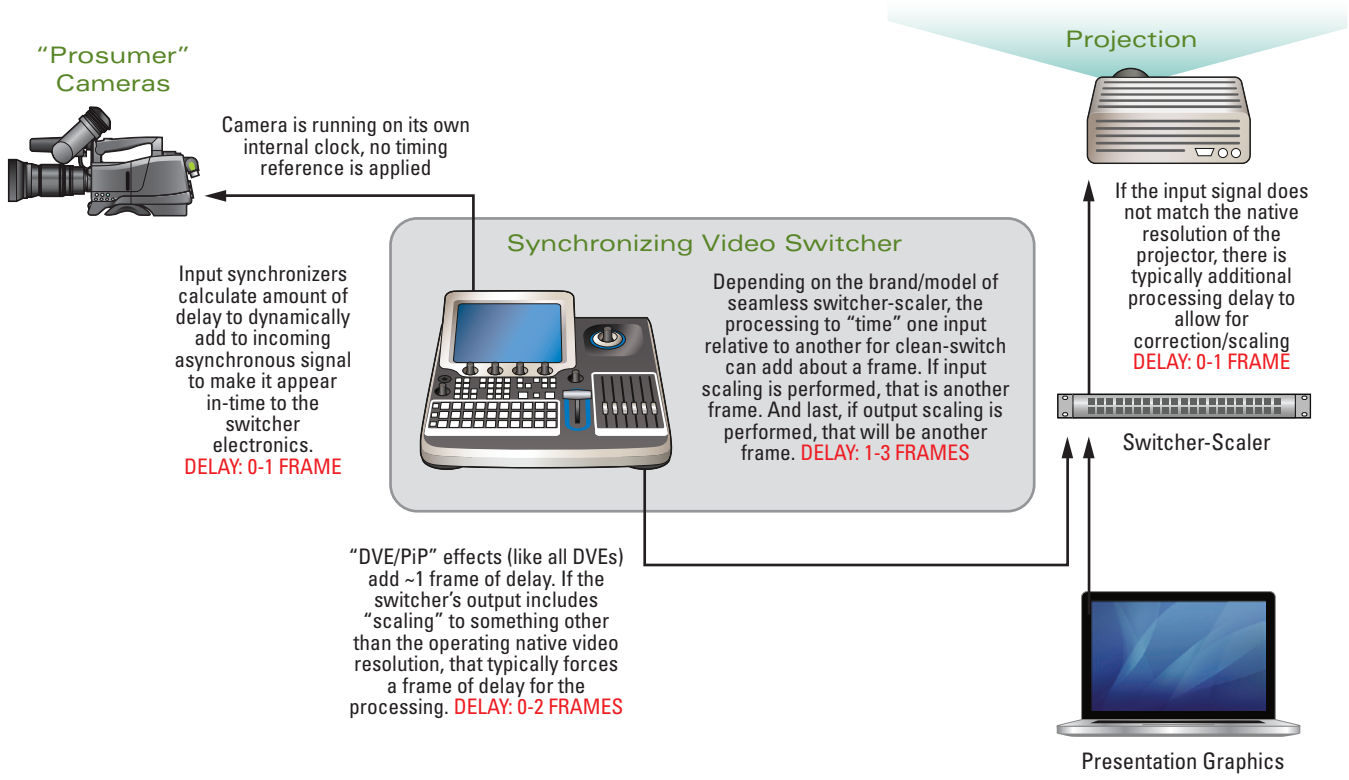


Figure 1 – System Design Contributing to Projection Feed "Lip-Sync" Errors.

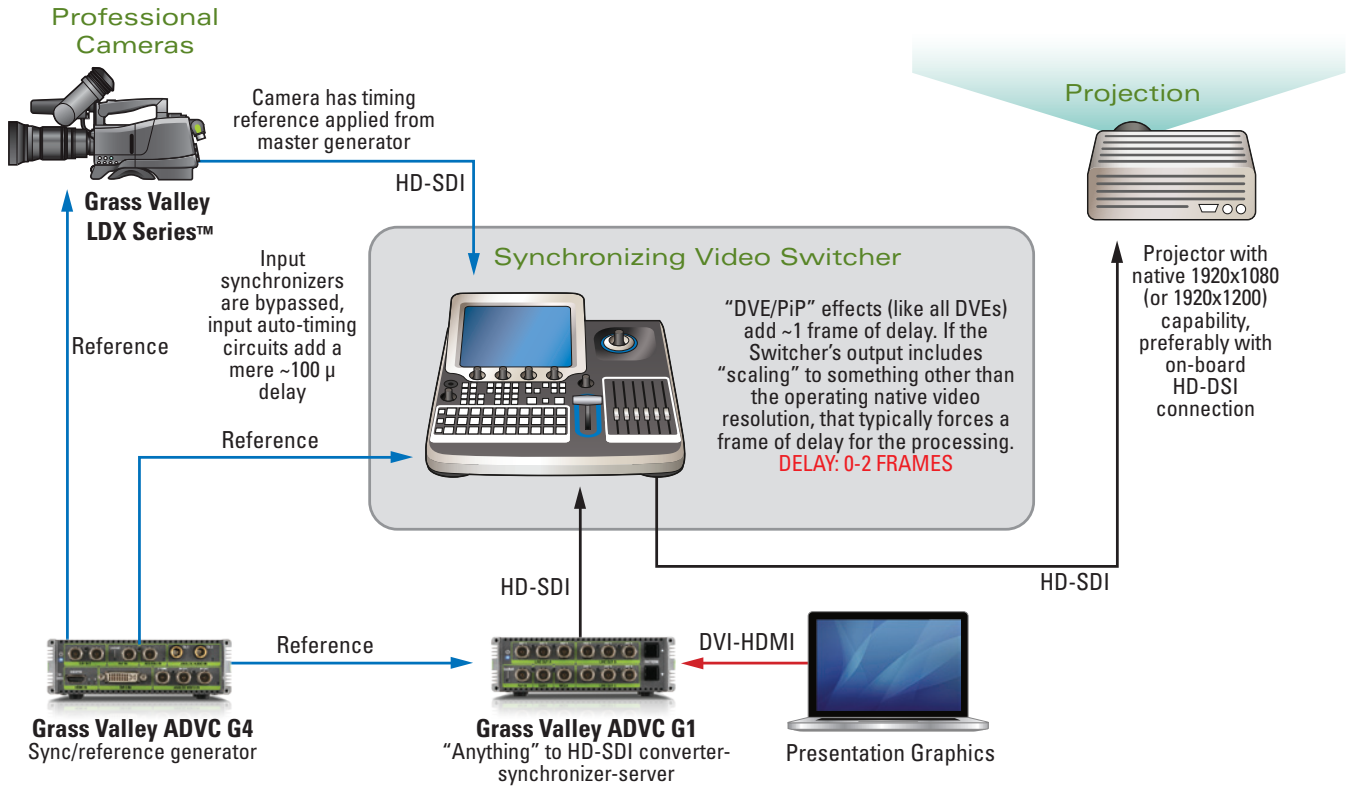


Figure 2